

CISC 3415 Fall 2011, Homework 5

1. Recall from Homework 3 that you are the chief robot designer for U.S. Robots and Mechanical Men, Inc., and you are working on designs for the following robots:
 - (a) A delivery robot that will carrying supplies to different departments in a hospital.
 - (b) A supply robot that will carry heavy loads across loose soil and sand.
 - (c) A security robot that has to secure a wooded, hilly, area.
 - (d) A butler robot that will greet guests in a home and bring them drinks.

For each robot, describe what kind of map you think will be most helpful for it in completing its tasks, explaining why you think this is the case.

(15 points)

2. The picture in Figure 1 (which should be familiar from Project 5) is a plan of an area that you have to program a robot to navigate in. At different times, the robot will have to move from its starting location (where the robot is on the map) to $(7, -1)$, $(7, 7)$, $(-5, 1)$ and $(-7, 6)$

Draw the following maps of the space, all of which should allow the robot to plan how to navigate to any of these goal locations:

- (a) A topological map.
- (b) A metric topological map.
- (c) An occupancy grid map.

(30 points)

3. How effectively do you think these different maps capture the essential features of the space? Why?

(10 points)

4. Explain how the robot would move if it used the Bug 2 algorithm to navigate from its starting place to $(0, 7)$.

(15 points)

5. Show how the robot would use a search algorithm along with the topological map you drew for 2(a) to find the best path from its starting point to $(7, 7)$. (You can use any of search algorithms that were covered in the notes).

(15 points)

6. Use the wavefront planning procedure on the occupancy grid you drew for 2(c) to find a path for the robot to move from its starting point to $(7, 7)$.

(15 points)

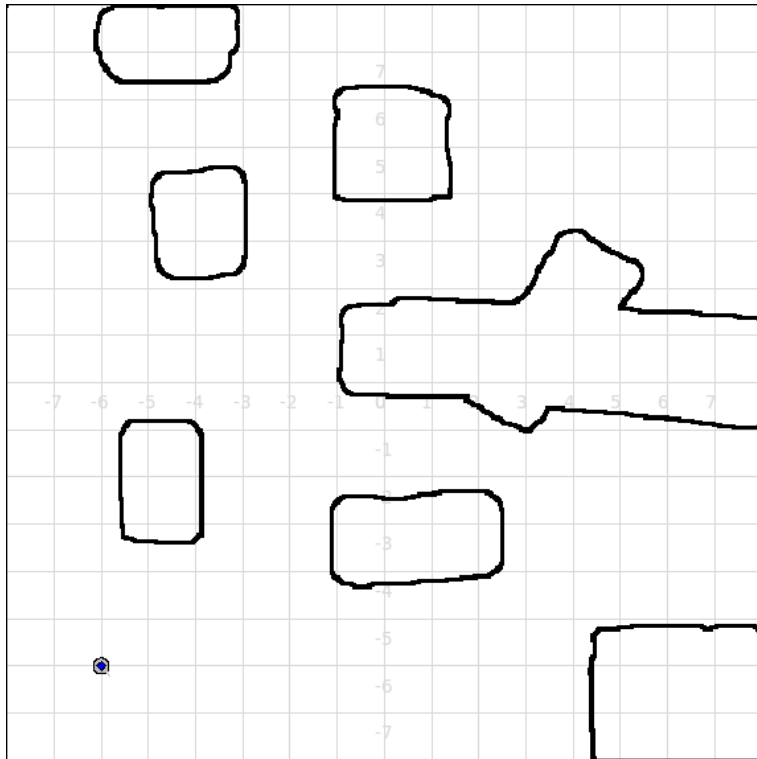


Figure 1: The map.