CSC384 Spring 2015 assignment 1

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8-puzzle

(a) Which heuristic performs better, misplaced tiles or Manhattan distance. (One sentence).
Manhattan distance performs better as it can be seen experimentally from the graph below.

(b) Create a graph (up to 1/2 page) of the number of nodes explored by the Manhattan distance heuristic on the x-axis, and the number of nodes explored by the misplaced tiles heuristic on the y-axis. Put a point on this graph for each eightpuzzle problem solved from file eightpuzzle_tests.py. Can you say anything about the trend, i.e., as Manhattan distance has to explore more nodes how is the number of nodes explored by misplaced tiles growing? (1-2 sentences).

Figure 1: eight puzzle heuristics comparison
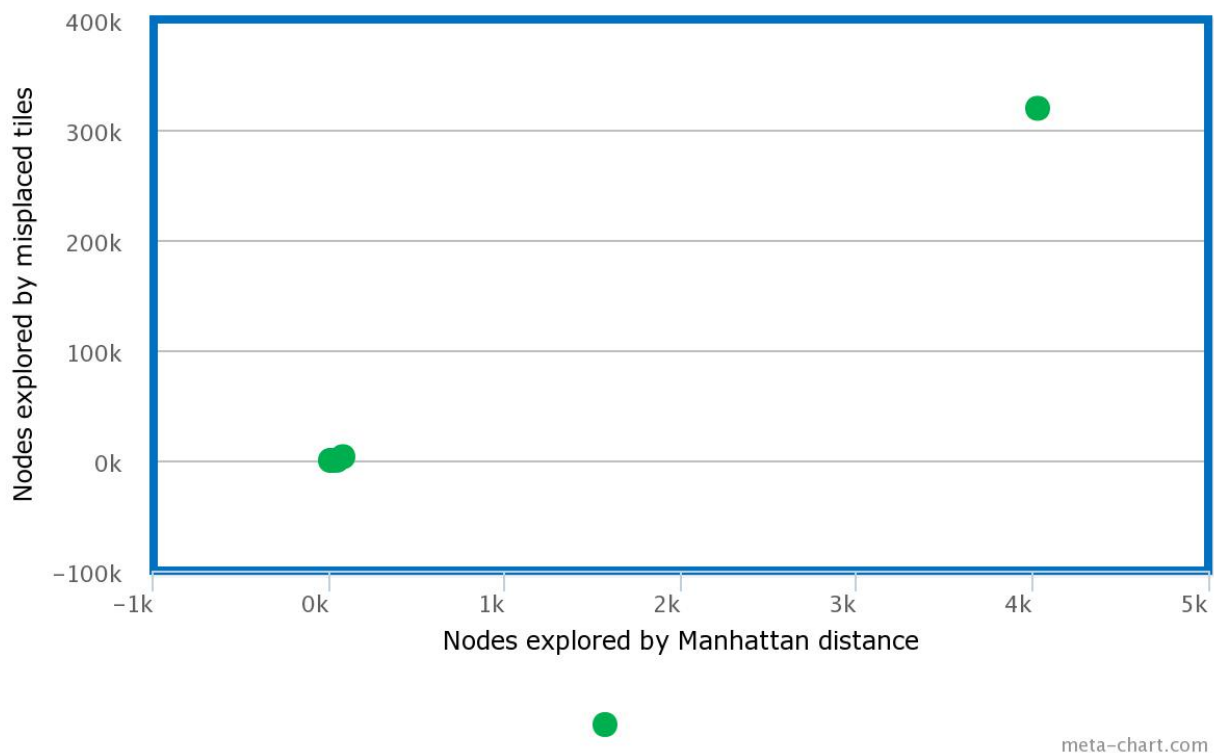
As Manhattan distance has to explore more nodes the number of nodes explored by misplaced tiles grows at a larger rate.

Courier domain

(a) For each of the two specified heuristics say if it is admissible or not (one sentence). What would the answer be if the courier is allowed to only carry one package at a time (one sentence).

(b) Does information from the location map have to be included in the hashable state? (1-2 sentences).
No, several states can have the same location map. The combination of jobs carried, the location, the time, the amount earned, and the jobs unstarted are sufficient to uniquely identify any two states.

(c) If part of the state can be computed from other parts (but is included for convenience) does it have to be part of the hashable state? (1 sentence).
No it does not because it is redundant to add it to the hashable state.

(d) Does stopping the courier from performing a pickup actions at a dropoff location for a jobs they are currently carrying affect (a) whether or not a solution exists and (b) the cost of the optimal solution? (1 sentence). Does blocking these pickup actions potentially make the search more efficient? (1 sentence).
Yes, it affects both. Yes, it does because you can potentially miss on earned revenue by choosing zero-cost pickup actions over deliver actions.

(e) If the courier is at some location, e.g., locA and there is an unstarted job that can be picked up at locA, is it always best for the courier to pick up up that job? (1-2 sentences).
Assuming no load constraints, it depends on the pickup time. If the job is available for pick up at the time of arrival at locA, then it is always best to pick up that job, but otherwise it is not necessarily best to pick up that job.

(f) Including the current time in the state limits the effectiveness of cycle checking—being at the same location carrying the same jobs, having earned the same money, and having the same set of unstarted jobs will not be a cycle if the time is different. What problem specific rule can we use to prune states from the OPEN list that will still allow us to find the maximum revenue solution? (1-2 sentences)
For any unstarted job J, if we immediately travel to J's pick up point, pick up J, then travel to J's drop off point, deliver J, and the time after these actions are performed is past the end of the day time, then prune the state. It is safe to prune such a state because it cannot lead to a goal state.