

UNIVERSITY OF COLORADO - BOULDER
Robotics Program

ROBO 5000 (CSCI 5202) - Intro to Robotics

Challenge Problem #3 (Assigned: Tuesday 2/25, Due: Tuesday 3/18 11:59pm on *Canvas*)
Kinematics

Instructions

For this challenge problem, please prepare a short writeup (1-2 pages) detailing your solution to this problem. Also submit all code files needed for your solution. Be sure to comment code so the grading staff can easily follow your logic. **You are encouraged to discuss your work with your team member. Please indicate in the header of your code who your team member is. You should not discuss your solution with other teams.**

Please complete all programming questions in a single .py file with the naming convention "Last-Name_FirstName.py". For example, my submission file would be called "Beuken_Leopold.py". Note: Only a supervisor python file is required for this challenge problem. A local controller is not required. **The final submission needs to contain a PDF of the writeup, the .py controller file and the GIF/video file(s).**

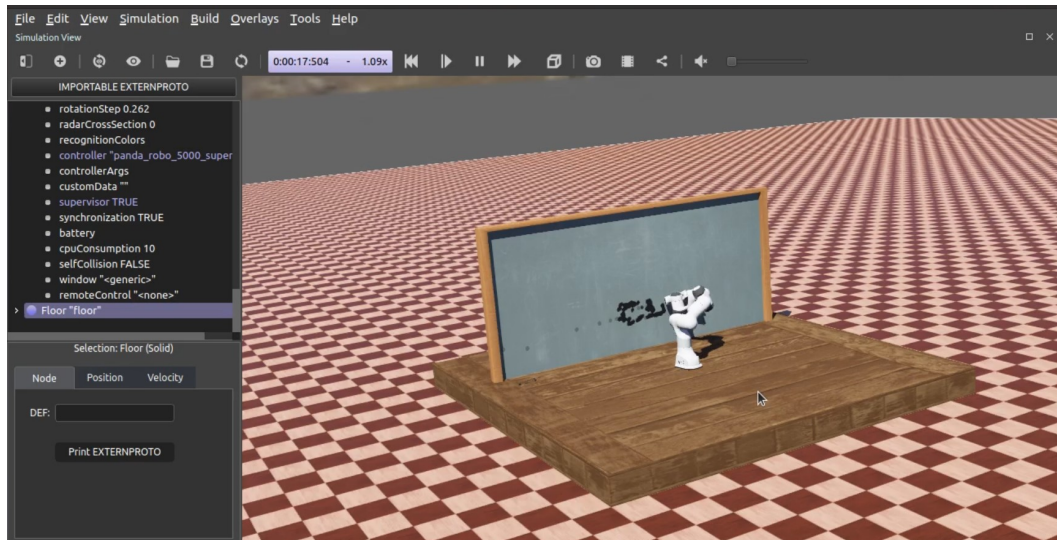
1 Inverse Kinematics

1.1 CU Boulder FTW! - 30 points

You have been provided a Webots world file that consists of the Franka Emika Panda robot mounted beside a blackboard. By default, the end effector of the manipulator contains a pen. Whenever the end effector comes in contact with a physical object in the simulation, it leaves a visible mark on the object.

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. The solution must only consist of a Webots supervisor controller and should not use the local robot controller. An example of the robot drawing the letters is shown below.

You are not expected to draw a perfect "CU" (as can be seen in the figure), but the letters should be clearly visible and legible. If the letters are not very clear, the end effector positions can also be validated using matplotlib visualization. In addition to the solution code, attach a video or a GIF of the robot performing the task.



1.2 SKO BUFFS - 5 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.

