

Introduction to Logic Programming – WS 2023 Exercise Sheet 10

1 Exercises

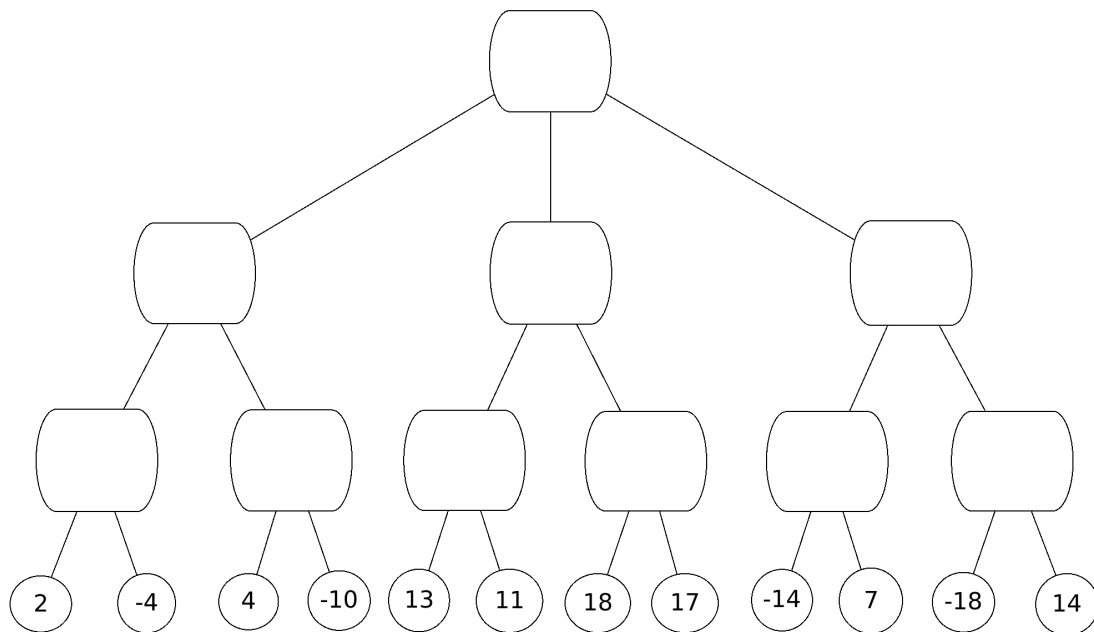
Exercise 1 (Lecture – Inverted Classroom)

Watch the lecture videos *18 AlphaBeta*¹ and *19 Prolog Accumulators*² in the HHU Mediathek.
 The corresponding slides are uploaded in ILIAS: 10_Minimax.pdf, 11_PracticalProlog.pdf

The complete playlist is available at: <https://mediathek.hhu.de/playlist/691>.

Note: you have to log in with your HHU account (Uni-Kennung) to see the lecture videos!

The exercises will be discussed on 9th January 2024.



Exercise 2 (Minimax with Alpha-Beta Pruning)

Apply the minimax algorithm with alpha-beta pruning to the game tree also starting with the maximising player. State all computed values (the final value v as well as α and β) for all *visited* nodes and highlight the best possible next move for the maximising player.

¹<https://mediathek.hhu.de/watch/373d0d6e-bbd7-4cd7-a6c1-27bcadf35adb>

²<https://mediathek.hhu.de/watch/7abd6b9e-58c3-4b53-9c31-3c6150a307bd>

Mark possible alpha- or beta-cuts by crossing out a corresponding edge in the game tree.

Label each level of the game tree with the player who is currently at turn.

Exercise 3 (Minimax - Implementation)

Implement a bot opponent for *number scrabble* using the Minimax algorithm. The game works as follows:

- There are two players.
- The players take turns by selecting a number ≥ 1 and ≤ 9 .
- A selected number is removed from the list of numbers to choose from.
- If the numbers selected by a player add up to 15, the player wins.
- If none of the players can reach the total of 15 anymore, the game ends in a draw.

The main goal of this task is the implementation of the minimax algorithm. We thus provide an implementation of the game logic where you just have to implement the minimax algorithm to select the best number for the bot opponent. You don't have to implement alpha-beta pruning here.