Artificial Intelligence

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Introduction

So, I chose "**Chebyshev Distance**" as my heuristic function, this function fits the requirements you asked, and it is admissible and consistent.

External Resources: https://en.wikipedia.org/wiki/Chebyshev_distance

Equation

$$D_{\text{Chebyshev}} = \max\left(|x_2 - x_1|, |y_2 - y_1|\right).$$

Consistent

I will use the inequality of the triangle and I show that from every node n, there is a certain action a that creates the successor n', and it meets the next equation: (cost(n, a, n') is the cost of taking action a and moving to node n')

h(n) ≤ cost (n, a, n') + h(n')

As I see it now h(n) is the minimum distance from n to the goal, this applies to any node in the system. I'm going to prove it by contradiction, let's say that h(n) > cost(n, a, n') + h(n') and the path contains n and n', from there I see that I split the path to 2 parts, the first one is n to n' and the rest is from n', let's build it as equation and I get h(n) = cost(n, a, n') + h(n'), but at the beginning, I said that h(n) > cost (n, a, n') + h(n'), therefore it cannot exist and this is **consistent**.

Admissible

I define h*(n) which is the true lowest cost from n, so here I need to prove that the heuristic function h(n) ≤ h*(n).

As said above, h is the minimum distance to the goal, of course I avoid moving on cliffs since it is restricted in the task, now considering a grid that contains only 1 cost from node to node, I can see that I will get the cheapest cost since every move is the same as h*(n), when looking at different costs the distance calculation puts us in same cost as h*(n) and therefore h(n) ≤ h*(n), therefore it is Admissible.

As I showed the distance is consistent and admissible hence its optimal.