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2035657

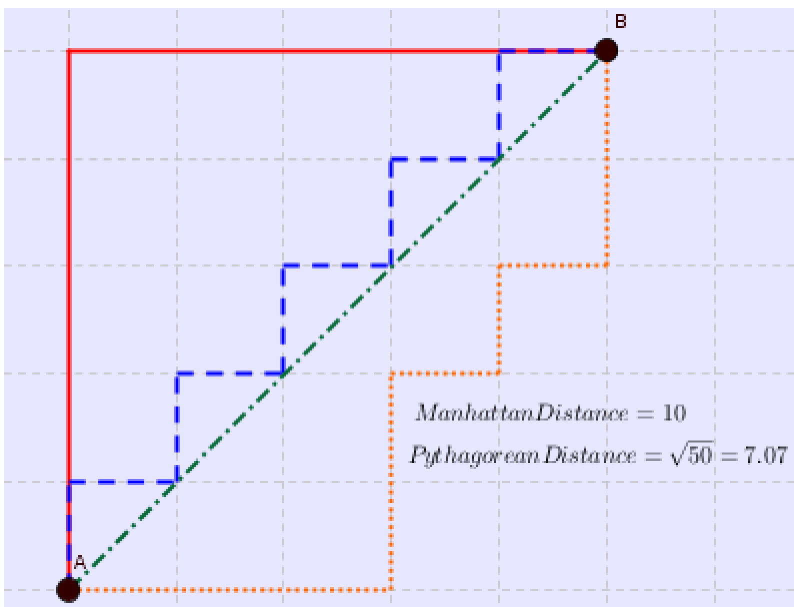
A heuristic function is admissible if the function never overestimates the cost of the optimal path that leads to the closest goal node. It is a way to inform the algorithm to which way to choose to reach goal. To determine my heuristic, I have chosen a simpler version of the problem.

Relaxation: Pieces can move diagonally

In the code, I keep current row and current column, width and height of every puzzle piece. Also, I use the most left, upper point of the piece to determine location. With the help of the above relaxation, I have chosen my heuristic function as follows:

h(x) = sqrt((goalRow - currentRow)^2 + (goalColumn - currentColumn)^2)

The Pythagorean distance is the shortest path to the desired point. It is clear that this heuristic is admissible since the total path to the goal point will always be greater or equal to the Pythagorean distance.



In the illustration above, the green line is h(x) and the other lines are Manhattan distance. By considering the constraints of our puzzle where the pieces cannot move diagonally:

We can see that, to go to a neighbor cell h(x) gives us 1, and we really need to move one tile, that is the real cost is 1. In other cases, the cost of moving to another tile is at least 2 and h(x) = sqrt(1^2+1^2) = $\sqrt{2}$. Since, $\sqrt{2} < 2$, the heuristic never overestimates the cost to reaching the goal. Therefore, h(x) is admissible.

Picture reference :

Manhattan Distance. Digital image. Bloggity. Terence Martin, n.d. http://bloggity.nurdz.com/gamedev-math/manhattan/