Assignment 4, EECS 397/600: DARPA Robotics Challenge
Jacobians and Differential Kinematics
due by 5pm, Tuesday, 30 September

In this assignment, you will get some practice with computing inverse kinematics numerically, using the manipulator Jacobian. Refer to the examples in the class code within the example_kdl package, and the accompanying notes on blackboard (frames, forward kinematics and differential kinematics).

Your objective is to find solutions for right-arm joints that will place the origin of the right-hand grasp frame at a specified location: **p** = [0.3; -0.5; 0.0], with respect to the pelvis frame.

For this assignment the orientation of the hand is unconstrained. The goal point is reachable, and thus with six joint angles determining three palm origin coordinates, there is a 3-dimensional null space, offering infinitely many solutions.

Build on the example code to find 3 example solutions for the six right-arm joint angles that satisfy placing the palm origin at the goal coordinates. State your solutions in your problem-set upload. Make sure that at least one of these solutions is within the valid range of motion of all six joints. (See example code for specification of valid joint ranges).

Prove that your solution is valid by putting this joint angles in a playfile (a *.traj) file, executing that trajectory file, then printing out the resulting hand coordinates. The program "tf_print" in the example_kdl package will print out Atlas's right-palm coordinates (with respect to the pelvis frame). Run this program and include a screen shot of its output, verifying that your solution works. Also upload a screenshot of Atlas in your solution pose.