

Robotic Manipulation, Fall 2015

Homework 1 (4752/4750: 100 points, 5752/5750: 120 points) Rigid Body Transforms and Kinematics

Due at the start of class, Wednesday, Sept. 30, 2015

Objective: Demonstrate understanding of rigid body transforms and kinematics.

Instructions: This assignment can be discussed as a group. There is no limit to this group size. Each student is responsible for working the problems, writing them up, and submitting their own PDF containing the answers to the questions below. You may find that it is helpful to use L^AT_EX to typeset the equations. Write your name and the names of all classmates you discussed any part of the homework with.

Assignment: Answer the following problems from the book, Spong, Hutchinson, and Vidyasagar. Show your work.

1. (10 points) Problem 1-16
2. (5 points) Problem 1-17
3. (10 points) Problem 2-7
4. (5 points) Problem 2-13
5. (10 points) Problem 2-39
6. (5 points) Problem 2-43
7. (10 points) Problem 3-2
8. (10 points) Problem 3-10. Do not actually compute the forward kinematic equations. Just give the DH parameters and A matrices.
9. (15 points) Problem 3-11
10. (20 points) Problem 3-19
The remaining problem is optional extra-credit for 4000-level students.
11. (20 points) Problem 2-9. Note it's not enough to show a θ exists. It must both exist and be unique.