

SSY156 - Modelling and Control of Mechatronic Systems

Peer-2-Peer Homework 02

Group06 Problem

Question 1 (1 point)

Find the joint angles of the KUKA manipulator that will result in the following end-effector position and orientation (Euler-angle ZYZ):

$$x_d = \begin{bmatrix} -0.1 \\ 0.2 \\ 0.7 \end{bmatrix} \quad \phi_d = \begin{bmatrix} 0 \\ \pi \\ 0 \end{bmatrix} \quad (1)$$

using an inverse differential kinematic approach. Give a brief explanation of your answer and show in one figure the 6 plots corresponding to the error of the end-effector position and Euler-angle orientation in the course of time (they must all go to zero at the end of the simulation). Consider the initial position as $q_0 = [\pi/6; -\pi/3; 0; -\pi/3; -\pi/6; \pi/2; \pi/2]$. Use the same D-H parameters provided in the first assignment.

Question 2 (1 point)

Consider now that the end-effector is stationary in the given position and orientation as given in equation 1 and is holding a block of 10kg. The mass can be considered as a single point mass located in the center of the end-effector frame. In the equilibrium, what are the joint torques needed to hold this block?