CS370 Project

Names:

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PRINCE SULTAN UNIVERSITY- SEMESTER 171

a. How you have implemented a node (the class or data type).

A node consists of a Connect Four board . The board is an instance of the Game class, which contains board size, number of tokens, and whose player's turn.

b. Brief description of the role of each student in the project.

Initial Game implementation was done collaboratively between the 2 students. While the implementation of the heuristic function and the Minimax with Alpha Beta pruning was done individually, and the more efficient implementation was chosen in the final configuration.

c. Analysis of time complexity:

Average Time Per Step

Depth	Minimax	Alpha_Beta
4 (Naive estimation)	Instantaneous - 800ms	Instantaneous - 400ms
5	12000 ms	4000 ms
6	1min -2 min	15 s
7	10 min -30 min	1 min-5min
8	2 hrs	8 min

- Both Minimax and AlphaBeta use same evaluation function **focused_evaluate**

Basic_evaluate Vs Better_Evaluate

Depth	Basic_evaluate	Better_Evaluate
Iterative_Deepening	Lost	Won
Depth = 4	Lost	Won
Depth = 6	Lost	Won

d. Are there any major problems/difficulties you have encountered?

Some of the difficulties we encountered were finding a good heuristic for solving the game, and handling deeper depths for the search tree.

e. What are the main bugs/limitations in your code?

The main limitation is the time complexity. As the depth increases, number of boards to analyze will increase, which will lead to more time spent on analyzing the boards.

f. Any other comments. E.g. what did you learn from the assignment? How was it beneficial? Did you enjoy implementing the game solver?

Solving the assignment helped us in enriching our understanding of minimax and alpha-beta pruning, and brought our attention to details we haven't noticed by only learning the algorithm. It was enjoyable, and challenging at times, but most importantly, at the end it was very rewarding and fulfilling.