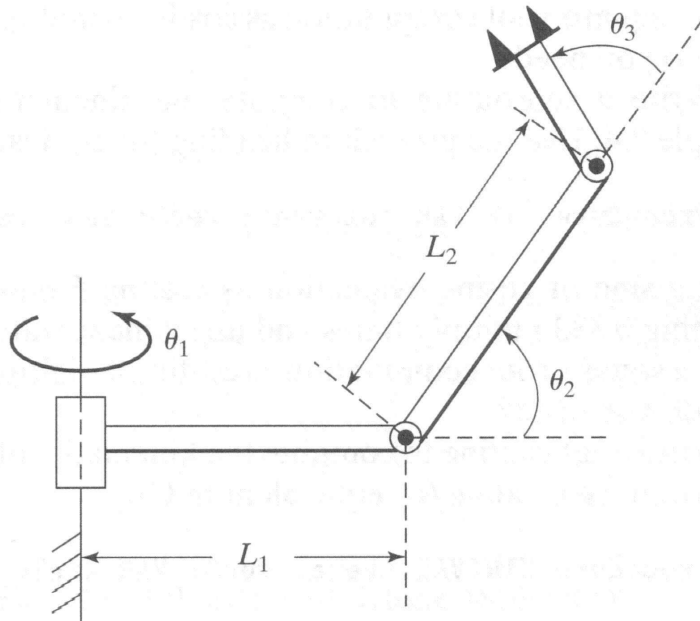


Assignment no. 4

due: Monday, June 13th, 2011

The goal of this assignment is to get acquainted with the basics of robot kinematics. Exercises 4.1, 4.2, and 4.3 relate to the following robot arm with three rotational degrees of freedom (3R for short; the figure is taken from Craig's *Introduction to Robotics*, Chapter 3):



Exercise 4.0 Read Chapters 3 and 4 of Craig's book, *Introduction to Robotics*. The highlights of the chapters were introduced in class. You are expected to be familiar with the details as they appear in the book.

Exercise 4.1 Assign coordinate frames to the links of the 3R arm and extract the Denavit-Hartenberg parameters of it. Then write the direct kinematics equations for the arm.

Exercise 4.2 Solve the inverse kinematics problem for the 3R arm as above.

Exercise 4.3 (p) Write an interactive program that implements the inverse kinematics solution you developed in Exercise 4.2. (No need for visualization; a simple command-line interface should suffice.) For every input frame it should decide whether there is a solution. If there is a solution (or multiple solutions) the program should output all the solutions.