

**Homework #4**

Due: 22.01.2025

Pen and pencil problems (submit the pictures with coloured axis). Hardcopy must be submitted **in the class**.

**Pen & Pencil Tasks (100 points)**

1.1. For the 6R robot in Figure 1 compute the DH table and the transformation matrix. Draw coordinate frames in different colours. **(25 points)**

1.2. A reverse engineering problem. Consider the following DH table and sketch the corresponding robot. Pay attention that  $d_4$  is constant, while  $\Theta_4$  is variable  $\Rightarrow$  rotational joint / distance  $d_4$ . Draw coordinate frames in different colours. **(15 points)**

Joint i	$\theta_i$	$a_{i-1}$	$\alpha_{i-1}$	$d_i$
1	$\Theta_1 - 90^\circ$	0	$90^\circ$	0
2	$\Theta_2$	50	$0^\circ$	0
3	$\Theta_3 + 90^\circ$	0	$90^\circ$	0
4	$\Theta_4$	0	$-90^\circ$	60
5	$\Theta_5 - 90^\circ$	0	$90^\circ$	0
6	$\Theta_6 + 90^\circ$	0	$90^\circ$	0

1.3. Compute the DH table and the transformation matrix for the robot in Figure 2. Draw coordinate frames in different colours. **(30 points)**

1.4. Compute the DH table and the transformation matrix for the robot in Figure 3. Draw coordinate frames in different colours. **(30 points)**

Comments to Figure 3: let's start from the bottom of the picture upward. The circle in the bottom is the robot base. Then comes a revolute (rotational) joint. On the upper side of the rectangular there is a second revolute (rotational) joint, so that a straight segment (stick) can rotate around a rectangular (but not for all 360 degrees). The last joint is a prismatic (translational) joint, it is on distance 0 from the previous rotational joint. End effector is assumed on the left end of the straight segment (green flat EE).

1.5. Add a list (for the pair case): details of work performed by each student **(-100 points if missing!)**

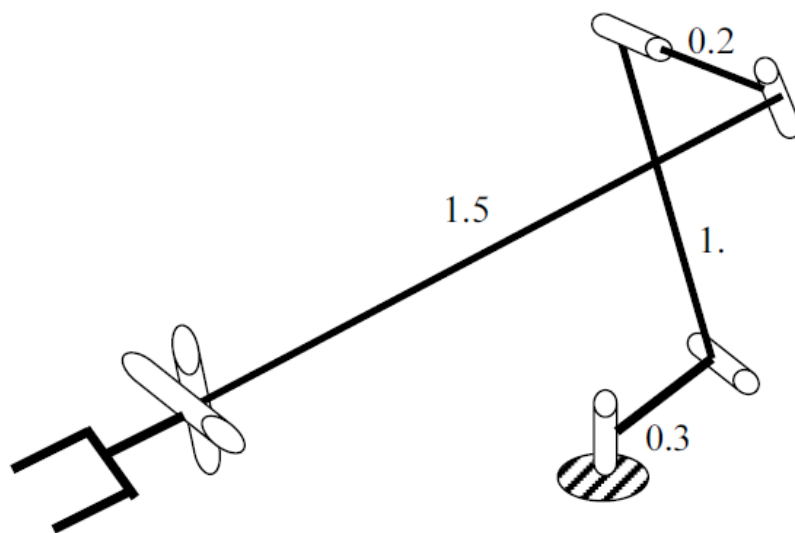


Figure 1.

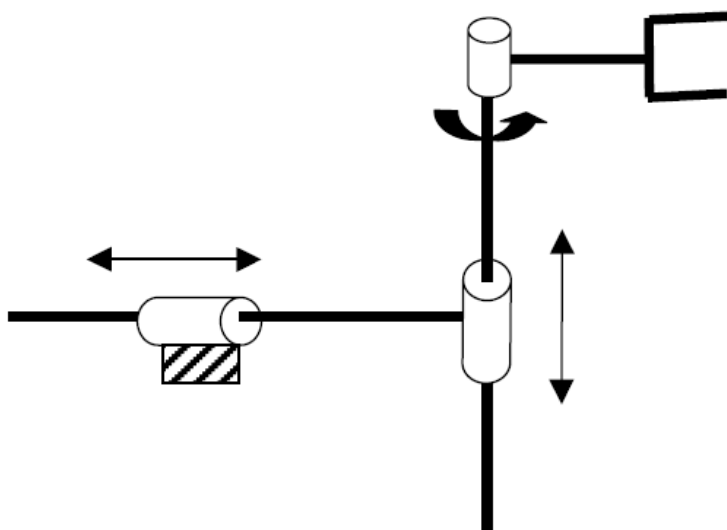


Figure 2.

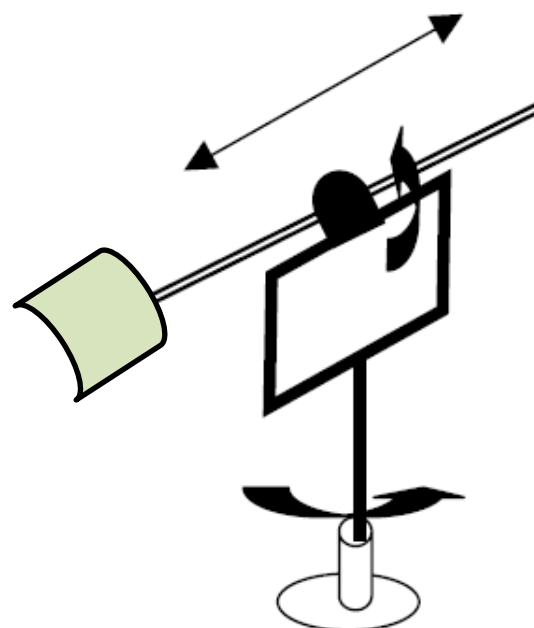


Figure 3.