

CS 335: Search in Games

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March 10, 2021

1 TASK

Answer the following questions in order:

- Consider the following board for a two player game (A and B) in its starting position:

1	A		
2			
3			B

Rules: Player A moves first. The two players take turns moving, and each player must move his token vertically or horizontally to an open adjacent space. A player can only move to one open space at a time, and cannot move to an occupied space. The game ends when one player reaches any space on the opposite side of the board –i.e player A gets to any space in row 3, or player B gets to any space in row 1, or when both players have played twice. The scoring is the Manhattan distance from B to the closest space on the opposite side (row) minus the Manhattan distance from A to the closest space on its opposite side (row)¹, or $Manhattan(B, Goal) - Manhattan(A, Goal)$. See some examples in the next section.

- Draw the complete game tree using the following conventions: (30pts)
 - * Draw the grid corresponding to each state
 - * Put each terminal state in a square box and write its game value in a circle
 - * Put loop states (states that already appear on the path to the root) in double square boxes.
- Now, mark each node with its backed-up minimax value (in a circle)(10pts)
- If the game were to continue until one player reaches the other side, explain how the game tree would be modified and how the standard minimax algorithm would fail on this game tree (15pts)
- Which of the following are true and which are false? Give brief explanations:
 - In a fully observable, turn taking, zero sum game between two perfectly rational players, it does not help the first player to know what strategy the second player is using –that is, what move the second player will make, given the first player’s move.(15 pts)

¹The Manhattan distance is the minimum number of spaces that a player would have to move to get to a space on the opposite side

- In a partially observable, turn taking, zero sum game between two perfectly rational players, it does not help the first player to know what move the second player will make, given the first player's move.(15 pts)
- A perfectly rational backgammon agent never loses.(15 pts)

2 EXAMPLES

Example 1: If the game ended like so:

1			
2		A	
3	B		

The Manhattan distance between A and its goal is 1, and between B and the goal is

2. The score of the game is $Manhattan(B, Goal) - Manhattan(A, Goal) = 2 - 1 = 1$.

Example 2: If the game ended like so:

1			B
2		A	
3			

The Manhattan distance between A and its goal is 1, and between B and the goal is

0. The score of the game is $Manhattan(B, Goal) - Manhattan(A, Goal) = 0 - 1 = -1$.

3 MUST HAVE

Your work must comply with the following:

- Done in a computer, not by hand.
- Respect all conventions for states.
- Answers that are exactly as they are on the internet will have points deducted, unless you explain the reasoning and cite the source. That, is, simply copying a tree won't get you all the points.

Not complying with these will result in discounts.

4 SUBMIT

ONE PDF (not Word (docx), Pages, Libre Office, text, etc.) with all of your answers. If you are working on Word, to make a PDF you should select "Save As" from the "File" menu and select PDF on the filetype drop down box.