CSE 4082 – Project 3

(Due 12.01.2024 at 23:59, electronic submission only, to cse.cse482@gmail.com)

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

The following description is obtained from [1]:

“Before play begins, a square grid of at least 3×3 squares in size is drawn. Players take turns to add either an "S" or an "O" to any square, with no requirement to use the same letter each turn. The object of the game is for each player to attempt to create the straight sequence S-O-S among connected squares (either diagonally, horizontally, or vertically), and to create as many such sequences as they can. If a player succeeds in creating an SOS, that player immediately takes another turn, and continues to do so until no SOS can be created on their turn. Otherwise turns alternate between players after each move.

Keeping track of who made which SOSs can be done by, e.g., one player circling their SOSs and the other player drawing a line through theirs. Once the grid has been filled up, the winner is the player who made the most SOSs. If the grid is filled up and the number of SOSs for each player is the same, then the game is a draw.”

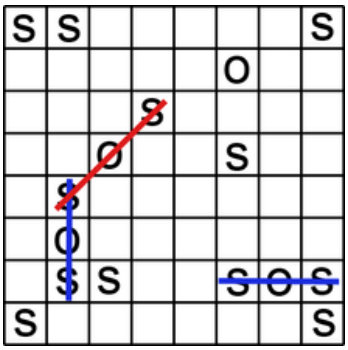

Figure 1: An example board state.

In this project, you will implement a modified version of the game in which:

- you will use 5x5 board with initial “S” symbols on the corners;
- when a player creates an SOS, he/she cannot play further and the turn alternates.

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 with alpha-beta pruning with a tree of 4-ply. You should also provide two evaluation (heuristic) methods h_1, and h_2.

Details of the project will be discussed in the class.

Notes:

a. The project should be done in groups of two or three.

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

c. Report the maximum time required to find the best move.

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. Human Player vs the Best AI Player Configuration

f. Do not submit any executable files. Submit only source code and design document (with outputs).

References:

[1] SOS (game), Wikipedia, https://en.wikipedia.org/wiki/SOS_(game). Accessed in Dec 2023.