Robotics: Homework 2
Due 11/3/22   Fall 2022

1. For a robot manipulator described by the following kinematic table with all revolute joints, (a) derive and plot the coordinate frame for each joint, (b) find the transformations A_1 - A_6, and T_6, and (c) solve the corresponding joint solutions from T_6 using both algebraic and geometric approaches.

Joint	d	a	α	θ
1	d_1	0	90°	0°
2	0	a_2	0°	0°
3	0	0	-90°	0°
4	d_4	0	90°	0°
5	0	0	-90°	0°
6	0	0	0°	0°

2. What are the advantages and disadvantages by using the D-H formulation to describe robot coordinate systems ? In principle, we should use six parameters to describe the spacial relationship between two coordinate systems, but only four parameters are used in the D-H formulation.

3. Inaccuracy is inevitably present in robot manipulators. What are the main factors causing it ? How does the inaccuracy affect the performance of a robot manipulator ? Discuss it from the difference between repeatability and accuracy. How will you set up a calibration and compensation scheme to compensate for the inaccuracy ? Discuss the main consideration in the selection of calibrated error parameters and methodologies for compensation. Does the D-H formulation need to be modified for the calibration model ? Usually in the calibration process, it needs a lot of measurement data for identifying the error parameters in the calibration model. Can you suggest methods to reduce the numbers of measurement ? Or can you provide automatic measurement setup ? Do not need to go into details, just describe your concept.