Foundations of Artificial Intelligence

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Exercise Sheet 3

Due: Tuesday, May 18, 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 sheet[1] and attach it to your solution.

[1] `http://www.informatik.uni-freiburg.de/~ki/teaching/ss10/gki/coverSheet-english.pdf`