Andrew Rutherford

CSCI 3104

CPU: 2.8 GHz Intel Core i7

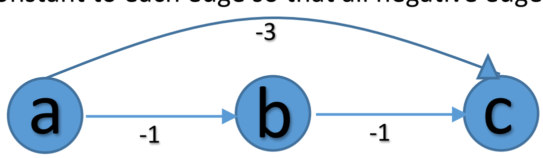
Ram: 16 GB 1600 MHz DDR3

OSX Yosemite

Homework #5

On my honor, as a University of Colorado at Boulder student, I have neither given nor received any unauthorized help.

1. Adding a large constant to each edge so that all negative edges become positive will not work.



If you were to add a constant of 4 to all the nodes, the distance from a-b-c would be 6, and the distance from a-b would be 1. In reality the shortest distance from a to c would be a-b-c.

2. Running Dijkstra's Algorithm once from city s to city t and again from city t to city s in graph G will give you all shortest path distances between cities s and t. The time complexity of doing this is O(|V^2|). In constant time, you can compute the length of the shortest path from city s to city t groing through e' for any e' in E'. Which of these paths is shortest give the best edge to add and that length will be the maximum decrease between the two fixed cities. The overall time complexity is O(|V^2| + |E'|)

3. `[['ME', 'EME', 'MAES', 'MENSA', 'UNSEAM', 'SURNAME', 'ANEURYSM', 'ANEURYSMS', 'NURSERYMAN', 'MENSTRUALLY']]`

This was the first chain output by the algorithm after approximately 45 minutes of run time. A problem exists where multiple letters in the smaller word are being counted twice for a single value in the larger word (i.e EME to MAES). This has since been corrected, which provided a new chain of:

```
[['ME', 'EME', 'HEME', 'THEME', 'THEMED']]
```

Due to the long run time of the algorithm, there was not enough time to allow the algorithm to print three unique chains.

To save time, and ensure correctness, the algorithm was run on a truncated word list:

```
DO DOG GOOD GOODS POT SUPERPOT DOGS TOPS GEODOMES DOT GOD TOP SPOT TOD DOTS
STOP STOPS STOPPED DOD STOOPS STROOPS
```

And the following output:

```
[['DO', 'DOG', 'GOOD', 'GOODS']]
[['DO', 'DOG', 'GOOD', 'GOODS']]
```

```
[['DO', 'DOG', 'GOOD', 'GOODS']]
[['DO', 'DOG', 'GOOD', 'GOODS']]
[['DO', 'DOG', 'GOOD', 'GOODS'], ['TOP', 'STOP', 'STOPS', 'STOOPS', 'STROOPS']]
[['DO', 'DOG', 'GOOD', 'GOODS'], ['TOP', 'STOP', 'STOPS', 'STOOPS', 'STROOPS']]
[['DO', 'DOG', 'GOOD', 'GOODS'], ['TOP', 'STOP', 'STOPS', 'STOOPS', 'STROOPS']]
[['DO', 'DOG', 'GOOD', 'GOODS'], ['TOP', 'STOP', 'STOPS', 'STOOPS', 'STROOPS']]
[['DO', 'DOG', 'GOOD', 'GOODS'], ['TOP', 'STOP', 'STOPS', 'STOOPS', 'STROOPS']]
[['DO', 'DOG', 'GOOD', 'GOODS'], ['TOP', 'STOP', 'STOPS', 'STOOPS', 'STROOPS'],
['POT', 'STOP', 'STOPS', 'STOOPS', 'STROOPS']]
[['DO', 'DOG', 'GOOD', 'GOODS'], ['TOP', 'STOP', 'STOPS', 'STOOPS', 'STROOPS'],
['POT', 'STOP', 'STOPS', 'STOOPS', 'STROOPS']]
[['DO', 'DOG', 'GOOD', 'GOODS'], ['TOP', 'STOP', 'STOPS', 'STOOPS', 'STROOPS'],
['POT', 'STOP', 'STOPS', 'STOOPS', 'STROOPS']]
[['DO', 'DOG', 'GOOD', 'GOODS'], ['TOP', 'STOP', 'STOPS', 'STOOPS', 'STROOPS'],
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[['DO', 'DOG', 'GOOD', 'GOODS'], ['TOP', 'STOP', 'STOPS', 'STOOPS', 'STROOPS'],
['POT', 'STOP', 'STOPS', 'STOOPS', 'STROOPS']]
```

```
[['DO', 'DOG', 'GOOD', 'GOODS'], ['TOP', 'STOP', 'STOPS', 'STOOPS', 'STROOPS'],
['POT', 'STOP', 'STOPS', 'STOOPS', 'STROOPS']]
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```

The programming of the algorithm was a collaborative effort between myself and David Olson.