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Institut für Informatik
Abteilung VI
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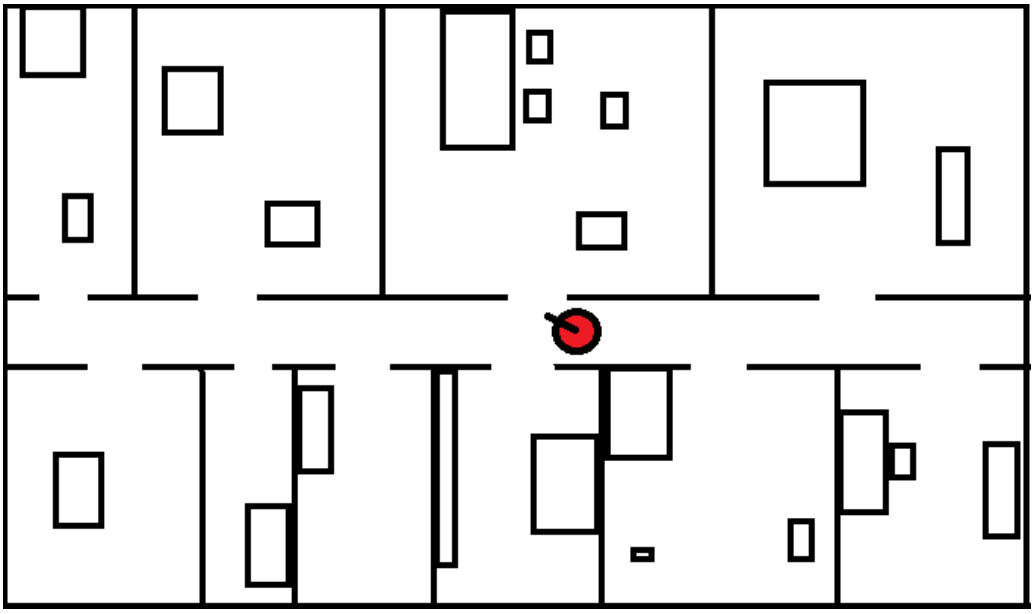
Cognitive Robotics

Assignment 4

Due Tuesday, November 14th, before class.

Note: If you submit your solutions via e-mail, then please submit a single PDF file containing all solutions for the exercise sheet, write your name on the first page, and name the file after your name.

4.1) In the lecture materials directory, you will find the following 2D grid map as an image with a resolution of 4cm x 4cm per pixel:



Given the current robot pose $x=(x, y, \theta)$, write a program that uses ray casting to generate laser-range measurements

$z=(z_{-125°}, z_{-123°}, \ldots, z_{+123°}, z_{+125°})$ for an opening angle of 250° (125° left and right of the heading direction), with a resolution of 2°. Use a maximum measurement range of 12m.

10 points

4.2) Now assume that you don't know the robot's pose and would like to compute the measurement likelihood for the scan generated in 4.1) for all possible robot poses $x=(x, y, \theta)$ within the map boundaries.

Implement the endpoint model for laser-range measurements. Pre-compute the likelihood field for $\sigma=0.35m$.

For each possible discretized pose of the robot and the given laser scan z, compute the measurement likelihood $P(z \vee x, m)$ given that

pose and the map.

Visualize the likelihood $P(z \vee x, m)$ in a 2D map as a grayscale value by taking the highest likelihood over all orientations θ.

10 points