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Research Proposal

For our research project, we have decided to implement an AI for playing the game Connect Four. We feel that this project will provide us with a chance to explore many of the concepts that we have been learning in the classroom. While the game itself has been strongly solved, we believe that this topic will provide a good starting point for developing an AI that we can complete within the allotted time frame.

The game of Connect Four can be classified as a zero-sum game and as such it will provide a good opportunity to apply several strategies we have learned such as state-space searches, minimax and alpha-beta pruning techniques, and heuristics functions. While the original board size of 7 columns by 6 rows is trivially solvable on today's computer, we would like to explore using larger board sizes as well as possibly using variations of the game such as Pop Out and Power Up. With the Pop Out variation, a player can use a turn to remove one of their discs if it is the bottom disc in a column. With the Power Up variation, each player is given one "Power Piece" which can be used to clear an entire column leaving the "Power Piece" as the bottom disc in the column.

We have also discussed the possibility of using some form of the genetic algorithm technique to generate a more powerful search heuristic for our project. It would also be interesting to develop several different AIs for the game and perform testing to see which AI would perform the best over a given number of games played. We also think it will possible to create different skill levels for the AIs so that a human player can choose the difficulty level when playing against the computer.

In the interest of time and to be able to better visualize the game board, we have decided to use the Java programming language to implement the AI. We both have had substantially more experience using Java than we have had using Prolog. Working together, I believe we will have the time needed to complete the project proposed in this document.