

Foundations of Artificial Intelligence

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Exercise Sheet 3

Due: Tuesday, May 31, 2010

Exercise 3.1 (A* search)

Trace the operation of A* search in the following 8-puzzle configuration:

2	8	3
1	6	4
7		5

Goal State:

1	2	3
8		4
7	6	5

Show the sequence of search nodes the algorithm will consider and the f , g , and h score for each node when used with the Manhattan distance heuristics and with the “Misplaced Tiles” heuristics. How does the heuristic influence the search?

Exercise 3.2 (Sudoku)

- (a) Show that it is possible to represent *Sudoku* puzzles as graph coloring problems in which some nodes are already initiated with a color. Describe a procedure that transforms a given Sudoku into an equivalent graph coloring problem (give graph nodes and edges, colors and initial colors).

For the game’s description, see <http://en.wikipedia.org/wiki/Sudoku>.

- (b) Describe how a given *Killer Sudoku* can be formalized as a Constraint Satisfaction Problem.

For the game’s description, see <http://www.killersudokuonline.com/>.

Exercise 3.3 (Minimax algorithm)

The Minimax algorithm for two-player zero-sum games returns the best move for a player under the assumption that the opponent plays optimally as well.

- (a) Does this still hold if the opponent does not play optimally?
(b) Is it possible to extend the algorithm to games which are not zero-sum?

The exercise sheets may and should be handed in and be worked on in groups of three (3) students. Please fill the cover sheet¹ and attach it to your solution.

¹<http://ais.informatik.uni-freiburg.de/teaching/ss11/ki/cover-sheet.pdf>