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CS 4200 - Artificial Intelligence
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Project 3 Report

Alpha-Beta Pruning and A 8x8 Tic-Tac-Toe Game

Approach

This was a difficult project because it took a very long time to play around with the different weights that certain situations would have. Sometimes it would be too defensive and not take easy wins for itself, and other times the AI would simply be too aggressive and think that it could build up to a win even if I already had three in a row. Very frustrating over all but I eventually found the perfect settings. I set the max depth to 7 plies with five seconds of thinking time. I weighed three in a row patterns and four in a row patterns much more heavily than one in a row or two in a row. It should be noted that by in a row I simply mean in a pattern. So “X-XX” would count as three in a row.

To come up with the evaluation function I thought about what the different important states were to catch. First I found all possible four in a row combinations (excluding combinations with blank spaces), then I added up a score based on those combinationsI found that you would be able to easily win easily by creating a pattern of OO-O, so i decided to weight this pattern for the human specifically as 95% of the cost of the human having four in a row. Another thing that I kept in mind was the bonus

for central control which only weighed a miniscule amount compared to the other weights. Something that I'm thinking of now that I write this is that by ignoring the blank patterns in states, I am most likely favoring clumping in the algorithm. This might not be the best idea and might lead to common draws. The alpha beta pruning algorithm was straightforward to implement, just by keeping track of the overall alpha beta values and breaking the look if beta was lower than alpha.

Fun project to tweak and get right. The only round I've included of a **human winnin** is from when the algorithm is really bad. I couldn't win otherwise!