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MATH. - NATURWISS. FAKULTÄT
FACHBEREICH INFORMATIK
KOGNITIVE SYSTEME · PROF. A. ZELL

Artificial Intelligence
Assignment 7

Assignment due by: 14.12.2016, Discussion: 20.12.2016

Question 1 Minimax (3+2+1=6 points)

Two players, MAX and MIN, are playing a game against each other with two heaps of three wooden matches each. Each player can remove one or two matches from a single heap per round. The player who removes the last match loses the game. MAX plays first.

(a) Build the entire search tree for the game.

(b) Set leaf values to 1 when MAX is winning and -1 when MIN is winning. Derive minimax values for all nodes.

(c) Is there an optimal strategy for one of the two players? If yes, which?
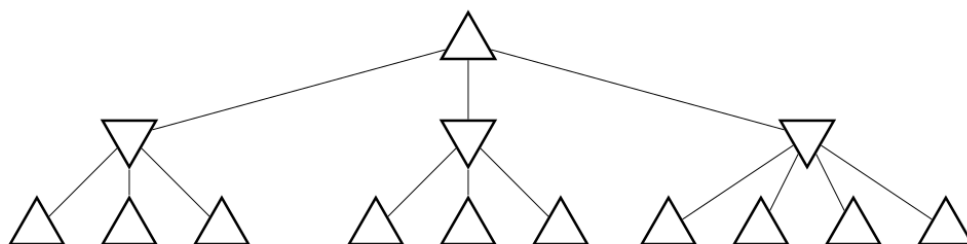
Question 2 Alpha-Beta Pruning (3+5=8 points)

The search tree shown in Appendix A is the representation of a game, where MAX should make a move. Therefore:

(a) Write down the minimax values for each node. Which path should MAX choose?

(b) Apply the Alpha-Beta pruning algorithm shown on the slides to fill in the information on each node. You should identify when and which values (v, α, β) should be written down. Which parts of the tree do get pruned and why?

Question 3 Alpha-Beta-Pruning II (2+2+2=6 points)

Consider the following search tree:

(a) Distribute integers from 1 to 10 on the leaves of the tree so that alpha-beta pruning does not prune a single leaf. Explain the choice of your distribution.

(b) Distribute integers from 1 to 10 on the leaves of the tree so that alpha-beta pruning prunes as many leaves as possible. Explain the choice of your distribution.

(c) Consider the following search tree:

Distribute integers from 1 to 8 on the leaves of the tree so that alpha-beta pruning prunes as few leaves as possible. Explain the choice of your distribution.