UNIVERSITY OF COLORADO - BOULDER
Robotics Program

ROBO 5000 (CSCI 5202) - Intro to Robotics

Challenge Problem #3 (Assigned: Tuesday 10/21, Due: Friday November 11/14 11:59pm on *Canvas*)
Kinematics

Instructions

Create a new repository on one group member's GitHub accounts that is to be shared with the other group members, as well as the course instructor and graders (Leoiii, juliannea-ucb, Charlotte-Robo). The repository should be named "CP3_GroupName", where GroupName is a group name that you are free to choose (please also update your group's name on the Canvas page). You will ultimately submit a link to this repository as your final submission for the Challenge Problem (groups are formed on Canvas; each group submits a single link). This repository needs to be well organized and should contain instructions on how to run your code, all of your code and your final report pdf document.

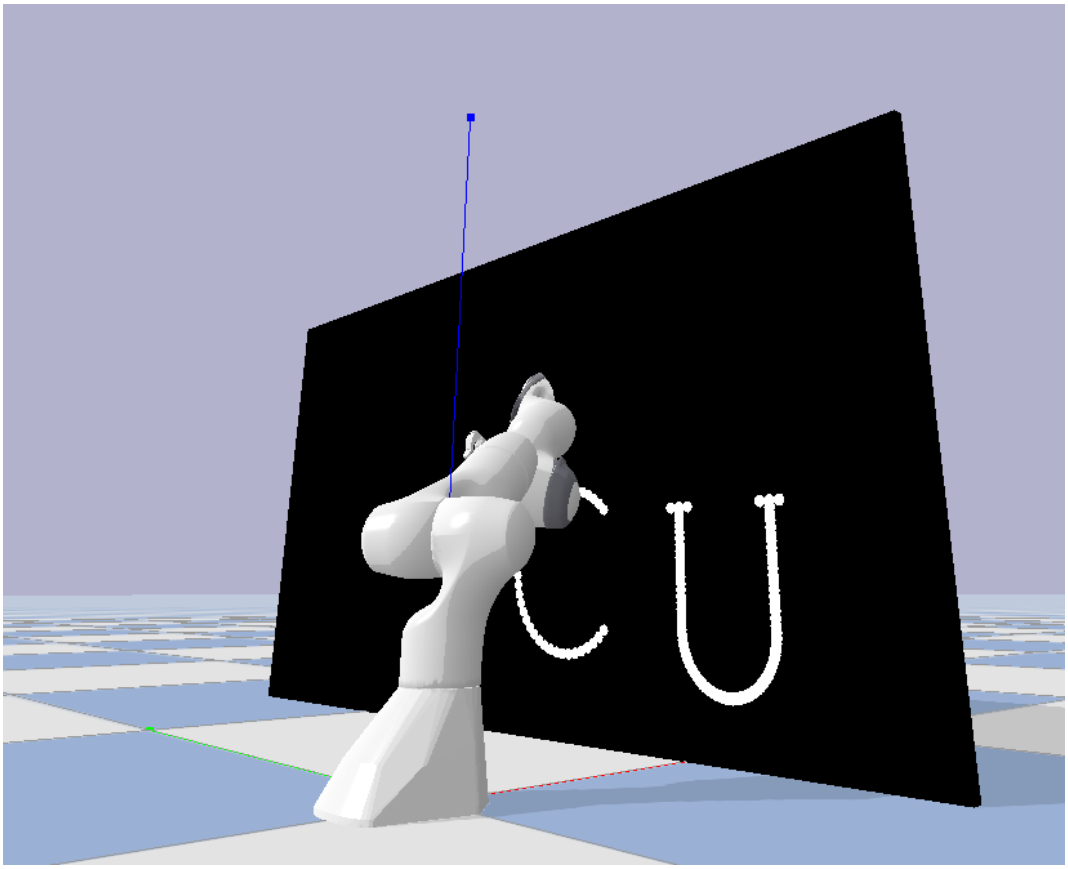
For all challenge problems, your group is expected to turn in a **report** that is 1-4 pages in length. The exact content for this report is not prescribed, but should include details on your overall approach to the challenge problem, the overall results of your solution and whether it was successful or not, any problems encountered and how you overcame them (or approached that you took if you weren't able to overcome them), relevant figures that show illustrate content of your report or show your results. Any references or citations you used for your solution or report should also be included at the end of the report.

1 Inverse Kinematics

1.1 CU Boulder FTW! - 100 points

You have been provided with some starter code that sets up a pybullet environment with a Franka Emika Panda robot next to a blackboard. In your starter code, you will find a function called *draw_on_blackboard* which when called, will leave a visible mark on the blackboard at the current location of the end effector.

The goal is to have the robot writes the letters "CU" on the board. Identify the corresponding end-effector positions and orientations and use python libraries of your choice to perform inverse kinematics for each of these end effector poses to obtain a series of joint angles. Set the robot's joint angle values to these over time until the robot writes the letters on the blackboard. An example of the robot drawing the letters is shown below.



1.2 SKO BUFFS - 10 bonus points

Extend this solution to make the robot draw the outline of CU's buffalo logo on the blackboard. The expected logo is shown below: (Note: Only the outline of the logo is sufficient to answer this question). In addition to the solution code, attach a video or a GIF of the robot performing the task.