MEEG671: Introduction to Robotics

Homework 5

Problem 1:
(Points: 100)
For the 7-degree-of-freedom robot arm shown in Fig. 1, write a Matlab script that will solve the inverse kinematics using the Jacobian inverse method. Test your inverse kinematics for the desired position and orientation described by the following homogeneous transformation matrix:

$$T_7^0 = \begin{bmatrix} 0.0525 & 0.4360 & 0.8984 & 0.7458 \\ -0.9111 & 0.3893 & -0.1357 & -0.2494 \\ -0.4089 & -0.8114 & 0.4177 & 0.4810 \\ 0 & 0 & 0 & 1 \end{bmatrix} \tag{1}$$

where the position is given in m. Assume that the initial configuration of the robot is:
$\mathbf{q} = \begin{bmatrix} q_1 & q_2 & q_3 & q_4 & q_5 & q_6 & q_7 \end{bmatrix}^T = \begin{bmatrix} \frac{\pi}{7} & \frac{\pi}{6} & \frac{\pi}{5} & \frac{\pi}{4} & \frac{\pi}{3} & \frac{\pi}{2} & \pi \end{bmatrix}^T$.

Make sure you test your resulted configuration doing forward kinematics, and checking whether your solution is correct. This test should be included in your script. **The Matlab script should provide a final output with the desired transformation matrix, the computed configuration and the actual transformation matrix**.

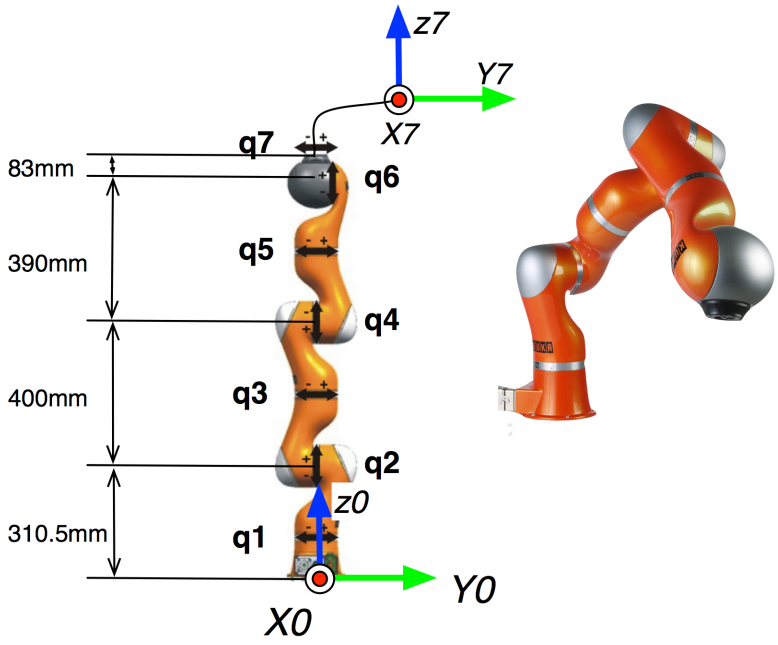

Figure 1: KUKA LWR4+ robot arm.