Übung Künstliche Intelligenz SS 2007
Wirtschaftsinformatik und Maschinelles Lernen (ISMLL)
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Übungsblatt 4

Abgabe: Mittwoch, 02.05.07 bis 13 Uhr

Exercise 1 Local search, Comparing search methods (20 Points)

Given the grid, heuristic function and tie-breaking rules defined in the last sheet (Sheet II, Exercise 2):

a) [7 pts.] Use the Hill-Climbing search and highlight the solution path found, if any, or explain why none is found.

b) [13 pts.] Suppose the grid is extended infinitely in all directions (start, goal state and obstacles remain as before). Which of the following methods will not be able to find a solution to this problem? Breadth-First, Depth-First, Iterative Deepening, Greedy Best-First, and A*. Which of these would be the best method, and why?

Exercise 2 Admissible Heuristics and Heuristic Search (20 Points)

a) [7 pts.] If *h1(s)* and *h2(s)* are both *admissible* heuristic functions, which of the following are also admissible:

1. $h3(s) = h1(s) + h2(s)$
2. $h3(s) = |h1(s) - h2(s)|$
3. $h3(s) = max(h1(s), h2(s))$
4. $h3(s) = min(h1(s), h2(s))$

Justify your answers.

Which of the above heuristics do you think is the best one? Why?

b) [13 pts.] Assume a non-finite maze in which a robot has the task to move from an initial state (0,0) to a goal state. The legal actions are up, down, left, and right that move the robot one field in the indicated direction. However, sometimes the robot cannot move in a particular direction e.g. if the robot faces a wall in the left it cannot move left. In the particular problem we try to reach one of 2 goal positions (100,300) and (300,100); unfortunately, usually, one of the two goal positions is unreachable.

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Ex.:

(0,0) (0,1) (0,2) (0,3) (0,4)
(1,0) (1,1) (1,2) (1,3) (1,4)
(2,0) (2,1) (2,2) (2,3) (2,4)
(3,0) (3,1) (3,2) (3,3) (3,4)
(4,0) (4,1) (4,2) (4,3) (4,4)
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Assume best-first search is used for this problem, and you want to find a path to the reachable goal position. Three heuristics, given below, are used to solve this problem (assume that states with the lowest values will be expanded first). For each of these three heuristics answer the following questions: will best-first always find a solution? If your answer to the previous question is yes, also evaluate the efficiency of the search. Justify your answers!

1) $h1(x,y) := |x|+|y|$

2) $h2(x,y) :=$ if $x < 200$ then $|x-100| + |y-300|$ else if $x<400$ then $|x-300| + |y-100|$ else 10000

3) $h3(x,y) := \min(|x-100| + |y-300|, |x-300| + |y-100|)$