

$$J_i = \begin{bmatrix} z_{i-1} \times (O_n - O_{i-1}) \\ z_{i-1} \end{bmatrix}$$

$$O_0 = \vec{0}$$

$$O_1 = \begin{bmatrix} 0 \\ 0 \\ d_1 \end{bmatrix}$$

$$O_2 = \begin{bmatrix} d_2 \cos \theta_1 \cos \theta_2 \\ d_2 \cos \theta_1 \sin \theta_2 \\ (d_1 + d_2) \sin \theta_1 \end{bmatrix}$$

$$O_3 = \begin{bmatrix} \cos \theta_1 d_3 \cos(\theta_2 + \theta_3) + d_2 \cos \theta_2 \\ \sin \theta_1 d_3 \cos(\theta_2 + \theta_3) + d_2 \sin \theta_2 \\ (d_1 + d_3) \sin(\theta_2 + \theta_3) + d_2 \sin \theta_1 \end{bmatrix} = O_4$$

$$O_5 = \begin{bmatrix} \cos \theta_1 d_3 \cos(\theta_2 + \theta_3) + d_2 \cos \theta_2 + d_4 \sin(\theta_2 + \theta_3 + \theta_4) + d_5 \sin(\theta_2 + \theta_3 + \theta_4) \\ \sin \theta_1 d_3 \cos(\theta_2 + \theta_3) + d_2 \sin \theta_2 + d_4 \sin(\theta_2 + \theta_3 + \theta_4) + d_5 \sin(\theta_2 + \theta_3 + \theta_4) \\ (d_1 + d_3) \sin(\theta_2 + \theta_3) + d_2 \sin \theta_1 - d_4 \cos(\theta_2 + \theta_3 + \theta_4) - d_5 \cos(\theta_2 + \theta_3 + \theta_4) \end{bmatrix} = \begin{bmatrix} a \\ b \\ c \end{bmatrix}$$

$$z_0 = \begin{bmatrix} \sin \theta_1 \\ -\cos \theta_1 \\ 0 \end{bmatrix} = z_1 = z_2$$

$$z_3 = \begin{bmatrix} \sin(\theta_2 + \theta_3 + \theta_4) \cos \theta_1 \\ \sin(\theta_2 + \theta_3 + \theta_4) \sin \theta_1 \\ -\cos(\theta_2 + \theta_3 + \theta_4) \end{bmatrix} = z_4$$

$$J_1) z_0 \times (O_5 - O_0) \rightarrow \begin{bmatrix} \sin \theta_1 \\ -\cos \theta_1 \\ 0 \end{bmatrix} \times \left(\begin{bmatrix} a \\ b \\ c \end{bmatrix} - \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix} \right)$$

$$J_2) z_1 \times (O_5 - O_1) \rightarrow \begin{bmatrix} \sin \theta_1 \\ -\cos \theta_1 \\ 0 \end{bmatrix} \times \left(\begin{bmatrix} a \\ b \\ c \end{bmatrix} - \begin{bmatrix} 0 \\ 0 \\ d_1 \end{bmatrix} \right)$$

$$J_3) z_2 \times (O_5 - O_2) \rightarrow \begin{bmatrix} \sin \theta_1 \\ -\cos \theta_1 \\ 0 \end{bmatrix} \times \left(\begin{bmatrix} a \\ b \\ c \end{bmatrix} - \begin{bmatrix} d_2 \cos \theta_1 \cos \theta_2 \\ d_2 \cos \theta_1 \sin \theta_2 \\ (d_1 + d_2) \sin \theta_1 \end{bmatrix} \right)$$

$$J_4) z_3 \times (O_5 - O_3)$$

$$J_5) z_4 \times (O_5 - O_4)$$

En matlab