DA 221: Introduction to Artificial Intelligence
January - May 2024

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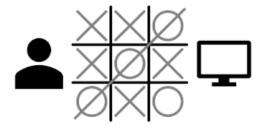
Lab: Assignment 2
(To be Completed in 03 Lab Classes)

Due: Feb 15, 2024
Max Marks: 25

Experimenting with Minimax and Alpha-Beta Pruning

1. This **assignment is based on *experimenting* with two-player, zero-sum game of Tic-Tac-Toe**.
2. You may write your own code for the Minimax Algorithm with and without alpha-beta pruning.
3. The board state must be displayed after each move and a message to indicate which of the two (computer vs. human player) has won the game must be displayed.
4. Need to have possibility of recording the experimental parameters of interest as detailed below.
5. You must cite any kind of help from elsewhere. Each algorithm should be run on the same set of problems for the comparison to be fair.

Q1. Minimax Algorithm

Write an adversarial search i.e., the Minimax algorithm for an agent to play 3 x 3 Tic-Tac-Toe.

A human player should be able to play against the agent you create. Your code should be able to run the algorithm for an arbitrary depth and score your nodes with the static evaluation function discussed in the Class.

Note that the code will be evaluated on whether it explores the correct number of game states and back-up the correct values.

Q2. Alpha-Beta Pruning

Create an advanced version of the above program. Optimize the adversarial search to more efficiently explore the minimax tree through alpha-beta pruning.

The code needs to explore the correct number of states in the correct order; and perform alpha-beta pruning without reordering children.

Submission Guidelines

- You are expected to present the **SOURCE-CODE together with a README** file to compile and run your code during the scheduled Lab Classes.
- You need to submit **PROGRAM OUTPUT for two SAMPLE SOLUTIONS**. For this your program should output each step from the initial to the final state. This is NOT part of the REPORT below.
- A **REPORT** (maximum **ONE A4-Page**) detailing discussion on **EVALUTION OF ALPHA-BETA** is to be submitted. The analysis together with justification is to be presented for figuring out the gain using pruning.