Technion – Israel Institute of Technology



HW4

Autonomous Navigation and Perception

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# Theoretical Questions:

For this section, we decided to provide our answers in a hand-written format. The Hands-on section can be found right after the scanned pages.

# Hands On:

In the first question (a) we are tasked to create maps, and in the second question (b) solve a shortest path problem via graph forward search.  
We decided to provide the plots for both questions together.

We built a map and a PRM with the following setting as follows:

* Create a map where
* Discretize the map to unit intervals, and place 15 rectangles of size such that they don’t overlap. Overlapping is checked by grid’s occupancy
* Build PRM nodes with = 100 or 500 by uniform sampling of the space. If a node falls inside a rectangle, it is discarded, and a new node is sampled instead.
* Connect the PRM nodes with edges such that each node is connected to all nodes whose distance to it is smaller than and where the edge doesn’t cross a rectangle. We checked for crossings via line intersection (each rectangle has 4 lines to check with).

We also implemented both Dijkstra and algorithms for *“SimpleWeightedGraph.jl”* in *“graphForwardSearch.jl”*

In *“Q1 hands on.jl”* we build the map, and searched for the shortest path between bottom left node to top right node (chosen by distance from ) on the PRM via with Euclidian distance to goal heuristics.

We show below the outcomes for all combinations , with information of number of edges and average node degree.

Diagram

Description automatically generated

Diagram

Description automatically generated

Diagram

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Chart

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