CECS 451 - Assignment 2

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1   Introduction

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.

      i. True because the rook would be able to get around a chess piece by choosing another optimal path with the fewest number of moves used.

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

      i. False because search space uses all adjacent positions to determine optimality while GA goes towards finding a maximum.

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?

   (a) w = 0
   $$f(n) = (2 - 0)g(n) + 0 * h(n)$$
   $$f(n) = 2g(n)$$
   Dijkstra Algorithm

   (b) w = 1
   $$f(n) = (2 - 1)g(n) + 1 * h(n)$$
   $$f(n) = g(n) + h(n)$$
   A* Search Algorithm

   (c) w = 2
   $$f(n) = (2 - 2)g(n) + 2 * h(n)$$
   $$f(n) = 2h(n)$$
   Greedy Search Algorithm

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

   (a) (2 points) Simulated annealing
      i. Simulated annealing is not guaranteed to converge to a solution because of how it allows "bad" moves to be made along with random restarts to find a global minimum. It changes the conditions in finding a global minimum which makes it unreliable in generating a solution.

   (b) (2 points) A* algorithm
      i. A* algorithm is guaranteed to converge to a solution because of how every move it takes is considered the best option. If a path is determined to be worse than another path, it can shift to that optimized path and repeat the algorithm again. The conditions are always the same which makes it less difficult to find a path.