EECS4421: Lab 4

Thu Jan 16, 2017
Due: Before 3:30PM Fri Mar 10, 2017

You will require your inverse kinematics solutions from Lab 3 to complete this lab. Consider creating a method that solves the inverse kinematics problem for the arm, rather than putting all of the inverse kinematics code inside of your solutions to Questions 1 and 2.

1. In the Matlab simulator for the A150 robot implement the method with signature `move(obj, T)` that takes as input a goal pose `T` (expressed in the base frame of the robot); the function should then move the origin of frame 5 to the goal location using a linearly interpolated joint space path, or output a message indicating that the final pose is not reachable.

You should interpolate all 5 joint angles at each step along the path. You should compute the number of steps along the path so that no joint moves by more than 10 degrees at each step.

Note: You basically need to write a loop that calls `madeg` or `dhmadeg` with the appropriate joint angles at each iteration of the loop.

Note: Your solution should produce a path very similar to that produced by calling `madeg` or `dhmadeg` with the joint values needed to reach `p`.

2. In the Matlab simulator for the A150 robot implement the method with signature `movelinear(obj, p)` that takes as input a goal location `p` (expressed in the base frame of the robot); the function should then move the origin of frame 5 to the input location in a straight line, or output a message indicating that the position is not reachable. You should assume that

$$R_5^0 = \begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$$

i.e., the gripper is always pointing straight down; this constraint means that you do not need to interpolate the orientation of the end effector. The path of the end effector should be a straight line. If a straight line path is not possible then the robot should complete as much of the straight line path as is possible; i.e., it should move from its current position towards the goal in a straight line until it can go no further and then stop (see the next paragraph for what "no further" means).

You should compute the number of steps along the path so that the end effector moves by no more than 5 cm at each step. If taking the next step in the path would cause the robot to move to an unreachable position then the robot should not take the next step.

1 Submit

Submit the Matlab files needed to run your solution:

```
submit 4421 L4 <your files>
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