MATRIX

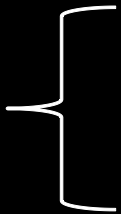
Scale

Rotation

Translation

벡터와 행렬

$$\vec{v} = [x \quad y \quad z \quad 1]$$



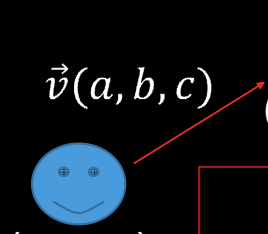
TRANSLATION

$$\vec{v} = [x \quad y \quad z \quad 1]$$

$$M = \begin{bmatrix} m_{11} & m_{21} & m_{31} \\ m_{12} & m_{22} & m_{32} \\ m_{13} & m_{23} & m_{33} \end{bmatrix}$$

$$\begin{cases} X = xm_{11} + ym_{21} + zm_{31} \\ Y = xm_{12} + ym_{22} + zm_{32} \\ Z = xm_{13} + ym_{23} + zm_{33} \end{cases}$$

TRANSLATION



$$\begin{cases} X = x + a \\ Y = y + b \\ Z = z + c \end{cases}$$

$$M = \begin{bmatrix} m_{11} & m_{21} & m_{31} \\ m_{12} & m_{22} & m_{32} \\ m_{13} & m_{23} & m_{33} \end{bmatrix}$$

TRANSLATION

$$\begin{cases} X = x + a \\ Y = y + b \\ Z = z + c \end{cases}$$

$$\vec{v} = [x \quad y \quad z \quad 1] \quad M = \begin{bmatrix} m_{11} & m_{21} & m_{31} \\ m_{12} & m_{22} & m_{32} \\ m_{13} & m_{23} & m_{33} \end{bmatrix}$$

$$\begin{cases} X = xm_{11} + ym_{21} + zm_{31} \\ Y = xm_{12} + ym_{22} + zm_{32} \\ Z = xm_{13} + ym_{23} + zm_{33} \end{cases}$$

TRANSLATION

$$X = x + a$$
$$Y = y + b$$
$$Z = z + c$$

$$\vec{v} = [x \quad y \quad z \quad 1]$$

동차 좌표계(*homogenous coordinate*)

$$X = xm_{11} + ym_{21} + zm_{31} + m_{41}$$

TRANSLATION

$$\begin{cases} X = x + a \\ Y = y + b \\ Z = z + c \end{cases}$$

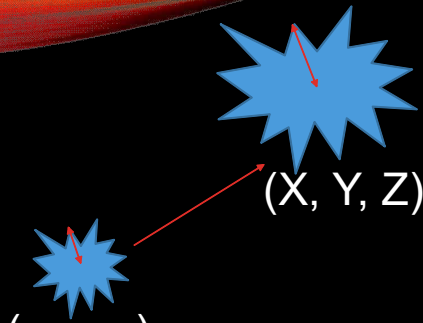
$$\vec{v} = [x \quad y \quad z \quad 1]$$

$$M = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ a & b & c & 1 \end{bmatrix}$$

Translation

$$\vec{V} = [X \quad Y \quad Z \quad 1]$$

SCALE



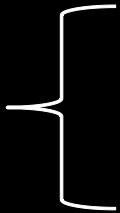
$$\begin{cases} X = ax \\ Y = by \\ Z = cz \end{cases}$$

SCALE

$$X = ax$$
$$Y = by$$
$$Z = cz$$

$$\vec{v} = [x \quad y \quad z \quad 1]$$

동차 좌표계(*homogenous coordinate*)



SCALE

$$\begin{cases} X = ax \\ Y = by \\ Z = cz \end{cases}$$

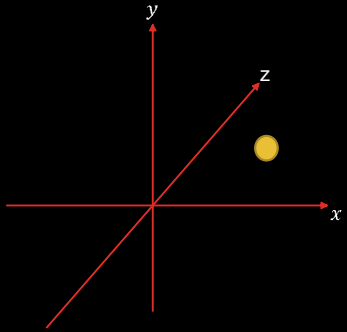
$$\vec{v} = [x \quad y \quad z \quad 1]$$

$$M = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ a & b & c & 1 \end{bmatrix}$$

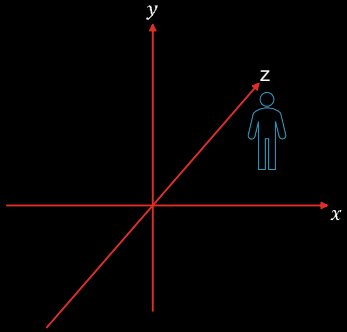
Scale

$$\vec{V} = [X \quad Y \quad Z \quad 1]$$

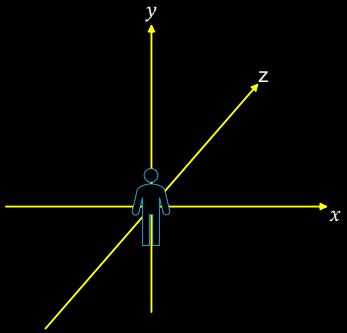
SCALE

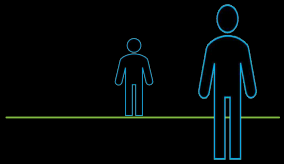


SCALE

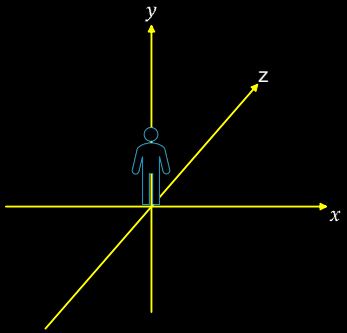


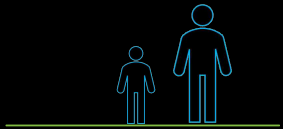
SCALE



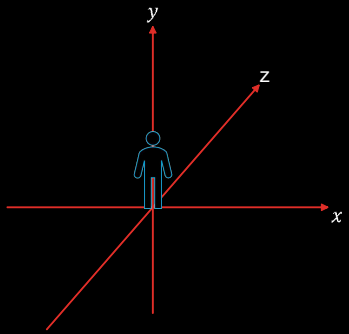


SCALE

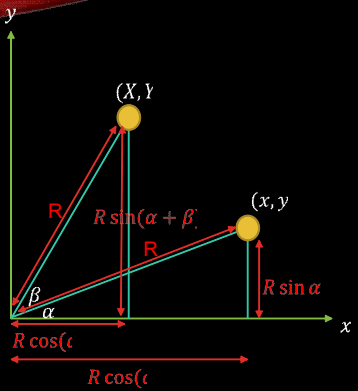




ROTATION



ROTATION



$$X = R\cos(\alpha + \beta)$$
$$= \mathrm{R}\cos\alpha\cos\beta - \mathrm{R}\sin\alpha\sin\beta$$
$$= \mathrm{x}\cos\beta - \mathrm{y}\sin\beta$$

$$Y = R\sin(\alpha + \beta)$$
$$= \mathrm{R}\sin\alpha\cos\beta + \mathrm{R}\cos\alpha\sin\beta$$
$$= \mathrm{y}\cos\beta + \mathrm{x}\sin\beta$$

ROTATION

$$X = \mathrm{x}\cos\beta - \mathrm{y}\sin\beta$$
$$Y = \mathrm{x}\sin\beta + \mathrm{y}\cos\beta$$
$$Z = z$$

$$\vec{v} = [x \quad y \quad z \quad 1]$$

동차 좌표계(*homogenous coordinate*)

ROTATION

$$\begin{cases} X = \mathrm{x}\cos\beta - \mathrm{y}\sin\beta \\ Y = \mathrm{x}\sin\beta + \mathrm{y}\cos\beta \\ Z = z \end{cases}$$

$$\vec{v} = [x \quad y \quad z \quad 1] \qquad M = \begin{bmatrix} c & -s & 0 & 0 \\ s & c & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Rotation Z

$$\vec{V} = [X \quad Y \quad Z \quad 1]$$

ROTATION

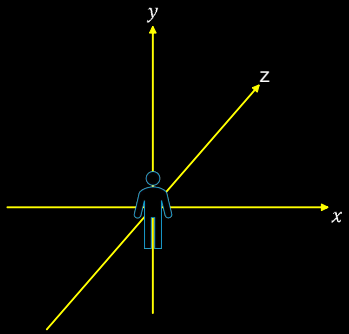
$$R_x(\phi) = \text{Roll}(\phi) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\phi & -\sin\phi \\ 0 & \sin\phi & \cos\phi \end{bmatrix}$$

$$R_y(\theta) = \text{Pitch}(\theta) = \begin{bmatrix} \cos\theta & 0 & \sin\theta \\ 0 & 1 & 0 \\ -\sin\theta & 0 & \cos\theta \end{bmatrix}$$

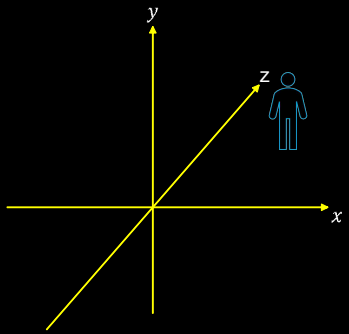
$$R_z(\psi) = \text{Yaw}(\psi) = \begin{bmatrix} \cos\psi & -\sin\psi & 0 \\ \sin\psi & \cos\psi & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

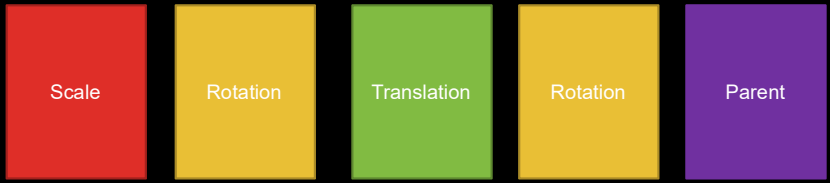
Rotation

ROTATION



ROTATION





스 자 이 공 부