RPY

z -> y -> x

x -> y -> z

notacja innej firmy z x z

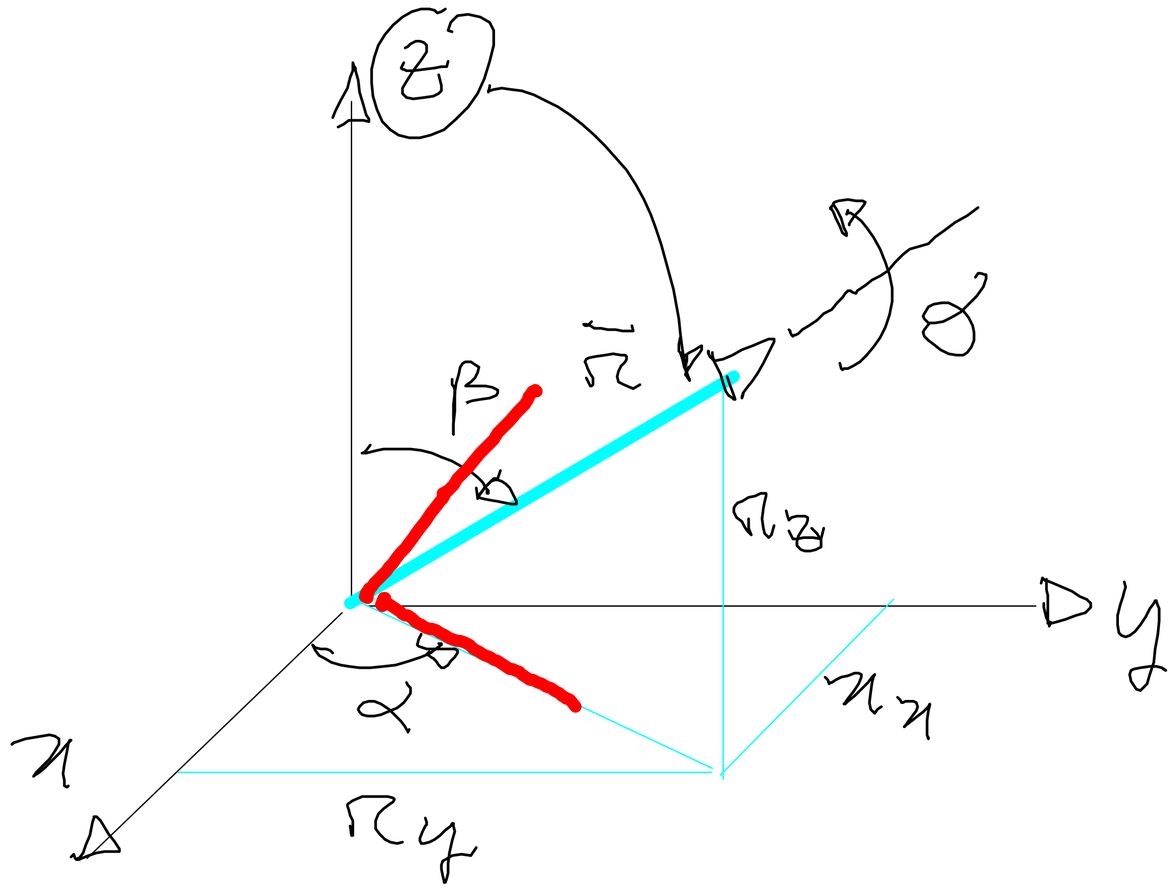
$R_z(\alpha)\ R_x(\beta)\ R_z(\gamma)$

$$R = R_x(\alpha)\, R_y(\beta)\, R_z(\gamma) \longrightarrow \alpha, \beta, \gamma$$

$$\neq$$

$$R = R_y(\bar{\beta})\, R_x(\bar{\alpha})\, R_z(\bar{\gamma}) \longrightarrow \bar{\alpha}, \bar{\beta}, \bar{\gamma}$$

Notazione asse-angolo



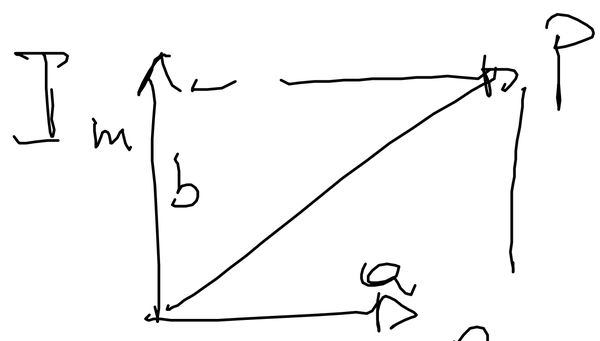
$$R(\alpha, \vec{r}) = R_z(\alpha) R_y(\beta) R_z(\alpha) R_y(-\beta) R_z(-\alpha)$$

UR10

$$\underbrace{\theta,\ r_x,\ r_y,\ r_z}$$

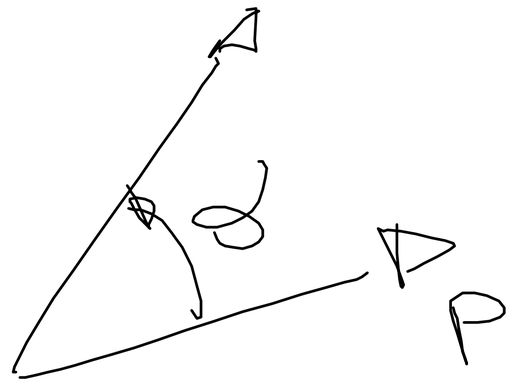
$$r_x\theta,\ r_y\theta,\ r_z\theta$$

QUATERNIONI



$p = a + ib$

$q = c\varphi + s\varphi i = e^{i\varphi}$



$z = a + ib$

$i^2 = -1$

$q = q_0 + q_1 i + q_2 j + q_3 k$

4 parám.

skalári

$i^2 = j^2 = k^2 = ijk = -1$

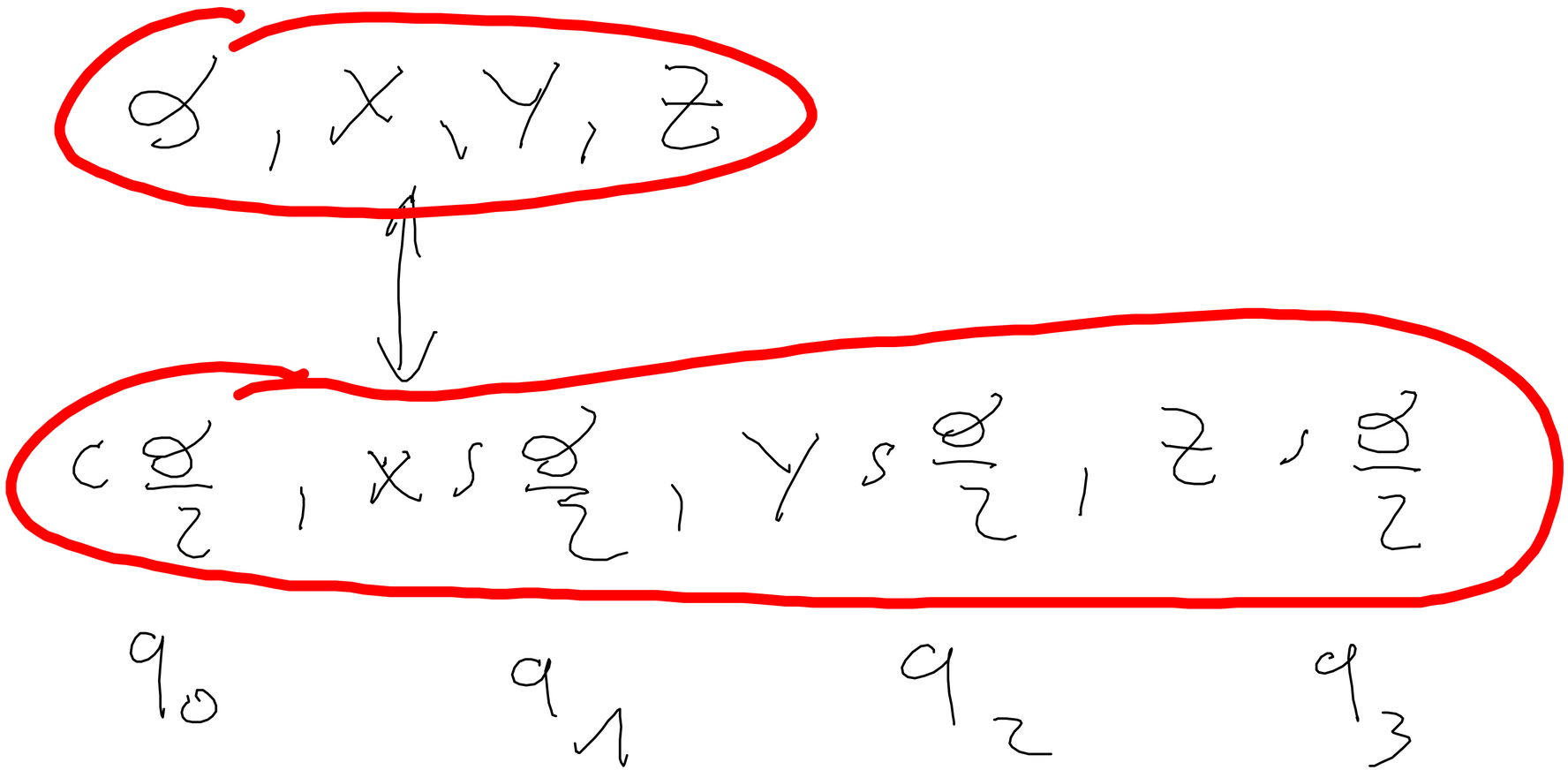
- nekomutatívne

$ij = k$

$ji = -k$

	1	i	j	k
1	1	i	j	k
i	i	-1	k	$-j$
j	j	$-k$	-1	i
k	k	i	$-i$	-1

Quaternioni di rotazione



ese n $\quad x=1 \quad y=z=0$

$$q = c\frac{\phi}{2} + s\frac{\phi}{2}\,\underline{i}$$

y $\quad q = c\frac{\phi}{2} + s\frac{\phi}{2}\,\underline{j}$

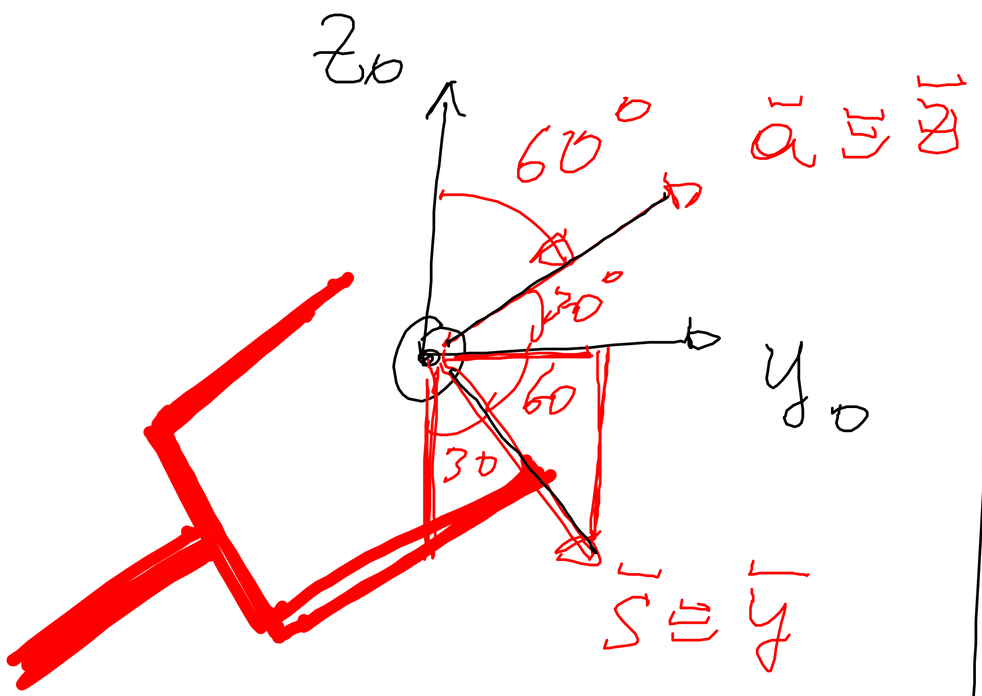
z $\quad q = c\frac{\phi}{2} + s\frac{\phi}{2}\,\underline{k}$

RPY

$z \longrightarrow y \longrightarrow x$

$\varphi \qquad \vartheta \qquad \psi$

$$\left(c\frac{\varphi}{2} + s\frac{\varphi}{2}\underline{k}\right)\left(c\frac{\vartheta}{2} + s\frac{\vartheta}{2}\underline{j}\right)\left(c\frac{\psi}{2} + s\frac{\psi}{2}\underline{i}\right)$$



1) RPY $\quad \varphi = 0 \quad \vartheta = 0$
$\psi = -60°$

2) $R = \begin{bmatrix} 1 & 0 & 0 \\ 0 & c60° & c30° \\ 0 & -s60° & s30° \end{bmatrix}$

3) $q_x(\varphi) = c\left(\frac{0}{2}\right) + s\left(\frac{0°}{2}\right) \underline{k} = 1$

$q_y(\vartheta) = 1$

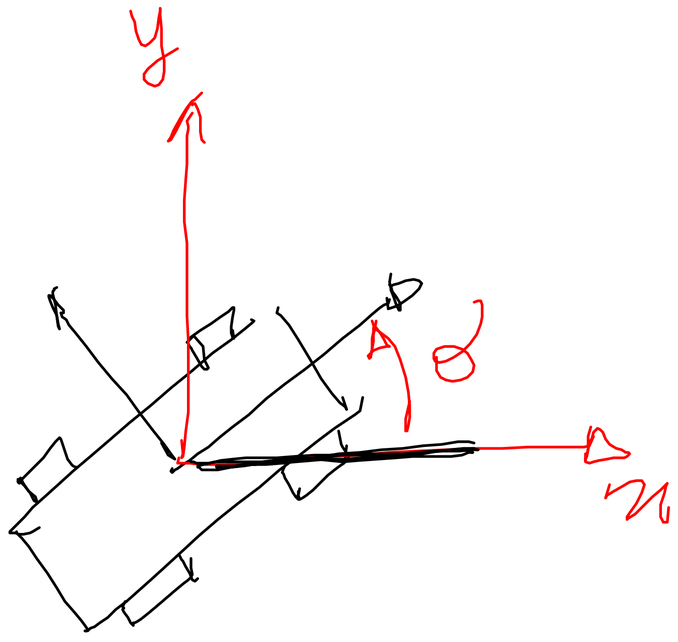
$q_z(\psi) = c\left(\frac{-60°}{2}\right) + s\left(\frac{-60°}{2}\right) \underline{i}$

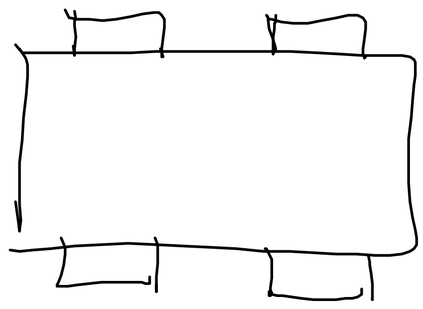
$q_0 = c(-30°)$

$q_1 = s(-30°)$

$q_2 = 0$

$q_3 = 0$





$$\varphi = \begin{cases} 0 \\ 2\pi \end{cases}$$

$$q = c\frac{\alpha}{2} + s\frac{\alpha}{2}\,\vec{k}$$

$$q = c\left(\frac{0}{2}\right) + s\left(\frac{0}{2}\right)\vec{k} = 1$$

$$q = c\left(\frac{2\pi}{2}\right) + s\left(\frac{2\pi}{2}\right)\vec{k} = 1$$