Collab Worksheet 8

CS440/ECE448, Spring 2021

Week of 4/2 - 4/7, 2021

Question 1

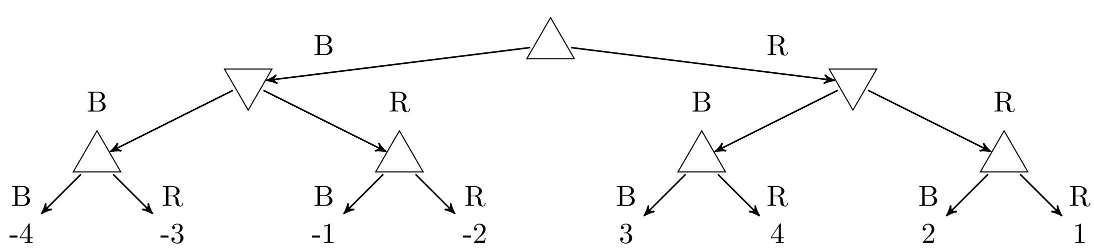
What is the horizon effect and how can it be counteracted?

Solution:

- A minimax or alpha-beta search can't search to the end of most two-player games, so it's usually cut off after a limited number of moves.
- The horizon effect is the problem of incorrectly estimating the minimax value of a state due to the use of a depth-limited search.
- Methods for combating the horizon effect include quiescence search and singular extensions.

Question 2

The following **minimax tree** shows all possible outcomes of the RED-BLUE game. In this game, Max plays first, then Min, then Max. Each player, when it's their turn, chooses either a blue stone (B) or a red stone (R); after three turns, Max wins the number of points shown (negative scores indicate a win for Min).



Max could be a Reflex Agent, following a set of predefined IF-THEN rules, and could still play optimally against Min, even if Min is not rational. To do so, Max needs just three rules of the form "If there have been ____ stones already chosen (and the stones already chosen were ____), then choose a ____ stone." Write those three rules in that form.

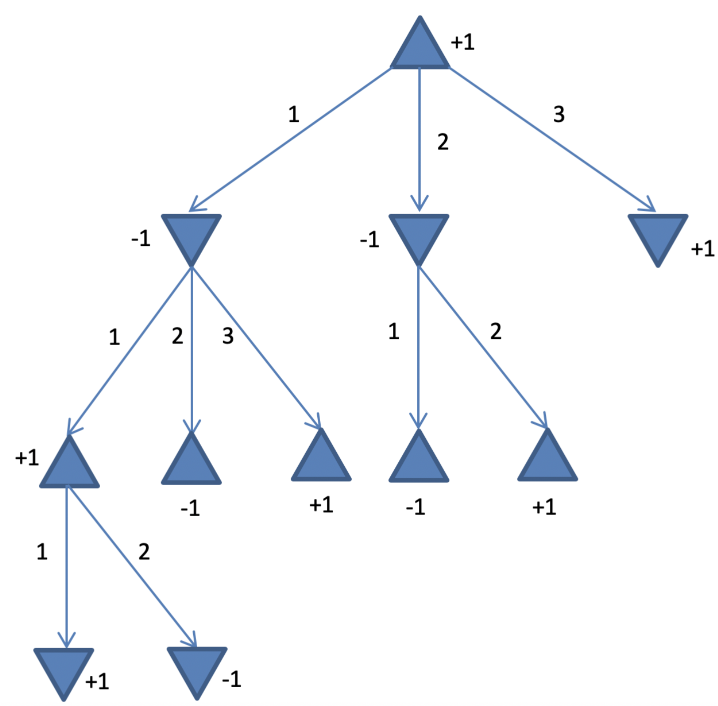
Solution:

- If there have been zero stones already chosen, then choose a Red stone.
- If there have been two stones already chosen (and the stones already chosen were R,B), then choose a Red stone.
- If there have been two stones already chosen (and the stones already chosen were R,R), then choose a Blue stone.

Question 3

There are four matches on the table. Two players, MAX and MIN, take turns, with MAX going first. At each turn, the player can take no less than one and no more than three matches from the table. The player who takes the last match loses. The utility for MAX of winning is +1, and losing is -1.

(a) Draw the game tree. Annotate each move by how many matches it takes. You can treat each node where the current player doesn't have a choice of moves as a terminal node. Write the utility (for MAX) next to every terminal node. Write the minimax value of every nonterminal node next to it.



Solution:

(b) What will be the sequence of moves in the game if both players play optimally?

Solution: MAX takes three matches, MIN loses.