

Automata Technologies  
Robotics Developer  
Technical Exercise

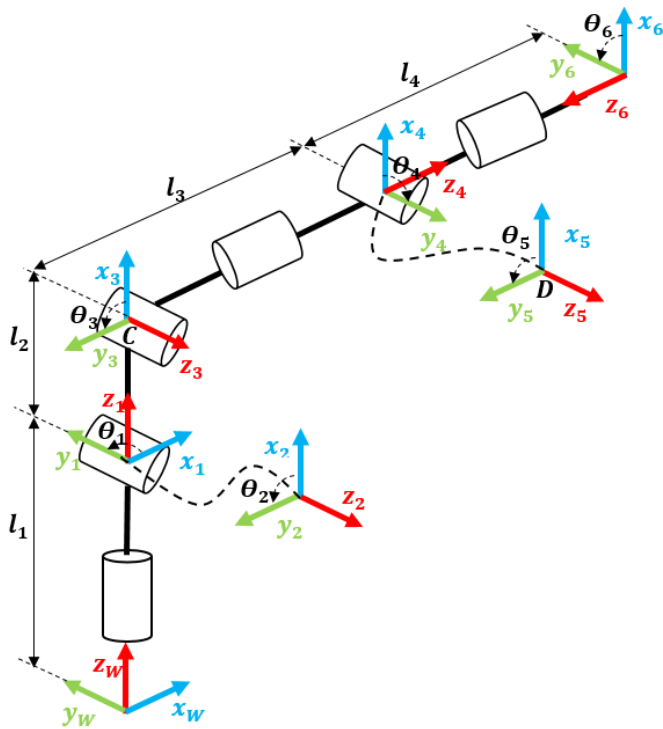


Figure: Left: 6 axis kinematics chain / Right: Picture of the 6 axis robot

Task 1:

Build the forward kinematics model of the 6 axis robot above. The output should be an 4x4 homogeneous transformation matrix  $H(\theta)$ :

$$H(\theta) = \begin{pmatrix} R(\theta) & p(\theta) \\ \mathbf{0}_{1 \times 3} & 1 \end{pmatrix}$$

Where  $R(\theta)$  and  $p(\theta)$  are respectively a 3x3 matrix and 3x1 vector describing the orientation and position of the end effector with respect to the world frame  $W$ .

For numerical test, use the following values:

$l_1$	0.213278 m
$l_2$	0.300 m
$l_3$	0.225 m
$l_4$	0.075 m

## Task 2:

Build the inverse kinematics model of the same kinematics chain using the method of your choice (analytical, iterative, optimization etc.). The model should give the expression of each joint angle with respect to the 3D position of the end effector and the components of the 3x3 orientation matrix. As several joints configuration can lead to the same end effector pose, the solution closest to the current configuration would be chosen.

