The BRITISH UNIVERSITY IN EGYPT

Logic and Artificial Intelligence

23CSCI05I

Dr. Amr S. Ghoneim

Mohamed Khairi – 224483 – A3

Abdelrahman Gamal – 227998 – A3

Karim Yasser – 206703 – A2

i. Introduction:

In this project of python game we plan to design a cubic player game mainly using minimax algorithm as when the human player selects a cell and draws “O”, then Ai uses the minimax which this algorithm uses heuristic and alpha beta to find the best next move to get the advantage over the human player. Let’s make thing clearer, the facts of the Minimax principle are that it should increase the player’s probability of winning and then reduce the possibility of the opponent doing the same based on all the possible actions that can be taken in the future. The program does this by going through the game tree in a recursive manner to determine the utility of each move. This is realized by giving up and compromise on the utility of the player at each level of the tree and that of the opponent maximized by the technique. Furthermore, the heuristic evaluation function permits the AI player a choice between the move that is more likely to win or another that would possibly lead to a loss. It enables the algorithm to make the right move by this method. Heuristic search can be used for quick decision making which in turns may help to speed up fast paced games in real time. In the final, the Alpha-Beta algorithm we integrated into the minimax algorithm to boost its performance by reducing computational complexity, increasing the decision-making efficiency, and resulting in an entertaining gaming experience.

ii. Methodolgy:

Minimax Algorithm:

We are designed minimax algorithm for the cubic game for Ai player that stares at the game tree looking for the most successful moves to beat human player.

Alpha-Beta Pruning:

This is a part of the computational algorithm that is implemented/integrated into minimax to improve its efficiency. It then compress the superfluous steps into relatively smaller move space and leave the path for accurate call-to-action only.

Heuristic Function:

We build a heuristic function special to cubic game, which can contain a sufficiently quick overview of the current position on the game board. The Heuristic Factors allows the detection of spatial patterns and positions that are conducive to win.

Graphical User Interface Development (GUI):

We have created a GUI for the cubic player (Ai and Human). GUI allows the user to execute moves instantaneously on a 4x4x4 grid cube and returns clear feedback on the Ai player.

iii. Results:

The player begins the Cubic Tic Tac Toe 4x4x4 game and will experience a well-dyed or graphically structured grid of buttons in the graphic user interface, similar to the cubic tic tac toe table.
Desired to go the player hits the button of their move, then the image of it change to the symbol of their mark (O).
It now stands players' turn. Ai presses board button printed with a symbol 'X'.
The player always provides a description of the depicted strategies that will allow for making a pattern above the cubic tray.
Successfully play the game to win and in meantime, Ai learn from player to finally resolve all the difficulties.
The participant is delightful to observe that playing the game is easy, while he comprehends that learning the reacting moves of the Ai will help him to be the winner.

iv. Conclusion:

The project was executed successfully implemented cubic Tic Tac Toe game 4x4x4 with Human player and Ai player implemented using the Minimax algorithm with Alpha-Beta pruning to increase efficiency. AI uses a uniquely constructed heuristic function to assess game board situation and make wise steps/moves. The GUI user interface allow easy navigation for each the either human or Ai players.