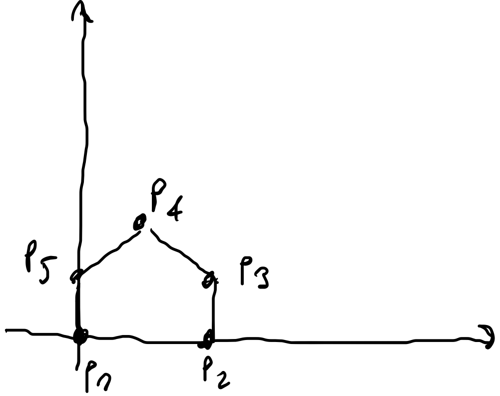
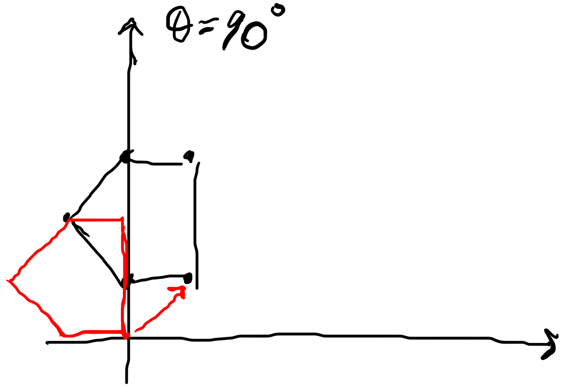
$P_1 = (0,0)$
$P_2 = (2,0)$
$P_3 = (2,1)$
$P_4 = (1,2)$
$P_5 = (0,1)$



$$\underset{1\times 2}{P'} = \underset{1\times 2}{P} \cdot \underset{2\times 2}{M} + \underset{1\times 2}{t}$$

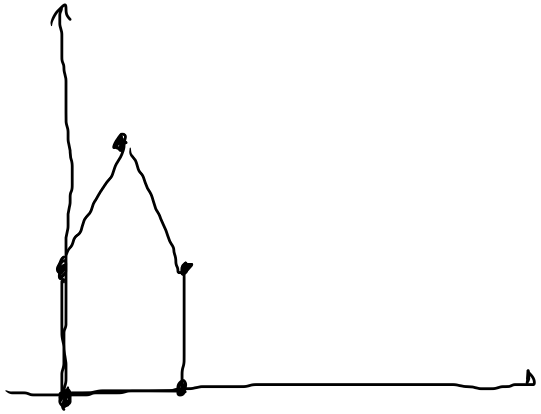
$$\begin{bmatrix} x' & y' \end{bmatrix} = \begin{bmatrix} x & y \end{bmatrix} \cdot \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix} + \begin{bmatrix} t_x & t_y \end{bmatrix}$$

$$\begin{bmatrix} 0 & 0 \\ 2 & 0 \\ 2 & 1 \\ 1 & 2 \\ 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} + \begin{bmatrix} 1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ 1 & 3 \\ 0 & 3 \\ -1 & 2 \\ 0 & 1 \end{bmatrix}$$



$$\begin{bmatrix} 0 & 0 \\ 2 & 0 \\ 2 & 1 \\ 1 & 2 \\ 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix} + \begin{bmatrix} 0 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 2 & 0 \\ 2 & 2 \\ 2 & 4 \\ 0 & 2 \end{bmatrix}$$

$$\begin{bmatrix} S_x & \\ & S_y \end{bmatrix}$$



$M \in R^{3\times 3}$ $\quad M = \begin{bmatrix} 0 & 1 & 0 \\ -1 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix} \Longrightarrow \begin{bmatrix} \boxed{M_{2\times 2}} & 0 \\ & 0 \\ \boxed{t_x \ t_y} & 1 \end{bmatrix}$

$P_i = [x_i \ y_i] \longrightarrow$ hom. coord. $[x_i \ y_i \ 1]$

$$\underset{5\times 3}{\begin{bmatrix} 0 & 0 & 1 \\ 2 & 0 & 1 \\ 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 1 & 1 \end{bmatrix}} \cdot \underset{3\times 3}{\begin{bmatrix} 0 & 1 & 0 \\ -1 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix}} = \underset{5\times 3}{\begin{bmatrix} 1 & 1 & 1 \\ 1 & 3 & 1 \\ 0 & 3 & 1 \\ -1 & 2 & 1 \\ 0 & 1 & 1 \end{bmatrix}} \rightarrow \begin{bmatrix} 1 & 1 \\ 1 & 3 \\ 0 & 3 \\ -1 & 2 \\ 0 & 1 \end{bmatrix}$$

$$[x_i \ y_i \ 1] \cdot M = [x_i' \ y_i' \ z_i'] \longrightarrow \begin{bmatrix} \frac{x_i'}{z_i'} & \frac{y_i'}{z_i'} & \frac{z_i'}{z_i'} \end{bmatrix} = \begin{bmatrix} \frac{x_i'}{z_i'} & \frac{y_i'}{z_i'} & \end{bmatrix}$$

$$\begin{bmatrix} 0 & 0 & 1 \\ 2 & 0 & 1 \\ 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 1 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 & 0.2 \\ 0 & 1 & 0.1 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 1 \\ 2 & 0 & 1.4 \\ 2 & 1 & 1.5 \\ 1 & 2 & 1.4 \\ 0 & 1 & 1.1 \end{bmatrix} \rightarrow \begin{bmatrix} 0 & 0 & \cancel{1} \\ 1.43 & 0 & \cancel{1} \\ 1.33 & 0.67 & \cancel{1} \\ 0.71 & 1.43 & \cancel{1} \\ 0 & 0.91 & \cancel{1} \end{bmatrix}$$