## Algorithmic Game Theory Problems 5

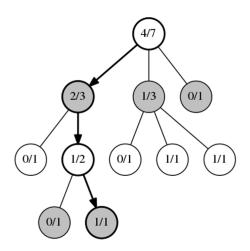
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Problem 1. In your own words, sketch the basic procedure for Minimax Tree Search, Alpha-Beta Pruning, Heuristic Evaluation, and Monte Carlo Tree Search.

- How do these approaches relate to one another?
- Can you think of example applications for each approach that best suits their procedure?

**Problem 2.** Consider the following game tree where the selection step has already been applied. Do the following:

- Follow the pre-selected path and illustrate graphically all subsequent steps involved in Monte Carlo Tree Search.
- How do the values along the selected path change for different simulation results?
- Decide whether the path selected in this example is also recommended by the UCT selection policy from the lecture where  $c = \sqrt{2}$ .



**Problem 3.** Note that a chance node is a node in the game tree where the outcome of an action is determined by some random event, such as rolling dice, drawing cards, or flipping a coin. Consider the following procedure for choosing moves in games with chance nodes:

- Generate some dice-roll sequences (say, 50) down to a suitable depth (say, 8).
- With known dice rolls, the game tree becomes deterministic. For each dice-roll sequence, solve the resulting deterministic game tree using alpha-beta.
- Use the results to estimate the value of each move and to choose the best.

Will this procedure work well? Why (or why not)?