

## The Final Project

due Thursday, February 10th, 2022<sup>1</sup>

The final project is based on the problems and solutions studied in the course. It should include an experimental component, implemented in Python or in C++. It can be an extension of one of the exercises given during the semester—see examples below. The work should be reported in a brief document typed (not handwritten) in English or Hebrew, the main body of which will comprise at most six pages in 12pt font. You can add as many appendices as you wish for more experiments, more details of any sort algorithmic or other, more figures etc. The main body of the report should include a clear statement of the problem, the solution techniques, and the main observations, results and conclusions drawn from the work.

The main points and desired properties of your project:

- Compact.
- Individual—each student conducts her/his own project.
- Carefully crafted in form and content.
- Includes implementation and experiments.
- Implementation in Python or C++.
- A limited form of code sharing is allowed, but only after approval by the course's team. Such code will be put in a repository accessible by all the students in the course.
- The program should be runnable by the course's team; include instructions how to operate it.
- Comprehensive, well-designed set of scenarios for the experiments, which will help to find and demonstrate interesting properties of the problem and the solution.
- Main body of the report: up to six pages, 12pt font.
- Submission deadline: Thursday, February 10th, 2022. You may ask **in advance** for a later deadline.
- Submission instructions will appear on the course website.

### Example 1

Extend Exercise 4.2 to work with an arbitrary, but small, number of disc robot, say up to five discs. Compare two different methods for producing paths of short total length: (i) PRM+HGraphs, (ii) dRRT+HGraphs, (ii) RRT\*, or (iv) dRRT\*.

**There are additional examples on the other side of the page.**

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<sup>1</sup>You may ask **in advance** for a later deadline.

## Example 2

Devise a player in the game CoMotion presented in class.

## Example 3

Extend Exercise 4.2 to work with an arbitrary, but small, number of discs. Design an algorithm that will balance between clearance and total path length. Experiment with different types of combinations of these two objectives. Account for two types of clearance: (i) between each robot and the obstacles, and (ii) between pairs of robots.

## Example 4

Extend Exercise 4.2 to work with an arbitrary, but small, number of discs. Apply LBT-RRT (see reference below) for finding paths of small total length. Experiment with different epsilon values, for epsilon as defined in the paper.

O. Salzman, D. Halperin: Asymptotically near-optimal RRT for fast, high-quality, motion planning. *IEEE Transactions on Robotics* 32(3): 473-483 (2016).