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# Four in a Line Project Report

For this project we had to make a connect four kind of game called Four in a Line. Unlike connect four, this game does not count diagonals for wins. Only four moves that are connected in a line while in  horizontal row or vertical column results in a win. The player is going up against an AI opponent that is using alpha beta pruning to come up with solutions against the players moves. It can go through almost all possibilities for moves and determine the best course of action for the current state of the board. The time is no greater than 30 seconds. So that means the program will run for 30 seconds to determine the best course of action if the user decides to give it that much time. Obviously the less time, the better for the user. If all the spots in a 8x8 matrix are used, means that no one wins and there is a draw.

The algorithm that the program uses to “think” about the best move possible is alpha beta pruning. The algorithm uses a minimax algorithm which basically eliminates moves that don't contribute to the optimal goal. It is a smart way to play compared to how a regular human would under the same time. A computer can calculate more possible good moves compared to a human could. The alpha beta algorithm uses iterative deepening so it looks at the shallowest nodes first before going deeper into the tree. So it basically looks right by where the user put its last move and then spreads out into where it would place a move on the matrix. I have getMax and a getMin method grabs the minimum and max values at a given iteration depth of the current run

through. It does this for as long as it can “think” then returns the best value for either “min” or “max”. After thinking its done, it sees if the move results in a win solution.  Win solution is checked by seeing if there is any player moves or AI moves that are in a row or a column.

Almost always, the AI wins. It doesn't matter if the player goes first or not. The player is always in an uphill battle. The ai will constantly try to combat the player’s move unless there is a clear win in favor of the AI. The computer mind is way better than a human mind when  it only has one thing to do.