Khulna University of Engineering & Technology

Department of Computer Science and Engineering

CSE 4110: Artificial Intelligence Laboratory

AI Based Two Player Game: Chip Star

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1 Objective

The objective of this project is to:

- Build a two player game named 'Chip Star' where one player would be human and other would be computer/AI.
- Build an AI that performs the role of a player in the game.
- Generate the game using PYTHON 3 and check the outcome through simulation.
- Gather knowledge about Minimax and Alpha Beta Pruning algorithms.

2 Introduction

The backtracking algorithm utilized in decision making, game theory, and artificial intelligence(AI) is known as the min max algorithm in AI . It is used to determine a player's best move, given that the opponent is also playing well. Popular two-player computer or online games like Chess, Tic-Tac-Toe, Checkers, Go, etc. also use this algorithm. A backtracking algorithm is used to find a solution to computing issues by slowly building a candidate towards a solution, one step at a time. And any candidate who does not finish a solution is promptly dropped. The algorithm is broken down to show how a decision to make the best move is made based on the players' actions and countermoves. The algorithm's properties are then listed.

3 MiniMax Algorithm

There are two participants in the AI min max algorithm: Maximiser and Minimiser. Both of these players compete in the game, with one attempting to achieve the highest score or maximum benefit and the other attempting to achieve the lowest score or minimum benefit.

Because each game board includes an assessment score, the Maximiser will choose the highest value, while the Minimiser will choose the lowest value with counter movements. When the Maximiser has the upper hand, the board score will be positive, but when the Minimiser has the upper hand, the board score will be negative.

This is based on the concept of a zero-sum game, in which the total utility score is distributed equally between the two players. As a result, a rise in one player's score causes a decrease in the score of the opponent, resulting in a total score of zero. As a result, in order for one player to win, the other must lose.

4 Alpha Beta Prunning

A search algorithm known as alpha–beta pruning. It seeks to reduce the number of vertices in its search tree that are assessed by the minimax method. It's most typically used for two-player games played on a computer. When at least one alternative has been uncovered that indicates the move is worse than a previously investigated move, it clips a group of moves. Because these moves don't need to be reviewed any further. When applied to a regular minimax tree, this Alpha–beta pruning prunes away branches that have no influence on the ultimate decision, but returns the same move as minimax. In other words, it boosts productivity. The benefit of alpha–beta pruning is that it allows you to remove branches from the search tree. This way, the search time can be reduced to the'more promising' subtree while also performing a deeper search. It belongs to the branch and bound class of algorithms, just like its predecessor. If the nodes are examined in an optimal or near optimal order (best choice for side on move ordered first at each node), the optimization reduces the effective depth to slightly more than half that of simple minimax.

5 Chip Star Game

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6 Discussion

A two-player game called 'Chip Star Game' has been built with PYTHON program through this project, with one player being a person and the other being a computer/AI. For this reason, an AI has been created that plays the role of a player in

the game using Minimax and Alpha Beta Pruning algorithms. Simulated versions of the game and its outcome have been tested multiple times. The AI's performance was also examined in order to verify the knowledge gained. Each step has been shown in the console for seamless game play. As a result, gaming has been used to implement and test the project.

7 Conclusion

We may say that the game 'Chip Star Game' has a well-developed AI that competes with the user and plays to win. The game was created and constructed to be played by a human and an AI, with the AI's performance ensuring the game's average difficulty level. To put it another way, we tried to make this game as simple and pleasant as possible for players.