

ROBOTICA

a.a. 2021-2022

Industrial Robotics Exercise

valid for exams taken from 06/08/2022 to 09/25/2022

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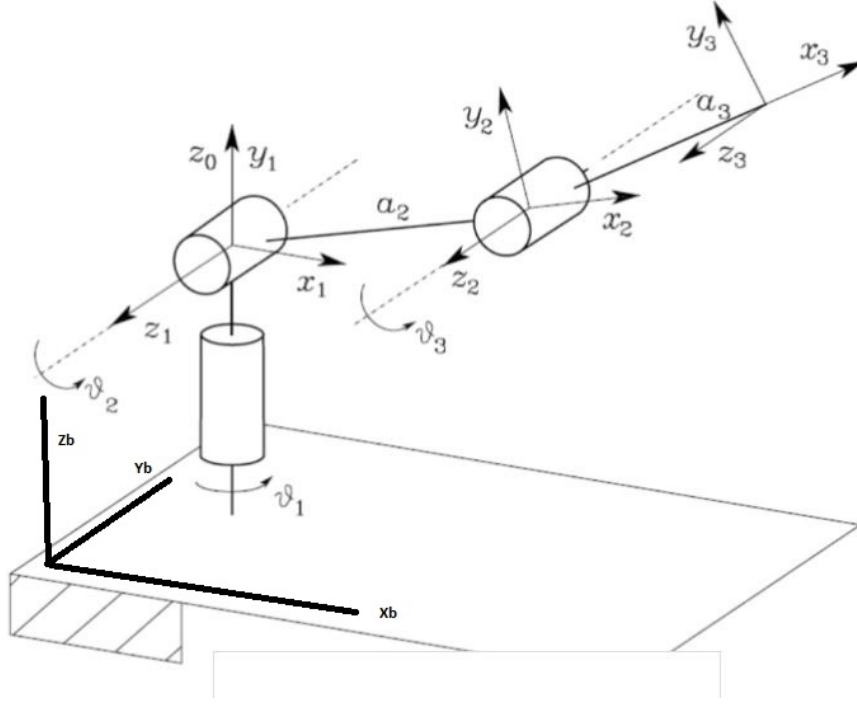


Figure 1:

The following D-H table models the supporting structure of the anthropomorphic robot in figure 1:

link	a (m)	α	d (m)	θ
1	0	$\frac{\pi}{2}$	0	θ_1
2	0.9	0	0	θ_2
3	0.9	0	0	θ_3

The reference systems (0) and (b) are linked by the following rototranslation matrix:

$$\hat{R}_0^b = \begin{pmatrix} 1 & 0 & 0 & 0.5 \\ 0 & 1 & 0 & 0.5 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

Referring to the SR_b , the following 3 points are assigned:

$$P_1 = \begin{pmatrix} 0.8 \\ 0.8 \\ 0.5 \end{pmatrix}; \quad P_2 = \begin{pmatrix} 1.2 \\ 0.8 \\ 0.5 \end{pmatrix}; \quad P_3 = \begin{pmatrix} 1.0 \\ 1.2 \\ 0.5 \end{pmatrix};$$

Determine the time trends of the joint variables (position and velocity) so that the origin of the SR_3 :

1. describe a triangle according to the sequence $P_1 \rightarrow P_2 \rightarrow P_3 \rightarrow P_1$
2. describes a circle passing through the points $P_1 \rightarrow P_2 \rightarrow P_3 \rightarrow P_1$

in both cases the total travel time of the curve must be 40sec.

P.S. - distances are expressed in metres; angles in radians.