EAI 320

Practical Assignment 4

16 March 2016

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Problem

Tic tac toe (noughts and crosses) is a zero-sum two player game where each player takes turns marking spaces in a 3×3 grid. One player marks spaces with an 'X', the other player marks spaces with a 'O'. The player who succeeds in placing three of their marks in a horizontal, vertical or diagonal row wins the game. For this game, there are $3^9 = 19683$ possible board layouts (3 possible marks, X, O or empty and 9 possible spaces). There are $9! = 362880$ possible games, which is the size of the game tree.

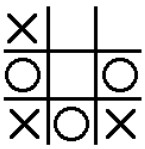
Question 1

a. Write a python program that implements the alpha-beta search algorithm for any given game. The algorithm should allow for a generic game class to be passed to it. The game class should contain methods as described in section 5.1, page 162 of the prescribed book. The alpha-beta search algorithm should interact with these methods.

b. Create a game class for the tic tac toe game.

Question 2

Consider the game state as illustrated in the below image. Use the software created for question 1 to find the optimal move for player X. Illustrate the search by drawing the game tree with the nodes that the alpha-beta algorithm evaluates. Show the terminal state values at the leaf nodes.



Question 3

Extend the program implemented for question 1 to create a tic tac toe computer game. The game must allow for a computer user to play against the AI agent created for question 1. The user can begin the game by specifying the first move or telling the agent to make the first move. The game is continued until a win, lose or draw results. The user should enter their moves through a command line interface (or graphical user interface if you prefer). As in question 1, AI agent must use the alpha-beta algorithm to compute its next move. Document resulting game states for a 'user wins', 'AI wins' and a tie.

Deliverables

- Write a technical report on your finding for this assignment.
- Include your code in the digital submission as an appendix, but leave it out for the hardcopy submission.

Instructions

- All reports must be in PDF format and be named report.pdf.
- Place the software in a folder called SOFTWARE and the report in a folder called REPORT.
- Add the folders to a zip-archive and name it EAI320_prac1_studnr.zip.
- All reports and simulation software must be e-mailed to *EAI320.UP@gmail.com* no later than 16:00 on 23 March 2016. No late submissions will be accepted.
- Place a hard copy of your report in the box in front of Eng 3 7-25 before the deadline.
- Submit your report online on ClickUP using the TurnItIn link.

Additional Instructions

- Do not copy! The copier and the copyee (of software and/or documentation) will receive zero for both the software and the documentation. Z-e-r-o.
- For any questions of appointments email me at *EAI320.UP@gmail.com*
- Make sure that you discuss the results that are obtained. This is a large part of writing a technical report.

Marking

Your report will be marked as follow:

- 60% will be awarded for the full implementation of the practical and the subsequent results in the report. For partially completed practicals, marks will be awarded as seen fit by the marker.
- 40% will be awarded for the overall report. This includes everything from the report structure, grammar and discussion of results. The discussion will be the bulk of the marks awarded.