KTH Royal Institute of Technology

School of Electrical Engineering and Computer Science

Questions for Assignment 2

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Describe the possible states, initial state, transition function

Possible states: All possibilities how player A and B could have made their moves (where the crosses and circles are on the 3×3 board)

Initial state: An empty 3×3 board

Transition function: The function that maps each state to a set of states the are achievable after the move of one of the players. (in other words: how will the board look after either player A or player B made a move)

Describe the terminal states of both checkers and tic-tac-toe

For checkers: terminal states are a set of state which come follow from the following situation: one player won (which means that the other player lost). A winning state is state where only pieces of the winning player are on the field (between 1 and 12 pieces)

For tic-tac-toe: The game is finished when one player has won or when a tie was reached. A player has won if he managed to reach 3 pieces in a row (vertically, diagonally, and horizontally). A tie was reached when all fields are filled but no player could reach the goal of having three pieces in a row.

Why is $v(A, s)$ a valid heuristic function for checkers

The function $v(A, s) = \#(white - checkers) - \#(red - checkers)$ is a valid heuristic function because it somehow says how good it is for a player to be a state. The amount of red checkers in comparison to the white checkers says how many possible moves a player can make. In general, the more moves a player can make the better are its chances of winning because the proability for more powerful moves is greater. Therefore, a positive number for player A says that it has more checkers on the board, which increases its chances of winning.

When does v best approximate the utility function, and why

If s is a winning state, the heuristic function $v(A, s)$ approximates the utility function best because then a positive number always leads to a win of player A. (A winning state of player A means that only its checkers are on the field which leads to a positive number)

Can you provide an example of a state s where $v(A, s) > 0$ and B wins in the following turn

For example, s is a state where two white checkers and one red checker is on the field. If player A enters this state, it will be the turn of player B. If the the white checkers are aligned in a row and one free field in between them the red checker can jump over the first white checker and subsequently over the other white checker, which means that B has won.

Will η suffer from the same problem (referred to in the last question) as the evaluation function v

No, it will not suffer from this problem. Player A will detect that player B can reach a terminal state in which player B wins. Therefore, player A will not choose to make this move as described in the previous question.