CSC384 Fall 2022: Assignment 1 (Original heuristic)

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Implementation: the power of the vertical distance between Caocao and the goal plus the horizontal distance between Caocao and the goal.

$$vertical\_distance^2 + horizontal\_distance$$

In python: return pow(abs(cao_location[0] - 3),2) + abs(cao_location[1] - 1)

Description: This new heuristic is admissible and dominates the Manhattan distance heuristic. First the heuristic is admissible, since the horizontal and vertical distance can't be negative, h(n) should always greater or equal to 0. Then, for any horizontal distance we must move at least this much to get to the goal state. For vertical distance, the maximum is when Caocao is at the top and the square of 3 is 9 which is much less than the actual cost for Caocao to move to the goal. Therefore, this new heuristic $0 \leq h(n) \leq h*(n)$ and it is admissible. This new heuristic also dominates the Manhattan distance heuristic. The Manhattan distance heuristic can be write as the horizontal distance plus the vertical distance. The only difference of our new heuristic is that we added a square to the vertical distance. Therefore, every state of our new heuristic should be greater or equal to the Manhattan distance heuristic. An example can be when Caocao is at the top middle and the vertical distance is 3. In this case our new heuristic get a value of 9, compare to the Manhattan distance heuristic evaluate to 3. Therefore we found an example where our heuristic is greater than the Manhattan distance. Thus our new heuristic is both admissible and dominate the Manhattan distance.