Artificial Intelligence CM3112

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1. Briefly discuss the effectiveness of your chosen heuristic, compared to the trivial heuristic that always returns 0. [10]

The trivial heuristic that always returns 0 isn't effective as it computes every single possible move and selects the lowest cost at the end of it. A heuristic is needed to try and lower the number of pointless nodes being expanded which will in turn improve the execution time and lower the amount of memory needed to run the program.

My chosen heuristic is effective over the trivial heuristic as it reduces the number of expanded nodes in all the tests. This means that the overall runtime has been greatly reduced in cases. The amount of memory needed to run the program has been reduced to a level where each text file can be processed with 1GB of dedicated memory.

Comparison of each heuristic

Text file	Trivial nodes	Trivial cost
random1.txt	462	6
random2.txt	178	6
random3.txt	2220	3
random4.txt	25435	12
random5.txt	*	*
random6.txt	*	*
random7.txt	3120	10
random8.txt	*	*
random9.txt	*	*
random10.txt	2673	13
random11.txt	*	*
random12.txt	355	20
random13.txt	98256	26

Text file	Heuristic nodes	Heuristic cost
random1.txt	171	6
random2.txt	57	6
random3.txt	8	3
random4.txt	17238	12
random5.txt	17108	8
random6.txt	13089	9
random7.txt	1880	10
random8.txt	22618	11
random9.txt	2402	12
random10.txt	2462	13
random11.txt	97438	15
random12.txt	350	20
random13.txt	84089	26

* = GC overhead limit exceeded

2. Explain why your chosen heuristic is admissible. [10]

My chosen heuristic is admissible as it never overestimates the cost of the goal car from reaching the goal. It does this by adding the number of vertical cars blocking the goal car from reaching its goal that are on the same row as the goal car and the cars that are in front of the goal cars column. Using this heuristic, the number of blocking cars will be lower or equal to the distance of the goal car from reaching the exit. I only counted the vertical cars as cars that are vertical can only block the goal car from reaching its goal. This is because the cars can only move in the direction their orientation is set to. It would be pointless adding horizontal cars to the total as only the vertical cars can be moved for the goal car to reach its goal.

3. Outline a strategy that could be used to further improve your chosen heuristic. [10]

To improve on the heuristic I implemented, I would need to calculate the cars that block the currently blocking cars. If the blocking car is blocked, it would gain another point which means that another move would have to be made. This would still make the heuristic admissible as it would still not overestimate the cost of the goal car from reaching the goal. The improvement on the heuristic would mean a better calculated estimated distance to goal and overall improve the efficiency of the program by reducing the number of expanded nodes.

I would have liked to implement this improvement on top of my heuristic but was a little complicated to do so. I couldn't figure a way of calculating if the blocking car was blocked as it could be blocked by not just the columns in my heuristic but also rows. If this was figured out, it would have made the program much more efficient than it is currently.