

\* In camera calibration

rotation/translation vector  $\Rightarrow$  std::vector<cv::Mat> type

cf. 행렬 곱: 
$$\begin{matrix} \vec{a} & \vec{c} & \vec{d} \\ \vec{b} & \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} & \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} \end{matrix} \times \begin{matrix} \vec{c} & \vec{d} \\ \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix} & \end{matrix} \quad (\text{벡터 } \vec{a}, \vec{b}, \vec{c}, \vec{d})$$

$$= \begin{matrix} \vec{a} \cdot \vec{c} & \vec{a} \cdot \vec{d} \\ \vec{b} \cdot \vec{c} & \vec{b} \cdot \vec{d} \end{matrix} = \begin{bmatrix} a_{11}b_{11} + a_{12}b_{21} & a_{11}b_{12} + a_{12}b_{22} \\ a_{21}b_{11} + a_{22}b_{21} & a_{21}b_{12} + a_{22}b_{22} \end{bmatrix}$$

cf. 행렬은 벡터의 조합

cf. 스케일 
$$\begin{bmatrix} 2 & 1 \end{bmatrix} \times \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix} = \begin{bmatrix} 2 & 2 \end{bmatrix} \rightsquigarrow$$

(1행, 2열)

cf. 회전 
$$\begin{bmatrix} 2 & 1 \end{bmatrix} \times \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} = \begin{bmatrix} -1 & 2 \end{bmatrix} \rightsquigarrow$$

하나의 행벡터로 생각하기

cf. 회전&이동 
$$\begin{bmatrix} 2 & 1 \end{bmatrix} \times \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix} + \begin{bmatrix} 2 & -3 \end{bmatrix}$$

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

$$= \begin{bmatrix} 1 & -1 \end{bmatrix}$$

cf. 회전과 이동을 한번에 처리하기

$$\begin{bmatrix} 2 & 1 & 1 \end{bmatrix} \times \begin{bmatrix} 0 & 1 & 0 \\ -1 & 0 & 0 \\ 2 & -3 & 1 \end{bmatrix} = \begin{bmatrix} 2 \times 0 + 1 \times (-1) + 1 \times 2 & 2 \times 1 + 1 \times 0 + 1 \times (-3) & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & -1 & 1 \end{bmatrix}$$

rotation & scaling  
translation