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CSCI.331.02

Lab 01 Writeup

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Your writeup should include all relevant decisions made in the implementation of your code. That is, how you implemented and justification for their correctness. You should also outline your different seasonal algorithms and your algorithm for human-consumable output should also be clearly described.

A* Decisions

- **Cost Function**

  To compute the cost of travelling between two points on the map, I utilized Tobler's Hiking function. Tobler's is an established formula that calculates the speed at which one walks based on the slope they are walking at. It is as follows:

$$W = 6e^{-3.5\left|\frac{dh}{dx} + 0.05\right|}$$

  where dh/dx is the slope. The constant 6 represents the individual's maximum walking speed, so I replaced this with a pre-determined walking speed based on the terrain of the starting location. (This speed is defined in a dictionary in util.py). Once I found the speed, I used the speed formula to compute the amount of time that it would take to travel from 1 pixel to the other. The time is the cost, where *more time = more expensive*. More information can be found at https://en.wikipedia.org/wiki/Tobler%27s_hiking_function .

- **Heuristic Function**

  My heuristic function is the flat-ground distance between the two points. It uses the Pythagorean formula to find the distance (not taking height into account).

Seasons

- **Winter/Spring**

  For both Winter and Spring, I first gathered all MapPoints that represented the water's edge. For Winter, this was the outermost affected water pixels. For Spring, this was the outermost affected non-water pixels that fit within the height constraint, as well as not being out of bounds.
  This set of pixels then defines the frontier of pixels to be expanded. I then iterate 7 or 15 times (for winter and spring respectively), each time turning the qualifying neighbors of the mud/ice pixels, and then redefining the frontier to be the outermost set of pixels to be expanded.

- **Fall**

  Fall followed a similar pattern to Winter/Spring. I gathered all MapPoints that were a footpath and that were adjacent to an easy walk forest. All of these MapPoints then were turned into a Fall footpath.

Human Consumable Output

- This wasn't taken into account. This is due to the fact that the specifications of the lab requested that the results be printed in a particular fashion.