HW 3 CAP4662

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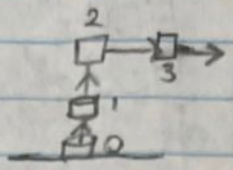
Link	a_i	α_i	d_i	θ_i
1	0	0	d_1	θ_1^*
2	0	-90	d_2^*	0
3	0	0	d_3^*	0



$$A_1 = \begin{bmatrix} C\theta_1 & -C\alpha_1 S\theta_1 & S\alpha_1 S\theta_1 & a_1 C\theta_1 \\ S\theta_1 & C\alpha_1 C\theta_1 & -S\alpha_1 C\theta_1 & a_1 S\theta_1 \\ 0 & S\alpha_1 & C\alpha_1 & d_1 \\ 0 & 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} C\theta_1 & -S\theta_1 & 0 & 0 \\ S\theta_1 & C\theta_1 & 0 & 0 \\ 0 & 0 & 1 & d_1 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$A_2 = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & -1 & 0 & d_2^* \\ 0 & 0 & 0 & 1 \end{bmatrix} \qquad A_3 \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & d_3^* \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$A_2^0 = A_1 A_2 = \begin{bmatrix} C\theta_1 & 0 & -S\theta_1 & 0 \\ S\theta_1 & 0 & C\theta_1 & 0 \\ 0 & -1 & 0 & d_1 + d_2^* \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$A_3^0 = A_2^0 A_3^2 \begin{bmatrix} C\theta_1 & 0 & -S\theta_1 & -S\theta_1 d_3^* \\ S\theta_1 & 0 & C\theta_1 & C\theta_1 d_3^* \\ 0 & -1 & 0 & d_1 + d_2^* \\ 0 & 0 & 0 & 1 \end{bmatrix} \qquad O_3 = \begin{bmatrix} -S\theta_1 d \\ C\theta_1 d \\ d_1 + d \end{bmatrix}$$

$$Z_{1-1} \times (O_3 - O_0) = \begin{vmatrix} i & j & k \\ 0 & 0 & 1 \\ -S\theta_1 d_3 & C\theta_1 d_3 & d_1 + d_2^* \end{vmatrix} = -C\theta_1 d_3^* - S\theta_1 d_3^*$$

$$Z_{2-1} \times (O_3 - O_1) = \begin{vmatrix} 0 & 0 & 1 \\ -S\theta_1 d_3 & C\theta_1 d_3 & d_3^* - d_2^* \end{vmatrix} = -C\theta_1 d_3^* + S\theta_1 d_3^*$$

$$Z_{3-1} \times (O_3 - O_2) = \begin{vmatrix} -S\theta_1 & C\theta_1 & 0 \\ -S\theta_1 d_3 & C\theta_1 d_3 & 0 \end{vmatrix} = 0$$

this not needed

Since joint 2-3 are prismatic, ans on back

1 cont.

$$J = \begin{bmatrix} -C\theta_1 d_3^* & 0 & -\sin\theta_1 \\ -S\theta_1 d_3^* & 0 & \cos\theta_1 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 1 & 0 & 0 \end{bmatrix}$$