Modelagem Dinâmica

quinta-feira, 8 de dezembro de 2022 07:55

* Modelagem Cinemática

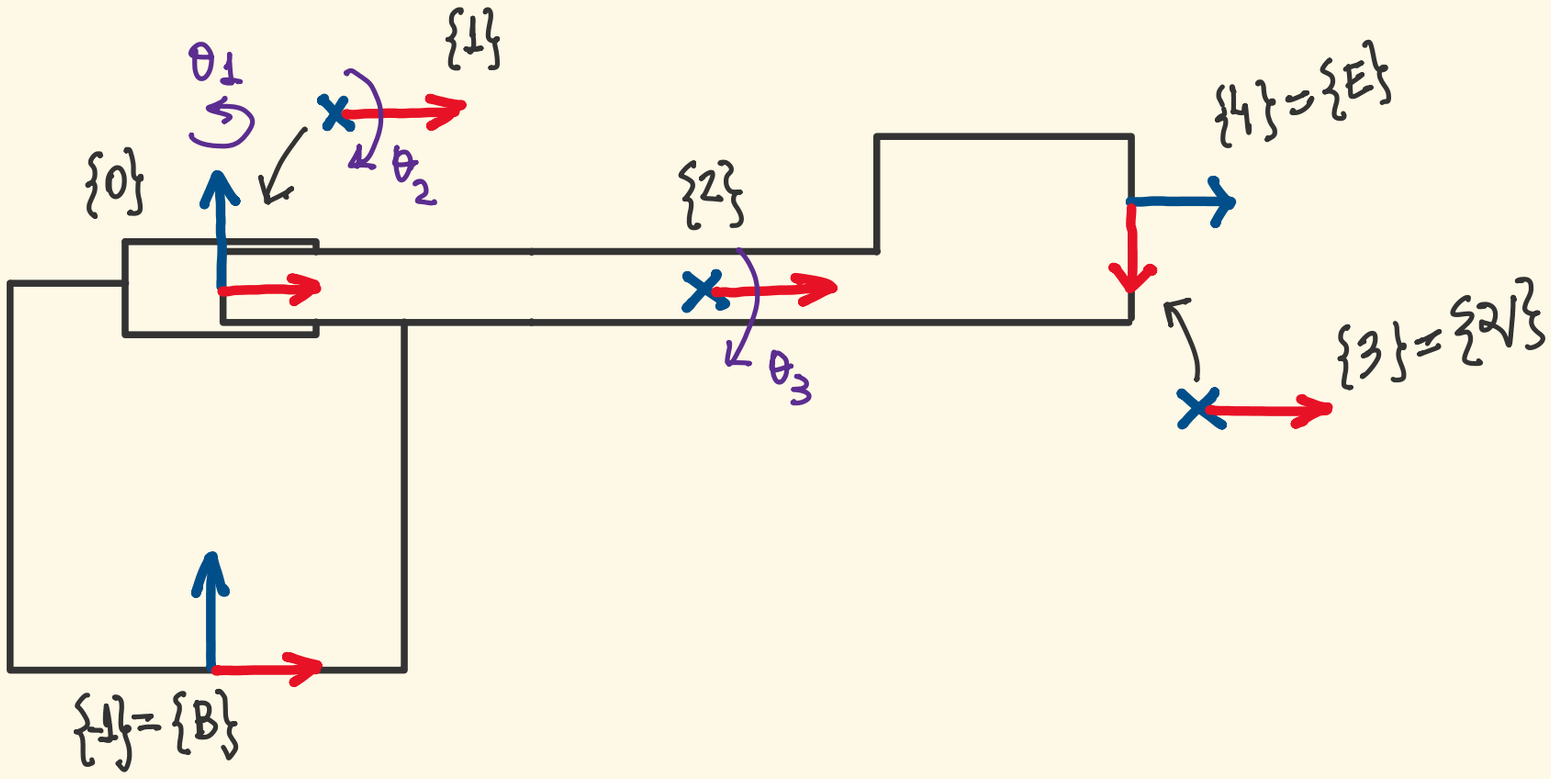

Tabela DH

i	θ	d	a	α
1	θ_1	0	0	$-\pi/2$
2	θ_2	0	a_2	0
3	θ_3	0	a_3	0
4	$\pi/2$	0	$-a_4$	$\pi/2$

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$$ {}^{E}_{B}\xi = {}^{0}_{B}\xi(0,d_0,0,0)\cdot {}^{1}_{0}\xi(\theta_1,0,0,-\pi/2)\cdot {}^{2}_{1}\xi(\theta_2,0,a_2,0)\cdot {}^{3}_{2}\xi(\theta_3,0,a_3,0)\cdot {}^{4}_{3}\xi(\pi/2,0,-a_4,\pi/2) $$

$$ \text{onde } {}^{i}_{i-1}\xi(\theta_i,d_i,a_i,\alpha_i) = \begin{bmatrix} c\theta_i & -s\theta_i c\alpha_i & s\theta_i s\alpha_i & a_i c\theta_i \\ s\theta_i & c\theta_i c\alpha_i & -c\theta_i s\alpha_i & a_i s\theta_i \\ 0 & s\alpha_i & c\alpha_i & d_i \\ 0 & 0 & 0 & 1 \end{bmatrix} $$

Calculando as transformações:

$$ {}^{0}_{B}\xi = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & d_0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad {}^{1}_{0}\xi = \begin{bmatrix} c\theta_1 & 0 & -s\theta_1 & 0 \\ s\theta_1 & 0 & -c\theta_1 & 0 \\ 0 & -1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad {}^{2}_{1}\xi = \begin{bmatrix} c\theta_2 & -s\theta_2 & 0 & a_2 c\theta_2 \\ s\theta_2 & c\theta_2 & 0 & a_2 s\theta_2 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} $$

$$ {}^{3}_{2}\xi = \begin{bmatrix} c\theta_3 & -s\theta_3 & 0 & a_3 c\theta_3 \\ s\theta_3 & c\theta_3 & 0 & a_3 s\theta_3 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \quad {}^{4}_{3}\xi = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & -a_4 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} $$

Usar programação simbólica

Multiplicando tudo:

$$ {}^{E}_{B}\xi = \begin{bmatrix} & & & f_x(\theta) \\ & R(\theta) & & f_y(\theta) \\ & & & f_z(\theta) \\ 0 & 0 & 0 & 1 \end{bmatrix} \qquad J(\theta) = \begin{bmatrix} \frac{\partial}{\partial\theta_1} f_x(\theta) & \frac{\partial}{\partial\theta_2} f_x(\theta) & \frac{\partial}{\partial\theta_3} f_x(\theta) \\ \frac{\partial}{\partial\theta_1} f_y(\theta) & \frac{\partial}{\partial\theta_2} f_y(\theta) & \frac{\partial}{\partial\theta_3} f_y(\theta) \\ \frac{\partial}{\partial\theta_1} f_z(\theta) & \frac{\partial}{\partial\theta_2} f_z(\theta) & \frac{\partial}{\partial\theta_3} f_z(\theta) \end{bmatrix} $$

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