

CS289 Mobile Manipulation

Fall 2026

Assignment 2

Submit your solution as a PDF to GitLab in a folder named HW2.

This assignment is related to Chapter 1 Foundations – 2 Representing Position and Orientation. (Starting from page 23) There is an installing tutorial at page 716 or you can go to its GitHub website for reference:

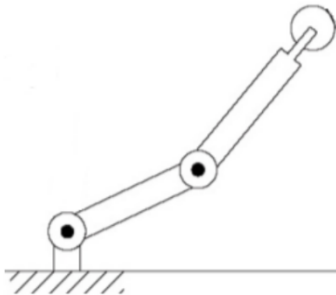
<https://github.com/petercorke/RVC3-python/tree/main>

Please submit your answers to problem 1,2,4 and results of problem 3 as a PDF file and your codes. You can find resources in the repo: Resources/HW2 on GitLab.

Problem 1:

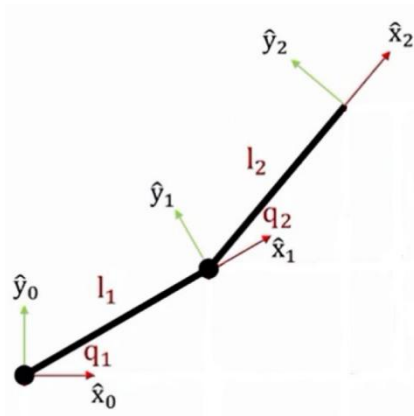
For the arm below,

1. draw lines and arcs in the image (or a copy) below for a and θ , explain why not α and d .
2. Give the final transformation matrix of the end effector. Keep your calculation process. (Assuming the first joint is at the origin of world coordinate and x-axis is parallel to the ground).



Problem 2:

1. List the methods to solve inverse kinematics problems and what are their advantages and disadvantages.
2. Since you solved Problem 1, you have the forward kinematics function to get the position of the end effector: $x = f(q)$. Now what you need to solve is the inverse kinematics of a 2-link planar robot. Given the final pose of the end effector, how to solve $q = f^{-1}(x)$? Please explain your answer step by step. Use the model shown below.

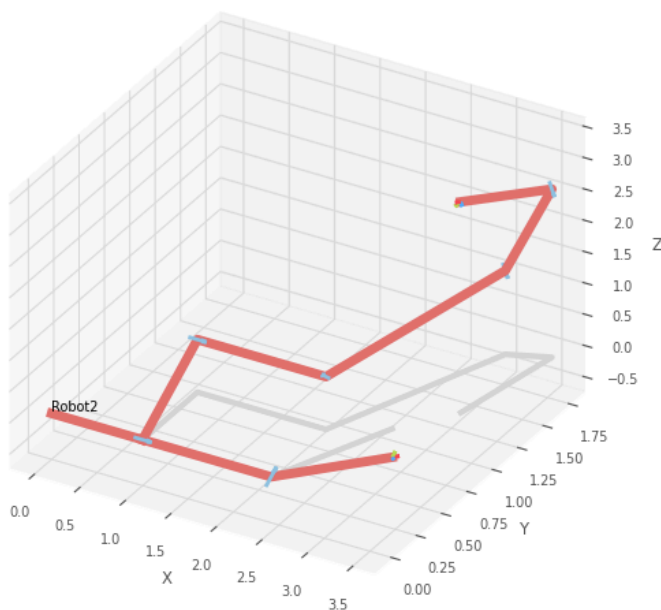


Problem 3:

1. Read Through Chapter 7.1.1-7.1.2 (Starting from page 256), use pose graph or chain of robot links method to draw some letters. Here shows an example of a "Z" in 2D. Your task is to draw letter "M" and "P".



2. Please create something simple but meaningful in 3D in RVC3, with branches. At least 6 DoF. (You can download this notebook and play with it: <https://github.com/petercorke/RVC3-python/blob/main/notebooks/chap7.ipynb>). Here is an example:



Problem 4:

AI usage: Detail here how you used AI in this HW (for the previous problems):

- Which AI did you use (if any)
- What did you use it for (any use is allowed!)
- Include some prompts you used (In the original language you used)