Motion Planning for Mobile Robotics
Homework_2

1 Project Work

This project work will focus on path finding and obstacle avoidance in a 2D grid map.

A 2D grid map is generated randomly every time the Project is run, which contains the obstacles, start point and target point locations will be provided. You can also change the probability of obstacles in the map in obstacle_map.m.

You need to implement a 2D A* path search method to find an optimal path with safety guarantee.

You can also design a 3D grid map and extend your A method to 3D case. (Not a must)*

这个 project 聚焦于二维栅格地图的路径搜索和障碍物躲避。

每次运行 project 时都会生成一个随机地图，包含障碍物和起点、终点。你可以通过 obstacle_map.m.改变障碍物出现的概率。

你需要实现二维的 A*搜索算法，寻找一条安全的最优路径。

*你还可以设计一个三维栅格地图并将 A*拓展到三维情形（非必须完成）。*

2 Structure of Simulator

Use the script "math.m" as the main entry point. And the folder A_star contains useful functions for A*. Simulator will generate a map contains random distribution obstacles in obstacle_map. And visualize_map.m will visualize the 2D grid map consist of obstacles/start point/target point/optimal path.

A_star_search.m is your homework, you need to generate an optimal path for the random map using A*.

使用 math.m 作为仿真的主入口点。文件夹 A_star 包含了实现 A*的函数，仿真通过 obstacle_map.m 生成一个包含随机分布障碍的地图。visulize_map.m 实现地图的可视化，包含障碍物、起点、终点和最优路径。

你的作业是完成 A_star_search.m，你需要使用 A*在随机地图中生成一条最优路径。

3 Tutorial

The 2D random grid map is shown in Fig.1. The green circles, blue *, red * represent obstacles, start point and target point respectively. The environments are divided into

1 x 1m grids, each grid is represented by the coordinates of the right-top corner. We provide the code to pre-process these maps into 2D map array in path from A_star_search.m.

二维随机栅格地图如图 1 所示。绿色圆圈、蓝色*、红色*分别代表障碍物、起点、终点。地图被划分成 1*1 的栅格，每个栅格由格子右上角的坐标所表示。我们提供了代码来将这些映射预处理为 A_star_search.m 路径中的数组。

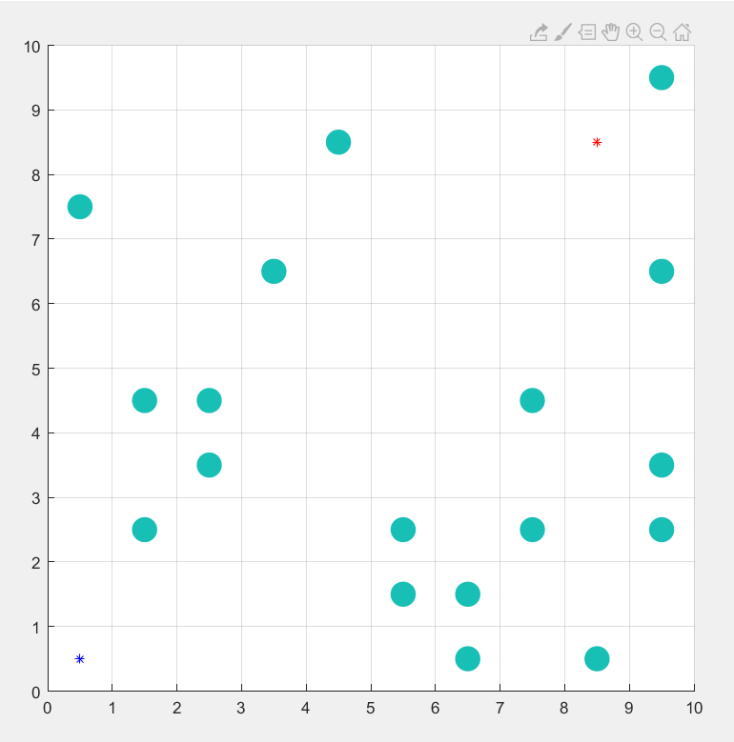

Figure 1: 2D grid maps

4 Submission

Your submission should contain:

1.A maximum 2-page document including:

(a) Figures which include the path in three different random maps.

(b) Analysis of your result.

(c) Any other things we should be aware of.

2. Files A_star_search.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 paths are. This time we will also test one other set of 2D grid map which will not be released.

你提交的作业应该包括:

1. 一份最多两页的报告“
   a) 在三种随机地图下路径结果的截图
   b) 分析你的结果
   c) 其他我们会感兴趣的。

2. 提供A_star_search.m 的源代码和运行代码所需的其他任何 matlab 代码

我们将根据代码的成功完成度以及路径的优化程度进行评分。同时我们还将用另一个未公布的 2D 网格地图来进行测试