AI Final Project Proposal

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Problem: Plan to write an agent to play the game of "gomoku" also known as/similar to "connect five" to win. It is interesting to see how the various agents which consider different methods(algorithms) perform in the game.

Approach: I plan to implement multiple agents which use different algorithms like mini-max and alpha beta. I also plan on using more than one heuristic functions(utility functions) which will be used for various agents. As of now, I am thinking of awarding points based on how beneficial a state is from the playing side's point of view. I plan on considering the number of advantages we have(like 4 in a row, 3 in a row plus 2 open ends etc) and also simultaneously include the opponent's pieces dynamics as well and award negative score to those situations. Finally sum both and get the utility score. However I still haven't decided the exact situations to consider and also the point mechanisms. I might use weights as well to normalize but keeping options open at this point of time. Utility function is not set in stone at this point of time.

Software: I plan on coding in python in Visual Studio Code IDE. Will refer to the structure in aima code available on github.

Preliminary Work: I have an understanding of the two algorithms widely used in the case of adversarial agents, minimax and alpha-beta pruning as I have implemented them to write agents to play the game, othello which is another adversarial game.

How will I evaluate: I plan on writing two agents just for evaluation purposes. One would be an agent that takes random moves. The other one would be an agent which operates based on an incomplete heuristic (It will maybe only look at advantages for the player and ignore the opponent player's pieces). All of our agents(minimax and alphabeta and the different heuristics) will be compared against these two agents and thus evaluated based on the performance variations.

Timeframe:
 I plan on setting up and implementing the basic game environment first.-by Nov 19

Then I hope to complete the part of heuristics I want to achieve so that I can start observing how the agents work.-by Nov 28

Then I will implement all the algorithms completely and thus code all the agents and start pitching one against another.-by Dec 8

Final step is to record observations and fine-tune parts of the functions and code to improve the final output.-by Dec 17

References:I have included some references which I will refer to or keep in mind when implementing parts of the project. {*Followed Chicago format in Google Scholars*}

Wang, Yuan. "Mastering the game of Gomoku without human knowledge." (2018).

Nasa, Rijul, Rishabh Didwania, Shubhranil Maji, and Vipul Kumar. "Alpha-beta pruning in mini-max algorithm–an optimized approach for a connect-4 game." *Int. Res. J. Eng. Technol* (2018): 1637-1641.

https://github.com/aimacode/aima-python/blob/master/games.py

NOTE: I am sorry if I haven't maintained proper format, please do let me know the improvements needed to be made. Looking forward to your feedback Professor so based on that I can build on it.

Also, all the time periods in timeframes are tentative and might be subject to changes when actually implemented.

I might leave early for the semester break (on Dec 19) therefore I hope my project can be reviewed like the latest by Dec 18. *Thank You*.