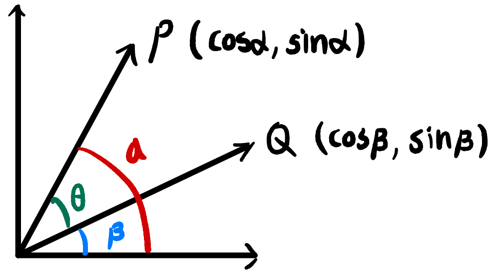
삼각 함수의 덧셈 정리

유튜브 OZTV 영상 참고

$\sin(\alpha+\beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$ $\qquad$ $\sin(\alpha-\beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$

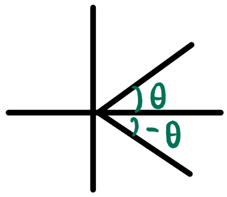
$\cos(\alpha+\beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$ $\qquad$ $\cos(\alpha-\beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$



$\vec{P}\cdot\vec{Q} = \|\vec{P}\|\cdot\|\vec{Q}\|\cdot\cos\theta$

▲ Dot product (1)

P와 Q의 길이가 1이면 $\vec{P}\cdot\vec{Q} = \cos\theta = \cos(\alpha-\beta)$



$\therefore \cos(\alpha-\beta) = \underline{\cos\alpha\cos\beta + \sin\alpha\sin\beta}$

$\vec{P}\cdot\vec{Q} = P_x Q_x + P_y Q_y$

▲ Dot product (2)

$\cos(\alpha+\beta) = \cos(\alpha-(-\beta)) = \cos\alpha\underline{\cos(-\beta)} + \sin\alpha\underline{\sin(-\beta)}$

$= \underline{\cos\alpha\cos\beta - \sin\alpha\sin\beta}$

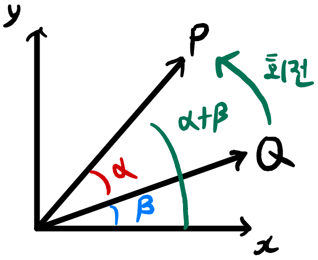
$\sin(\alpha+\beta) = \cos\left(\frac{\pi}{2}-(\alpha+\beta)\right) = \cos\left(\frac{\pi}{2}-\alpha-\beta\right) = \cos\left(\frac{\pi}{2}-\alpha\right)\cos\beta + \sin\left(\frac{\pi}{2}-\alpha\right)\sin\beta$

$= \underline{\sin\alpha\cos\beta + \sin\alpha\cos\beta}$

$\sin(\alpha-\beta) = \cos\left(\frac{\pi}{2}-(\alpha-\beta)\right) = \cos\left(\frac{\pi}{2}-\alpha+\beta\right) = \cos\left(\frac{\pi}{2}-\alpha\right)\cos\beta - \sin\left(\frac{\pi}{2}-\alpha\right)\sin\beta$

$= \underline{\sin\alpha\cos\beta - \sin\alpha\cos\beta}$

Z축 회전 행렬



$P(\cos(\alpha+\beta), \sin(\alpha+\beta))$

$Q(\cos\beta, \sin\beta)$

$P_x = \cos(\alpha+\beta) = \cos\alpha\underbrace{\cos\beta}_{Q_x} - \sin\alpha\underbrace{\sin\beta}_{Q_y}$

$P_y = \sin(\alpha+\beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$

$\therefore P_x = \cos\alpha Q_x - \sin\alpha Q_y + 0$

$P_y = \sin\alpha Q_x + \cos\alpha Q_y + 0$

반시계방향 회전행렬

$$\begin{bmatrix} \cos\alpha & -\sin\alpha & 0 \\ \sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}\begin{bmatrix} Q_x \\ Q_y \\ 1 \end{bmatrix} = \begin{bmatrix} P_x \\ P_y \\ 1 \end{bmatrix}$$

시계방향 회전행렬

α에 -α 넣음.

$$\begin{bmatrix} \cos\alpha & \sin\alpha & 0 \\ -\sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}\begin{bmatrix} Q_x \\ Q_y \\ 1 \end{bmatrix} = \begin{bmatrix} P_x \\ P_y \\ 1 \end{bmatrix}$$