Manhattan Distance + Enhancement

My heuristic estimation function is inspired by the famous

`Manhattan Distance` heuristics, which evaluates a given node

With respect to a given goal node, by the number of

"Gridded" distance from a misplaced marble to its goal position.

My enhancement to the heuristic function is adding to

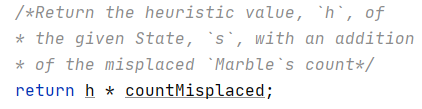
the calculated `Manhattan Distance` of a given marble

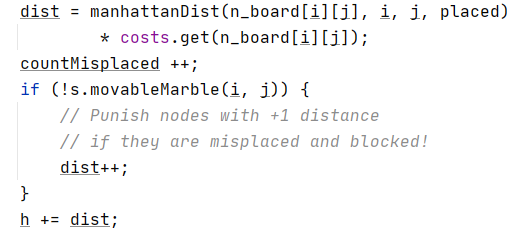
At index (i, j), the movement cost of that marble (to indicate total distance in weight) and count the misplaced marbles. represents the sum of Manhattan distances of all misplaced marbles.

My heuristic evaluation function, , is defined:

I've enhanced my heuristic by adding a "punishment"

value to states which have misplaced marbles that are blocked from all 4 moving directions.





Claim:

My heuristic function is and

*Note:* My heuristic function, , avoids grading nodes by the `cost` function

It is easy to see that if is a goal state – then .

Because all marbles are placed in their goal position.

*Admissibility:*

My heuristic function never overestimates a node target.   
The general idea is that each State is evaluated with a strong relation

to the goal State.

I've had trouble proving my enhanced function, but it is clear that a board with a `G` marble with distance 2 and `R` with distance 1 –

should be prioritized over `G` with distance 1 and `B` with distance 1, no matter the given states.

*Note*: If for example `G` with distance 1 to travel, was blocked from all sides, then this state gets punished by 1 point to let the marble out of the way.

This is not a proof of the properties of my heuristic function, but a general explanation of the main idea behind the heuristic evaluation.

Hope the code makes a lot more sense!