CECS 451
Assignment 4
Total: 24 Points

General Instruction

- Submit a PDF file in the Assignment folder via Canvas (Not email)
- Simple reasoning is required, otherwise you will get half of the points

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1. True or False?
    a. (2 points) Assume that a rook can move on a chessboard one square at a time vertically or horizontally, but cannot jump over other pieces. Manhattan distance is an admissible heuristic for the problem of moving the rook from square A to square B in the smallest number of moves.
    b. (2 points) Genetic algorithm (GA) is equivalent to a random walk in search space because GA uses a random function.

2. The heuristic path algorithm is a best-first search in which the evaluation function is
$$f(n) = (2 - w)g(n) + wh(n)$$
(6 points) What kind of search does this perform for $\boldsymbol{w} = 0$, $\boldsymbol{w} = 1$, and $\boldsymbol{w} = 2$?

3. Is the algorithm guaranteed to converge to a solution?
    a. (2 points) Simulated annealing
    b. (2 points) A* algorithm

4. Imagine that, one of the friends wants to avoid the other. The problem then becomes a two-player pursuit–evasion game. We assume now that the players take turns moving. The game ends only when the players are on the same node; the terminal payoff to the pursuer is minus the total move taken. An example is shown in Figure 1.
    a. (2 points) What is the terminal payoff at the node (1)?
    b. (2 points) What are the positions of the two players at the node (2) and (2)'s children?
    c. (3 points) Can we assume the terminal payoff at the node (2) is less than −4? Answer yes or no, then explain your answers.
    d. (3 points) Assume the terminal payoff at the node (4) is less than −4. Do we need to expand node (5) and (6)? Answer yes or no, then explain your answers.

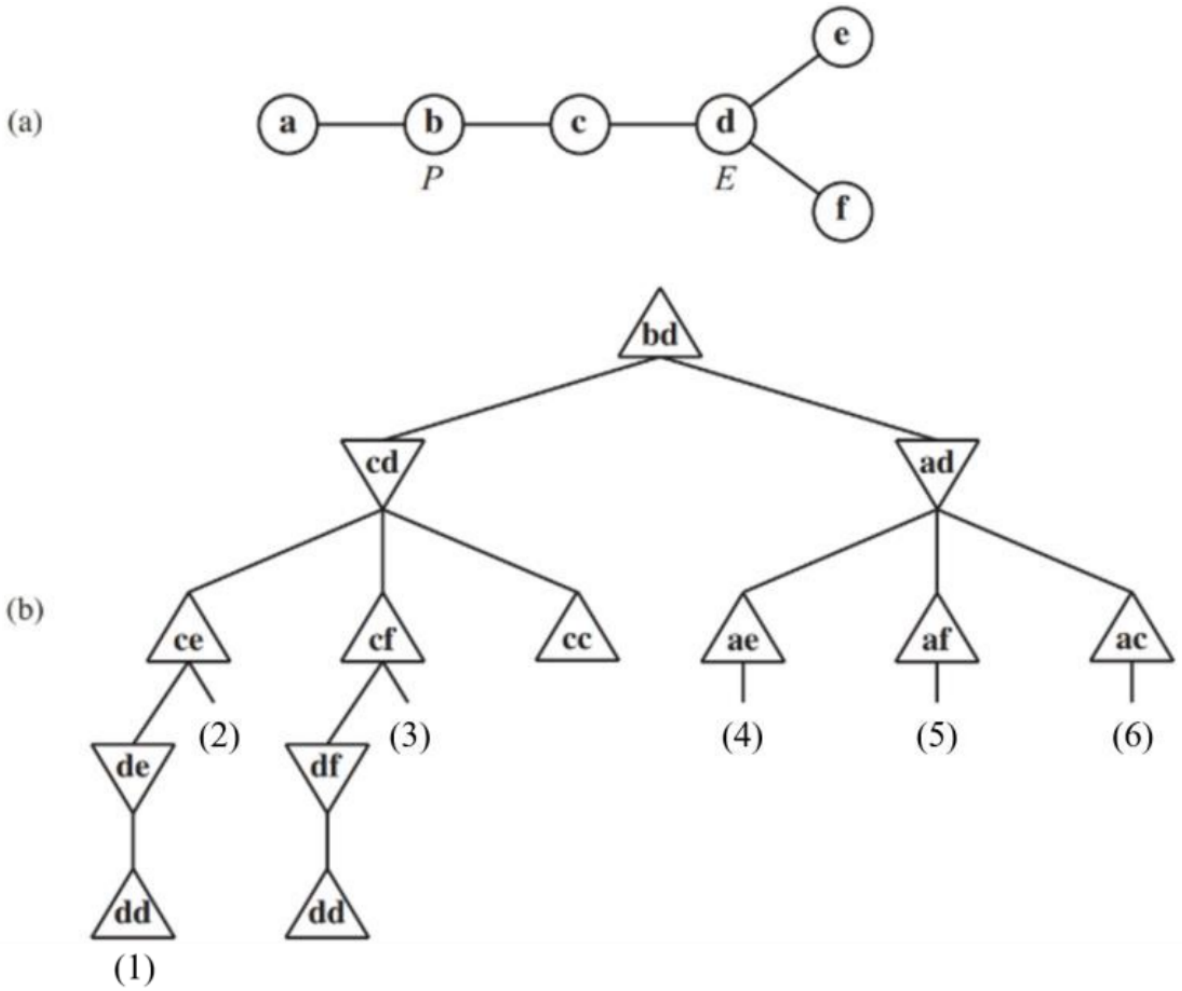

Figure 1: (a) A map where the cost of every edge is 1. Initially the pursuer P is at node b and the evader E is at node d. (b) A partial game tree for this map. Each node is labeled with the P, E positions. P moves first.