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**Exercise: Robot navigation with a map (ca. 3h)**

## **1. Introduction**

The goal of this exercise is to let you think about own ideas to bring a robot from a point A to a point B in the world.

Imagine e.g. a robot that works in the night shifts in a factory. At the end of the human shift, a human instructs the robots to bring items from a point A to a point B and the robot has the whole night for achieving this goal. We can therefore assume for the sake of simplicity that the world is statically: In the night there are no humans that walk around in the factory during the working time of the robot and no other moving “things”.

We further want to ease the problem by giving the robot a 2D map of the world (floor plan), that shows the robot where obstacles and free drivable spaces are in the world. Assume that the robot gets as map information an occupancy grid: A grid map of the world with the information for each grid cell whether the cell is free or occupied.

You can assume a 2D position sensor that returns the current (x,y) location of the robot in the 2D world.

## **2. Coding task**

Draw a simple 2D world with some obstacles in a drawing program where free cells are colored black and obstacle cells are colored white.

Then encode in your program the start point A and the goal point B or better: Let the user click in the 2D world where the robot starts and where it shall go to.

Implement your navigation strategy that can make use of the 2D map information to come from point A to point B. In the exercise you should first explain your navigation strategy, then show your code and then show some example runs where the robot moves from some point A to some point B.