Hua Rong Dao puzzle solver heuristic function

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Proposal

The advanced heuristic function that I propose is the maximum of the L_1 distance of the goal piece's current location and it's goal location , and the number of non-goal pieces that are occupying the goal squares, denoted $P(n)$. In other words, the Heuristic function can be defined as:

$$h(n) = \max\{L_1(n), P(n)\} \qquad (n \text{ is a state})$$

Note that for 1×2, 2×1 piece, if the piece is partially occupying (its edge) or fully occupying the goal space, we will count it as 1.

This Heuristic is admissible. If $L_1(n)$ is the max, we know that it's admissible. If $P(n)$ is the max, we know that we must vacant the pieces that are occupying the goal space out first, then we can move the goal piece in. This means that for any state n, $P(n)$ is less than or equal to the cheapest cost for n to reach the goal state. □

This Heuristic dominates $L_1(n)$. Since we are taking the maximum of $L_1(n)$ and $P(n)$, we ensure that $h(n) \geq L_1(n)$ for all states. Now, consider the following state:

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^ ^ ^ ^
v v v v
2 2 < >
1 1 2 .
1 1 2 .
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In this case, we have two 1×1 piece occupying the goal space, so $P(n) = 2$. Since $L_1(n) = 1$, our heuristic function $h(n) = 2$. Therefore, in this specific state, $h(n) > L_1(n)$.