

CSCI-4610 Artificial Intelligence: Assignment 1

Group Members:

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GitHub Link:

<https://github.com/jude-arokiam-uoit/csci-4610-assignment-1>

NOTE: All group work was equally distributed through group meetings and pair programming. Commit log is not a good representation of work done.

Overview

Uses A* algorithm to find the shortest path between two locations in the town of Whitby.



Heuristic and Cost Function

Heuristic

The heuristic function has not been changed from the starter code. This is because we have combined the cost and heuristic together.

Cost Function

For every edge we compute the difference in distance as well as elevation. The cost is initialized as the absolute distance between nodes. If the destination node elevation is greater than the starting node then we can consider this as walking "up hill". The cost will increase due to it being physically more difficult. We have created a threshold value to account for cases where the change in elevation is very small or very large. Similarly, when the destination node elevation is less than the starting node, the cost will decrease since walking "down hill" is less work. The same threshold value is used when the incline is very steep and results in the cost increasing.

```
difference = abs(d.elev - src.elev)

if d.elev > src.elev:
    #A steep uphill way will increase cost
    if difference > 30:
        self.cost += difference*2
    else:
        self.cost += (difference)*0.5
else:
    #A steep downhill way will increase cost
    if difference > 30:
        self.cost += difference*2
    else:
        self.cost -= (difference)*0.5
```

Experiment 1

Route planned from Lumsden to Thames.



```
/usr/bin/python2.7 assign1.py
Clicked on 446,301 last node 392178940
Clicked on 707,43 last node 392168434
Planning!
('From', 392178940L, 'to', 392168434L)
('Path found, time will be', 52.0573004781451)
Lumsden Crescent
Bassett Boulevard
Henderson Drive
unnamed way
Rossland Road East
Thickson Road
Winterberry Drive
Waller Street
Thames Drive
```

Experiment 2



```
/usr/bin/python2.7 assign1.py
x Desktop x ...ython2.7 assign1.py Downloads
shayne@shayne-Latitude-E5470:~/Documents/ai/csci-4610-assignment-1$ clear
shayne@shayne-Latitude-E5470:~/Documents/ai/csci-4610-assignment-1$ python assign1.py
<Element 'osm' at 0x7f5272074350>
32
287482826
(43.899202, -78.918233): Thickson Road Marta Road
set(['footway', 'service', 'residential', 'unclassified', 'secondary_link', 'path', 'tertiary',
    'secondary'])
Clicked on 374,606 last node 394431780
Clicked on 470,159 last node 392179986
Planning!
('From', 394431780L, 'to', 392179986L)
('Path found, time will be', 40.72929457843957)
unnamed way
Beech Street East
```


Experiment 3

Route planned from Dryden to Geddy



```
✕ /usr/bin/python2.7 assign1.py 🔍 ⚙️ ↗️
+ Desktop ✕ ...ython2.7 assign1.py Downloads ⌛
Clicked on 48,221 last node 289831805
Planning!
('From', 392172596L, 'to', 289831805L)
('Path found, time will be', 59.840162066272015)
Dryden Boulevard
Fallingbrook Street
Parnell Crescent
Patrick Drive
unnamed way
Garden Street
Meadowglen Drive
Forest Heights Street
Bridgewater Avenue
Rycroft Court
unnamed way
Willowbrook Drive
```