50.021 – Artificial Intelligence

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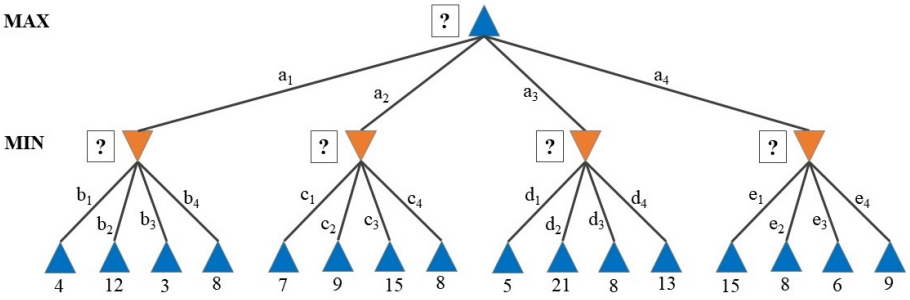
Week 9 Theory Homework - Adversarial/Game Search

[The following notes are compiled from various sources such as textbooks, lecture materials, Web resources and are shared for academic purposes only, intended for use by students registered for a specific course. In the interest of brevity, every source is not cited. The compiler of these notes gratefully acknowledges all such sources.]

Due: 29th March, 11:59pm
Submission: via eDimension

1 Minimax Search



Consider the above game tree for a 2-ply game between two players, with the utility scores as listed. Apply the Minimax algorithm on this search, where the exploration of moves/actions is based on alphabetical order (i.e., $a_1, a_2, a_3, ...$). Answer the following:

(a) List down the Minimax values at each level (i.e., the square boxes with the question mark).

(b) Briefly explain why those values are chosen.

(c) Which move/action would be chosen?

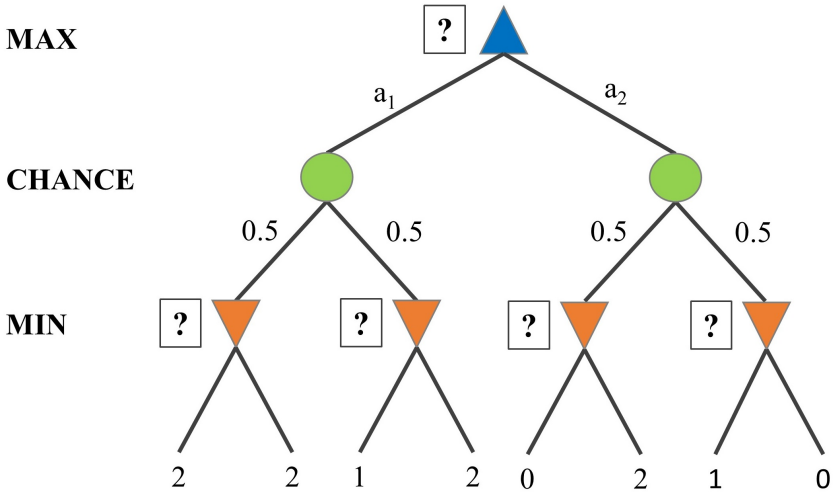
2 $\alpha - \beta$ Pruning

Using the same search tree from Task 1, apply $\alpha - \beta$ pruning with the same move ordering as before. Answer the following:

(a) Which moves/actions are pruned (if any)? List them in the order they were remove.

(b) Briefly explain why these moves/actions were removed (if any).

3 ExpectiMinimax Search



Consider the above game tree for a probabilistic game between two players, with the utility scores as listed at the leaf nodes. In this game, there are chance nodes (denoted by circles) that are based on a fair coin toss. Apply the ExpectiMinimax algorithm on this search, where the exploration of moves/actions is based on alphabetical order. Answer the following:

(a) List down the ExpectiMinimax values at each level (i.e., the square boxes with the question mark).

(b) Which move/action would be chosen?