Dr. Hannes Strass

M.A. Jonas Karge

Algorithmic Game Theory

Summer Term 2024
Exercises 5
13–17/05/2024

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

  (a) How do these approaches relate to one another?

  (b) 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:

(a) Follow the pre-selected path and illustrate graphically all subsequent steps involved in Monte Carlo Tree Search.

(b) How do the values along the selected path change for different simulation results?

(c) Decide whether the path selected in this example is also recommended by the UCT selection policy from the lecture (based on UCB1) where $c = \sqrt{2}$.
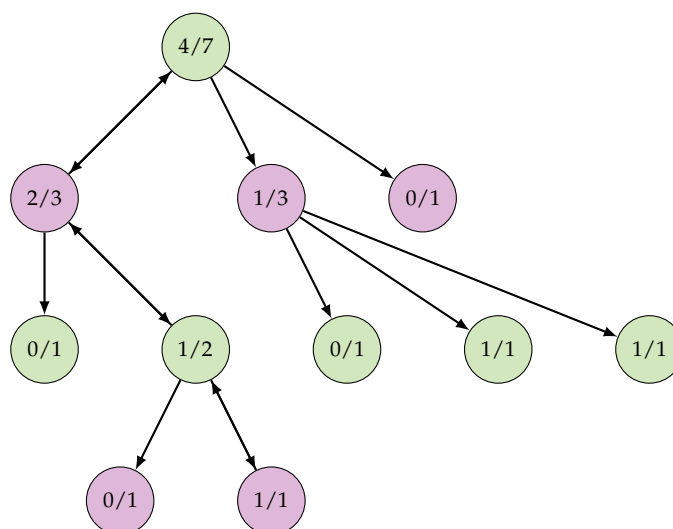
Problem 3.
Note that a chance node is a node in the game tree where the outcome of an action is determined by some random event, such as rolling dice, drawing cards, or flipping a coin. Consider the following procedure for choosing moves in games with chance nodes:

1. Generate some dice-roll sequences (say, 50) down to a suitable depth (say, 8).

2. With known dice rolls, the game tree becomes deterministic. For each dice-roll sequence, solve the resulting deterministic game tree using alpha–beta.

3. Use the results to estimate the value of each move and to choose the best.

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