
Exercise: Robot localization with a map (ca. 2h)

1. The kidnapped robot problem vs. the robot wakeup problem

First, read these short descriptions about

- i) [the kidnapped robot problem](#)
- and
- ii) [the robot wakeup problem.](#)

What is the difference between both problems? Formulate the difference in your own words! What would you say: which problem is harder?

2. Localization with the help of a map

Start with the *robot wakeup* problem. The robot has a map of the world and is brought to some unknown location (x,y) while it is switched off, then it is switched on and has to localize itself on the map. Simulate this situation in the robot simulator, develop some localization idea and implement it in an algorithm in order to localize the robot with the help of the map.

Do not use / do not assume a (x,y) position sensor as in the previous exercise (robot navigation with a map)! Only use the distance sensor data, the robot's orientation and the map in order to localize the robot. The robot is allowed to drive around in order to improve its localization estimate.

Visualize the locations where your robot thinks it is in the world to see whether your approach works.

First work with perfect distance sensors, then simulate noisy distance sensors and check whether your localization performance degrades.