Adversarial Search III

Minimax with alpha-beta pruning

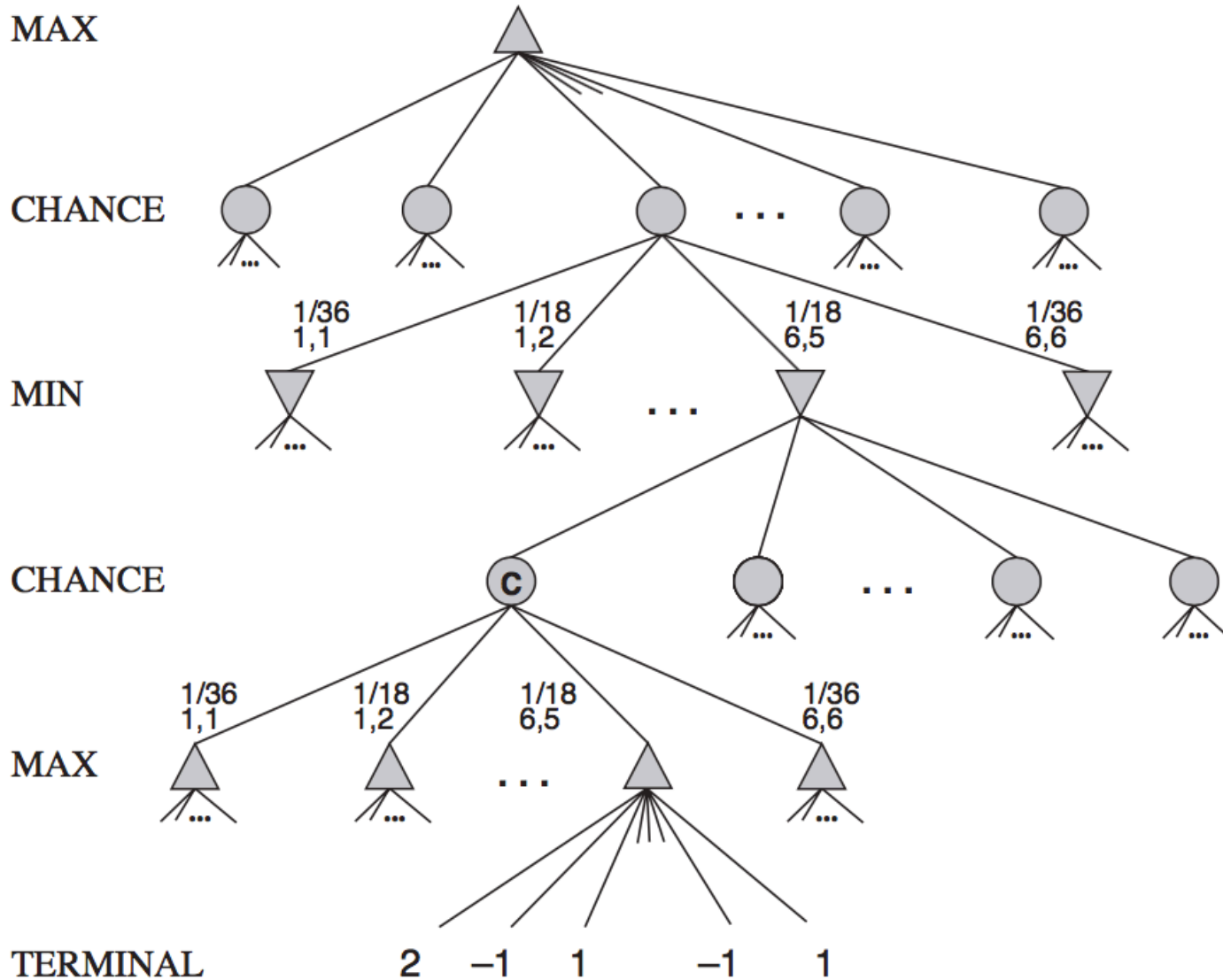- Revisit worksheet from last class.

Review of what we know

- Minimax – basic algorithm
- Possible speed-ups
  - Minimax + alpha-beta pruning
  - Minimax + transposition table
  - Minimax + alpha-beta + transposition table

Minimax + heuristics

$$\text{H-MINIMAX}(s, d) =$$

$$\begin{cases} \text{EVAL}(s) & \text{if CUTOFF-TEST}(s, d) \\ \max_{a \in Actions(s)} \text{H-MINIMAX}(\text{RESULT}(s, a), d + 1) & \text{if PLAYER}(s) = \text{MAX} \\ \min_{a \in Actions(s)} \text{H-MINIMAX}(\text{RESULT}(s, a), d + 1) & \text{if PLAYER}(s) = \text{MIN}. \end{cases}$$

Game tree with chance nodes

Expectiminimax

$\text{EXPECTIMINIMAX}(s) =$

$$\begin{cases} \text{UTILITY}(s) & \text{if TERMINAL-TEST}(s) \\ \max_a \text{EXPECTIMINIMAX}(\text{RESULT}(s,a)) & \text{if PLAYER}(s) = \text{MAX} \\ \min_a \text{EXPECTIMINIMAX}(\text{RESULT}(s,a)) & \text{if PLAYER}(s) = \text{MIN} \\ \sum_r P(r)\text{EXPECTIMINIMAX}(\text{RESULT}(s,r)) & \text{if PLAYER}(s) = \text{CHANCE} \end{cases}$$