CSE 4082 – Project 2

(Due 23.01.2021 at 23:59, electronic submission only, to cse.cse482@gmail.com)

In this project, you are going to implement the Connect-Four game and an AI player for this game.

"Connect-Four is a tic-tac-toe-like two-player game in which players alternately place pieces on a vertical board 7 columns across and 6 rows high. Each player uses pieces of a particular color (commonly black and red, or sometimes yellow and red), and the object is to be the first to obtain four pieces in a horizontal, vertical, or diagonal line. Because the board is vertical, pieces inserted in a given column always drop to the lowest unoccupied row of that column. As soon as a column contains 6 pieces, it is full, and no other piece can be placed in the column.

Both players begin with 21 identical pieces, and the first player to achieve a line of four connected pieces wins the game. If all 42 men are played and no player has places four pieces in a row, the game is drawn." [1]

You should implement a fully functioning game (text-based interface can be used) that can be played by:

- a human player vs a human player,
- a human player vs the AI player,
- AI player vs AI player.

For the AI player, you are required to implement minimax or negamax algorithm. You should also provide three evaluation (heuristic) methods h_1, h_2, and h_3. The complexity of AI player should be configurable (number of plies, i.e., depth of the tree, and the evaluation heuristic to be used).

Details of the project will be discussed in the class.

Notes:

a. The project should be done in groups of two. If you want to work in groups of three, you should also implement alpha-beta pruning.

b. You should also submit a design document describing the classes (fields and methods) used in the project. The document should also contain the description of the evaluation methods.

c. Report the maximum ply number that can be achieved along with the maximum time required to find the best move. If you implement alpha-beta pruning, also indicate this in the report.

d. You are not allowed to use any source code available.

e. You should record a video for the following plays (compress the videos if necessary):
    i. AI player using h1 vs AI player using h2 (using the maximum ply possible for each player).
    ii. AI player using h2 vs AI player using h3 (using the maximum ply possible for each player).
    iii. AI player using h1 vs AI player using h3 (using the maximum ply possible for each player).
    iv. Human Player vs the Best AI Player Configuration

f. Do not submit any executable file (your e-mail may return back!) Submit only source code and design document (with outputs).

References:

[1] Wolfram MathWorld, Connect-Four, https://mathworld.wolfram.com/Connect-Four.html. Accessed on Jan 2021.