

Learning Objectives

- To practice running minimax search and alpha-beta pruning.
- To evaluate the properties of a real-world example of adversarial search.

Q1. Adversarial Search

Observe the minimax graph below.

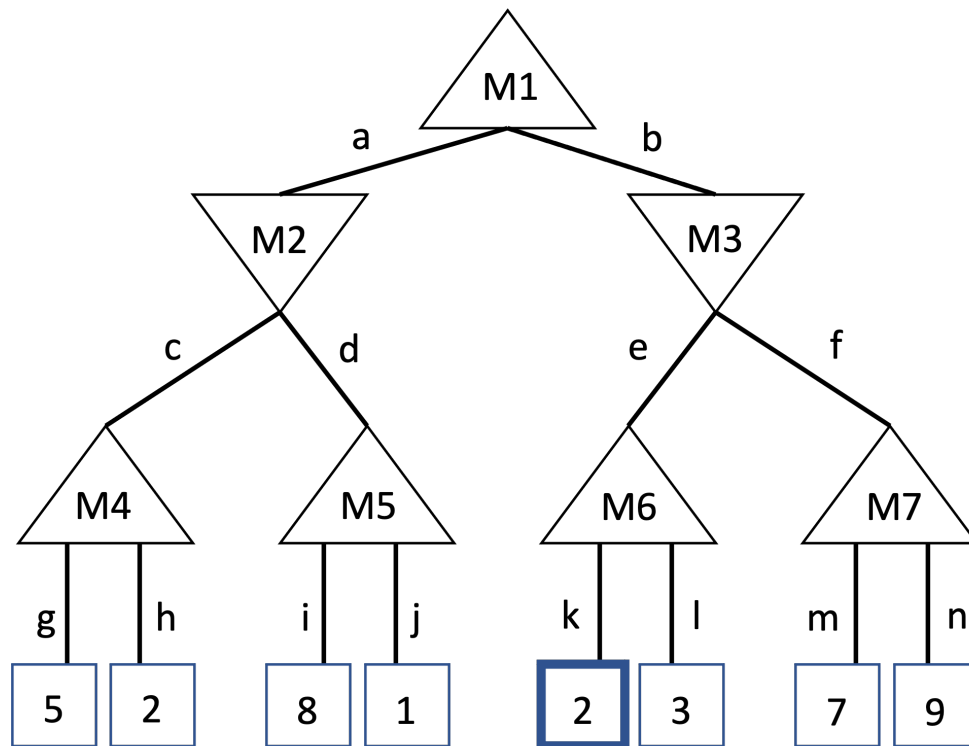


Figure 1: Graph

- (a) What is the minimax value of the root (M1)?
- (b) What is the smallest integer value could you change the highlighted 2 to change the value of M1?
- (c) With the original 2 in place again, what edges would be pruned in alpha-beta pruning?

Q2. Connect 4

Connect Four is a two player game in which players take turns dropping colored discs into a column of a 6 row by 7 column grid. The discs stop at the lowest open row in the column. The first player with 4 of their colored discs to appear consecutively (horizontally, vertically, or diagonally) wins.



Figure 2: Connect 4 game

- (a) You decide to model each player as an agent. Is the game static or dynamic? Is it stochastic or deterministic? Is it fully observable or partially observable?
- (b) What is the maximum branching factor for each agent? What is the minimum branching factor?
- (c) What is the maximum depth of the search tree?
- (d) Is it feasible to search through the whole minimax tree to find a best move? If not, what kinds of heuristics could you create to value a non-leaf node?
- (e) Is the minimax algorithm still optimal if you used a heuristic to value non-leaf nodes?