AI for Robotics II
Assignment 2: Task and Motion Planning

1 Introduction

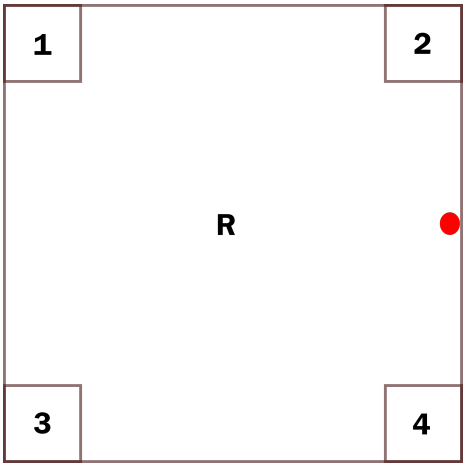

Figure 1: A 2D environment. The robot (R) can navigate to regions 1-4 and to the location marked in red.

Consider the 2D environment shown in Fig. 1. There are four student groups, each assigned to regions 1-4, working on their assignments. Robot R is responsible for collecting the assignment reports and delivering them to the submission desk (red in figure).

The dimension of the environment is $6m \times 6m$. R is initially at $(0, 0)$ and the submission desk is at $(3, 0)$. For the sake of simplicity, assume each region is of size $1m \times 1m$ and associate a single way-point (x, y) to each region. Randomly sample 24 way-points (x, y) from the environment, outside the regions. The sampled way-points are connected to form edges. You can choose a k such that each way-point is connected to a maximum of k other way-points. This results in a roadmap with way-points as nodes. Finally, the 4 way-points associated with each region, the initial location of R, and the submission desk are to be connected to the nearest nodes in the roadmap.

The objective for robot R is to collect any 2 assignment reports and bring them to the submission desk while minimizing its motion cost. The motion cost is the length of the path covered by the robot. The path length is computed by adding the Euclidean distance between the way-points (edge costs) traversed by the robot.

The files shared during the tutorial may be modified to achieve the desired results. The modified files, including the domain, problem, and external module, must be submitted along with a brief report. The report should be limited to a maximum of 2 pages.