Artificial Intelligence

COSC1127

Assignment 2

Report

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My agent uses the supplied minimax as the decision rule for the Connect 4 Artificial Intelligence assignment. The Minimax works in a way that it identifies the max and min value of the moves that is defined for the players. The Max value would be the one in favour to achieving the best outcome of winning. The Min value is the least favourable move that will give the enemy the best advantage and put the maximising player in a disadvantage.

The current depth can be switched between 2 and 3, where 3 would cause further delay but would search further recursively. The way the heuristic that I’ve implemented works is that it would run through 2 loops which will be row and column. In running through the row and column of the board, it will add value to the heuristic value for every combo or pieces in a row. The way it was defined is two pieces in a row would give additional 10 value except for horizontal which gives 11 as it is more advantageous to start off in the beginning, three pieces in a row would give 50 and four pieces in a row (game winning move) would give additional 5000. This remained the same for horizontal, vertical, positive diagonal and negative diagonal directions. The same was true for the enemy’s agent, where two pieces in a row for them would decrease the heuristic value by 10, three pieces in a row by 50 and four pieces in a row by 5000. This way, as the minimax searches through the depth, it would have to pick the most favourable choice for itself(max).

Another feature that was implemented was if the agent was player 2 meaning the 2nd player to make a move, I added similarly to the above but instead there are certain checks. It would be an additional in decreasing the value as it calculates the enemy players moves again. However, this time it checks for empty spaces from the combos of the enemy. What I mean by this is let’s say there is an empty on either side of a 2 combo of the enemy’s pieces, it will decrease by an additional 50 points. If there are three pieces in a row/combo and there is an empty space on either side, decrease the value of the evaluation by 800. In doing this, it will give priority to blocking the enemy that has their pieces in a row on the board.

There are several problems with this agent. First one is the optimal strategy of the connect four for the first player is to place a piece in the middle. This agent does not achieve that and therefore tends to be at a disadvantage as the first player. In addition to this, the agent does not play defensively very well when it is the first player. Also, this agent isn’t the very best at defending. This is because after it does defend against a four in a row, it will proceed to vertically place pieces on top even if the enemy blocks it. This is due to the calculation of the pieces in a combo without empty spaces and may be the reason it continuously places the pieces on top of the column until it reaches the very top.

However, this is decent at purely blocking the enemy from winning. It does not lose to Monte Carlo Agent as much and rarely loses to Random Agent.