

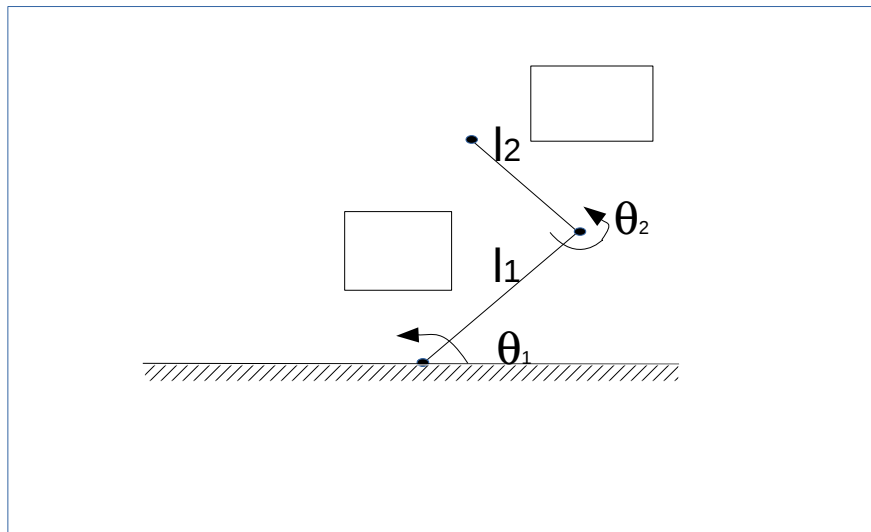
Robot Motion Planning

Homework 1

The homework can be implemented in any programming language of your choice. We will use Matlab in the tutorial, which is available for free to TUM students

1) Configuration Space

Assume a robot with two joints without any joint limits. The link lengths l_1 and l_2 can be chosen as parameters of your program. The robot is placed with the first joint on a planar table surface limiting its operating range, while the second joint can turn freely.



Write a program (script) that places 2 rectangular objects in the workspace of the robot and calculates the configuration space representation of this space projecting the objects as C-obstacles into this space.

- implement a collision checker to check collisions of the robot with each rectangular obstacle
- build a configuration space as a grid representation for this 2 link robot

2) Visibility Graph

Write a program that places randomly a mixture of 3 convex and concave polygons with min. of 6 vertices in a workspace. Build a visibility graph in its original not simplified structure for this environment. Build a second graph with the simplified version of the graph in a second window.

3) Voronoi Diagram

Write a program that approximates the Voronoi lines with the discrete approximation discussed in the lecture for a set of two randomly placed polygonal objects in the scene.