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CECS 451 Assignment 2

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.

   False, A rook can move across the board in one move and Manhattan assumes the worst which means it will overestimate the optimal number of moves, therefore it is not an admissible heuristic.

   (b) (2 points) Genetic algorithm (GA) is equivalent to a random walk in search space because GA uses a random function.

   True, because there is a possibility that a random walk in search can find the answer as fast as GA can.

2. (6 points) 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	f(n)	Algorithm
w = 0	f(n) = 2g(n)	Uninformed best-first search
w = 1	f(n) = g(n) + h(n)	A* Search
w = 2	f(n) = 2h(n)	Greedy best-first search

3. Is the algorithm guaranteed to converge to a solution?

a. (2 points) Simulated annealing

   Simulated annealing algorithm picks the best move at random and if the move improves the situation, it is always accepted. Otherwise, the algorithm accepts the move with some probability less than 1. Therefore since it's so random and dependent on physical annealing we can't guarantee it converges to a solution.

b. (2 points) A* algorithm

   A* algorithm is an informed search which uses the formula $f(n) = g(n)+h(n)$ where $h(n)$ is the heuristic distance and $g(n)$ is the shortest distance. A* algorithm leverages its search tree by expanding a leaf node and adds its successors to the tree. Therefore, since A* is an informed search and assuming it uses a heuristic function with a goal equal to 0 then we can assume it will converge to a solution.