ARK Task Round Documentation

Advance Tasks

Task 4.2 3D Tic Tac Toe Agent

I. Introduction

In this task we had to use minimax algorithm to create an agent to play the 2D tic tac toe game.

So, you had to design a tic tac toe game that would be player vs AI. To do this task I have used the help of minimax algorithm and called it recursively to find out the best possible move.

II. Problem statement

In the first part of the task, you had to create a program that plays 2D tic tac toe game with the user. The AI has to evaluate the best possible move at each step and play accordingly. For example, in chess you play with the laptop or you have chess engines like stockfish that help you analyse the game. Similarly, you had to do to play a 2D tic tac toe game.

In the second part of the question, you had to create a 3D tic tac toe game using gym tic tac toe environment. You had to use minimax algorithm and try to optimise it. You could also use genetic algorithms. The search space would be much larger our here.

III Related Work

Mostly I had tried to use the minimax algorithm, iterations, recursion to solve the 2D tic tac toe problem. I had broken down the code into functions to help check the number of moves on the board, if there were any empty boxes and to check if someone have won. There was another function to find the best possible move using minimax algorithm.

IV Initial Attempts

Initially what I had tried to do was implement the code using an already defined easy matrix, as in the one in which either ‘X’ or ‘O’ has already won or is in the position of just winning. Later on, I tried to implement it in smaller defined matrixes.

I really was not able to have a fully functional algorithm.

V. Final Approach

Here is the code for what I had tried to implement.

The code tells us the best possible move at that time and returns 0 if it is a draw, 10 if maximizer wins and –10 if minimizer wins.

VI. Results and Observation

The algorithm that I have tried to use is not 100% accurate and still has to improve on. Like for example when you could use a trick like to get double wins in the next play whatever the opponent plays, is something that I could not implement. Also, if there are a smaller number of entries the code goes a bit haywy and does not display the correct output.

VII. Future Work

The code could be worked upon several areas like firstly upon how to play trick moves, or how to play your moves in such a way that you do not fall into an opponent’s trap. It also be improved upon how to decide what to play as the first move depending upon what the minimizer plays as the first move.

Conclusion

The overall problem was about implementing minimax and genetic algorithm, using gym tic tac toe environment and about creating an algorithm to have a 2D tic tac toe and a 3D tic tac toe player vs AI.