

RO10005 - Advanced Robotics

Project 1 Phase 3

Lecturer: Prof. Yi Zhou

eeyzhou@hnu.edu.cn

TA1: Jinghang Li

li_jinghang@163.com

TA2: Delei Kong

dl_kong@qq.com

1 Project Work

In phase 1 and 2, a controller and trajectory generator are implemented respectively. Phase 3 will focus on path planning and obstacle avoidance.

1.1 A* Path Search

We provide two simple 2D grid maps which contain the obstacles, start and target locations (see Fig. 1). You need to implement a 2D A* path search method to find an optimal path with safety guarantee. You can assume that in the 2D case a node is only connected to its four neighboring nodes, i.e., only horizontal or vertical movements are allowed.

You are also required to design a 3D grid map and extend your A* method to 3D case. Again you can assume that a node is only connected to its six neighboring nodes. Then you need to connect all the path points using your previous trajectory generator and control your drone to follow the trajectory.

2 Structure of Simulator

The simulation code is almost the same as phase 1 and 2 besides an additional file `path_from_A_star.m`. See comments for details.

3 Tutorial

- Task 1: 2D Path Planner

The two provided grid maps are shown in Fig.1. The black dot, circles, red * represent start point, obstacles and goal respectively. The environments are divided into 1 x 1m grids, and each grid is represented by the coordinates of its centre. Note

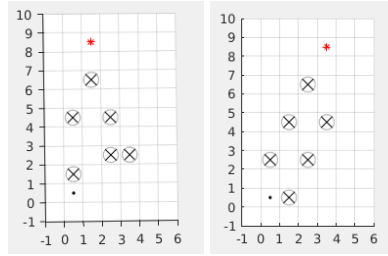


Figure 1: 2D grid maps

that we have provided the code to pre-process a 3D map into a 3D map array in `path_from_A_star.m`. You can address the 2D case by referring to the 3D case.

- Task 2: 3D Path Planner

Similar to the above 2D case, we provide three 3D maps for testing. Please refer to the comments in `path_from_A_star.m`.

4 Submission

Please submit your code and documents to hnu_ro10005@yeah.net. The project name for this assignment is titled “proj1phase3-YOUR NAME-STUDENT ID”.

Your submission should contain:

1. A **maximum 2-page** document including:
 - (a) Five groups of figures consisting of the path (i.e., way points) and the trajectory. Two groups for the 2D case and the other three groups for the 3D case.
 - (b) Analysis of your result. (For example, parameter studies).
 - (c) Any other things we should be aware of.
2. Folder code containing files `controller.m`, `trajectory_generator.m`, `path_from_A_star.m` as well as any other Matlab files you need to run your code.

You will be graded on successful completion of the code and how optimal your path and trajectory are.