

Artificial Intelligence (CPS 270) : Homework 1

Due September 19, 2006

1 RBFS

Give a detailed example and analysis showing how RBFS can take $O(n^2)$ time to search a tree with n nodes.

2 Monotonicity

Do problem 4.7.

3 Nearly Admissible Heuristics

Prove that using A* with a heuristic which never overestimates (additively) by more than c will return a solution with cost that exceeds the optimal cost by no more than c .

4 Combining Heuristics

Prove that a convex combination of admissible heuristics is admissible.

5 Leaf Value Robustness

Prove (by induction on the depth of the search tree) that adding the same constant to all leaf values in minimax search will not change the optimal decision at the root.

6 Expectiminimax

One nice property of minimax is that any order-preserving transformation on the leaf values of the search will not change the optimal action at the root node. (This makes it easier to come up with good evaluation functions.) Demonstrate how this is not necessarily the case for expectiminimax.

7 Pruning

Consider Figure 6.2 in the textbook. (a) Rearrange siblings in the last level of the tree to *maximize* the amount of pruning done by alpha-beta, assuming that nodes are expanded in left to right order. (b) Rearrange siblings in the last level of the tree to *minimize* the amount of pruning done by alpha-beta, again assuming that nodes are expanded in left to right order. *Show the alpha and beta values (at the entry point) in both cases.*