Split transformation

Cartesian coordinate

M_{rotate}

$$\begin{bmatrix} x_2 \\ y_2 \\ 1 \end{bmatrix} = \begin{bmatrix} \cos(\theta) & \sin(\theta) & 0 \\ -\sin(\theta) & \cos(\theta) & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

Original

Rotation

M_{zoom}

$$\begin{bmatrix} x_3 \\ y_3 \\ 1 \end{bmatrix} = \begin{bmatrix} Cx & 0 & 0 \\ 0 & Cy & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x_2 \\ y_2 \\ 1 \end{bmatrix}$$

Zooming/Scaling

Result
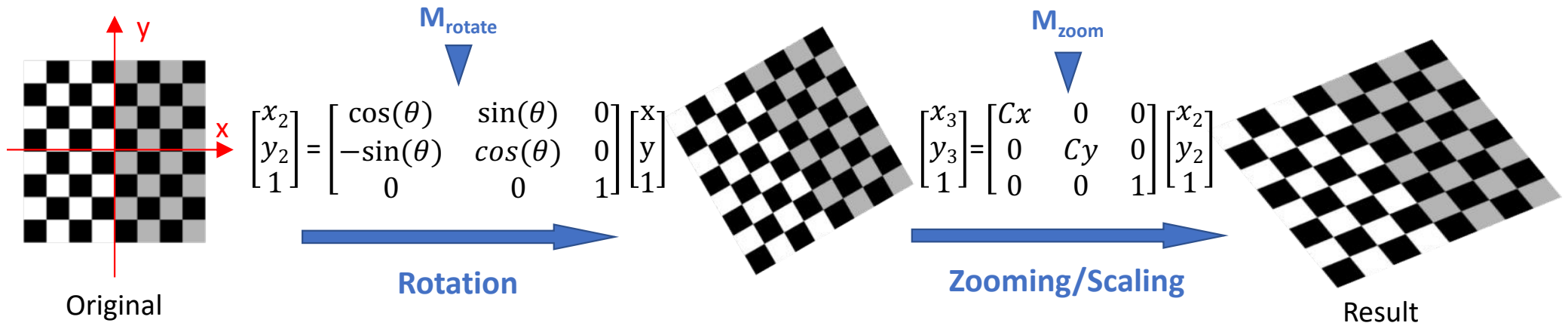
Combined transformation

Original

$M_{zoom} \times M_{rotate}$

$$\begin{bmatrix} x_3 \\ y_3 \\ 1 \end{bmatrix} = M_{combine} \times \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}$$

Result