CSC384H Tutorial 5

Game Tree Search

Summer 2025

Questions

1. With the *MINIMAX* algorithm, we know that the value v computed at the root (i.e. the utility for the MAX player) is a worst-case value. This means that if the opponent MIN does not act optimally, the actual outcome v' for MAX can only be better, and never worse than v. That said, the *MINIMAX* algorithm may not select the optimal move given sub-optimal play from the MIN player.

   Construct an example where, should the MIN player play sub-optimally, the *MINIMAX* algorithm makes a sub-optimal move.

2. Consider the minimax tree of figure 2, where the squares are terminal states with undetermined values.
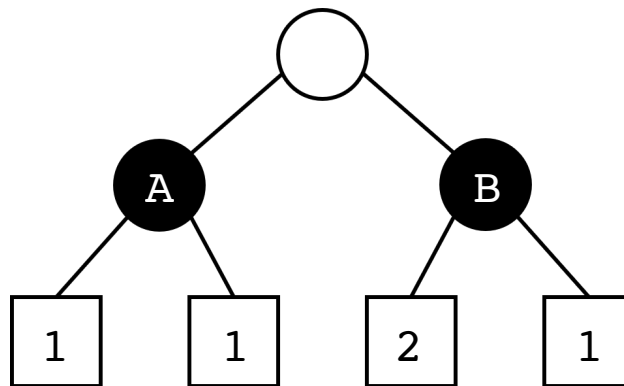
   (a) For each leaf node, is it possible to be pruned? If yes, give an example of terminal values that would cause the leaf to be pruned. Otherwise, explain why not.

   (b) Will your answers change if the range of values that the leaf nodes can take on has both an upper bound and a lower bound, whose values are known to you?
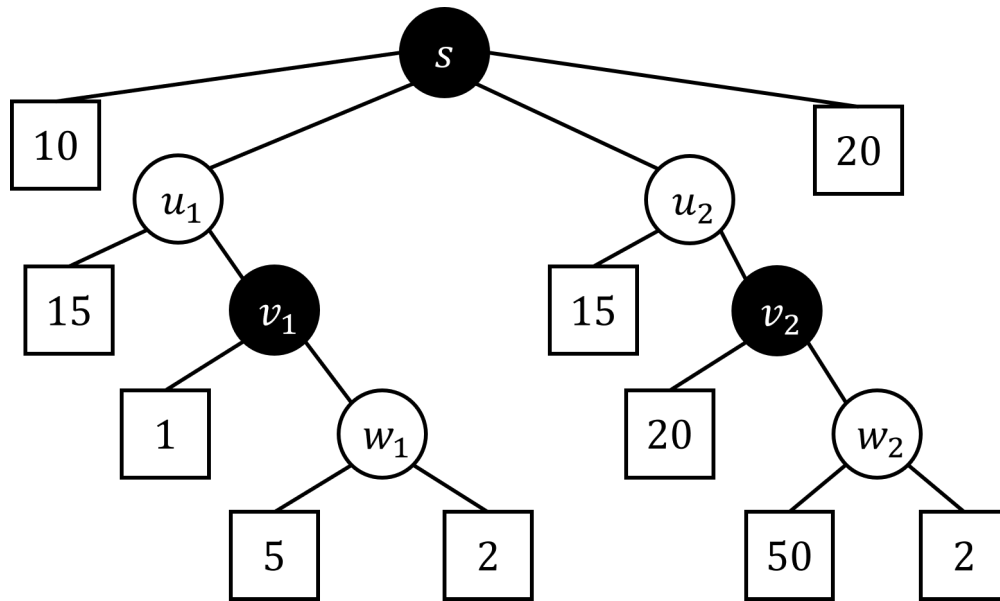
3. Consider the following minimax trees:
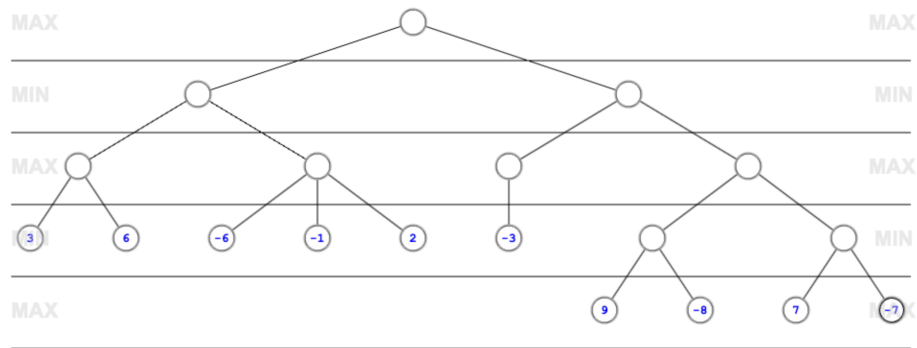

Figure 1: Minimax tree 1

Figure 2: Minimax Tree 2

(a) What is the minimax value at the root?

(b) Mark with an '×' all edges that are pruned by α-β pruning, assuming children are visited from **left to right**.

(c) Is there another ordering for the **direct children** of the root node for which more pruning would result? If so, state the ordering.