Control of Mobile Robots - Laboratory 3
Motion planning algorithms
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Exercise 1

Using PRM algorithm available in MATLAB Robotics System Toolbox and the *simpleMap*, one of the maps available in *exampleMaps.mat* file (an example file included in standard MATLAB installations) create a simple planning example, performing one or more executions of the algorithm and looking, step by step, at the evolution of the roadmap. Does the algorithm represent an implementation of PRM or sPRM?

In particular, focus on how the roadmap, the planned path and the execution time changes according to different selections of the number of nodes and the radius used to compute the near set.

Exercise 2

Using PRM algorithm and the *simpleMap*, define a start and a goal configuration and solve the planning problem for an increasing number of nodes and a radius for the near set equal to 2 meters. Analyse the results considering the path length and the time needed to construct the roadmap and plan the path, and select the number of nodes that represents the best compromise.
Using this number of nodes, solve the planning problem for an increasing radius of the near set. Analyse the results considering again the path length and the time needed to construct the roadmap and plan the path, and select the radius that represents the best compromise.
Run the two analysis more than once. Do you get the same results? Why?

Exercise 3

Using RRT algorithm available in MATLAB Navigation Toolbox and the *simpleMap* create a simple planning example, performing one or more executions of the algorithm and looking at the planned path for different values of the algorithm parameters.

In particular, try to select a validation distance and a connection distance that are appropriate to the selected environment.

Exercise 4

Using RRT algorithm and the *simpleMap*, define a start and a goal configuration and solve the planning problem for different values of the *goal bias*, the *goal reaching tolerance*, and the *maximum connection distance*. Analyse the results considering the path length and the time needed to plan the path, and select the parameterisation that represents the best compromise.