

Robotic Manipulators Project: Step #3

ECE 9053A “Robot Manipulators”

Fall 2024

Objective

The purpose of this project is to evaluate various ways of planning a trajectory for the manipulator chosen in Step #1, within the workspace created. You will use the scripts created in Step # 2. At this point, we will not worry about the robot links colliding with the obstacles. Assume that if the end-effector does not collide, then the trajectory is acceptable. You are allowed to adjust the workspace and obstacle locations as you go along.

Instructions

1. **Cover page.** List project title and student name.

Recommended length: 1 page

2. **Potential Field:** Develop a script using MATLAB to implement a path-planning algorithm using Potential Fields. Select an appropriate range for the repulsive fields, and for the attractive and repulsive field constants. Note that the Forward Kinematics and Jacobian scripts will have to be modified to obtain the intermediate matrices.

Recommended reporting instructions: 1-2 pages in the main document explaining the decisions made during the process of attractive/repulsive fields design. As many pages as needed in the appendix with the MATLAB code.

3. **Obstacle Avoidance:** Once the script has been implemented, select two different start and end positions of your choice, and show that the obstacle avoidance works. These positions must be chosen such that a straight line path would collide with at least one obstacle. Include figures that show the results of the path planning.

Recommended reporting instructions: 1–2 pages

4. Evaluation of the Parameters Chosen.

- (a) For one particular start and end position of your choice, vary the range for the repulsive fields for some of the obstacles (at least two different values). Show the results of this variation. Explain and discuss what is happening.
- (b) For one particular start and end position of your choice, vary the attractive and repulsive field constants (at least two different values for each). Show the results of this variation. Explain and discuss what is happening.

Recommended reporting instructions: 2 - 3 pages.

Evaluation

- Marks will be assigned on the basis of originality, correctness of solution, thoroughness and clarity of presentation.
- Present all MATLAB scripts developed as an appendix. Add comments to the scripts to explain what each command does. Include all figures necessary to assess the effectiveness of the methods implemented.
- The evaluation of this report will follow the marking scheme attached at the end of this manual.

Warnings

Scholastic offences are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_grad.pdf. This report will be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

You must write your report in your own words. Whenever students take an idea, image, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Please note that this includes software code. University policy states that cheating, including plagiarism, is a scholastic offence. The commission of a scholastic offence is attended by academic penalties, which might include expulsion from the program. If you are caught cheating, there will be no second warning.

Reports

Project reports are due on **November 25th, 2024, 11:59pm**, and should be submitted electronically through OWL (section “Assignments”). Reports are to be completed individually. No group work is allowed.