

CECS 451 Assignment 2

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February 9, 2022

1. True or False?
 - (a) Assume that a rook can move on a chessboard one square at a time in 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.
 - True. Since we can only move **one square at a time** in vertically or horizontally, Manhattan distance is an admissible heuristic.
 - (b) Genetic algorithm (GA) is equivalent to a random walk in search space because GA uses a random function.
 - True. Because genetic algorithm uses random function.
2. The heuristic path algorithm is a best-first search in which the evaluation function is $f(n) = (2 - w)g(n) + wh(n)$. What kind of search does this perform for $w = 0$, $w = 1$, and $w = 2$?
 - $w = 0$: $f(n) = (2 - 0)g(n) + 0h(n) = 2g(n)$. **Uniform Cost Search** (The constant 2 makes no difference)
 - $w = 1$: $f(n) = (2 - 1)g(n) + 1h(n) = g(n) + h(n)$. **A* Search** (Chapter 3 slide 15)
 - $w = 2$: $f(n) = (2 - 2)g(n) + 2h(n) = 2h(n)$. **Greedy Best-First Search** (The constant 2 makes no difference)
3. Is the algorithm guaranteed to converge to a solution?

(a) Simulated annealing

- Simulated annealing cannot be guaranteed to find the globally optimal solution, but it does usually produce a good solution. By allowing some "bad" move such as randomly restarting in limited space, the algorithm helps to escape local maxima and reach a solution.

(b) A* algorithm

- A* is guaranteed to give an optimal solution if it is an admissible heuristic, never overestimates the cost of reaching the goal.