**Garance Nicole Loison, UCID 10083186 CPSC441 - Assignment 3**

Necessary tools to be installed:

- g++ for the appropriate OS of running computer to compile C++ code.

- Download the full file including the text files to be read.

Settings and Limitations:

The main.cpp file has text files and 2 header files dependencies:

get\_address.h: reads from the addresses.txt file and returns the Dwarves and their source city.

graph.h: reads from the map files and compute the statistics of the path taken by the dwarves. The destination is hardcoded to be ‘C’ (Calgary) at the top of the file. Change it to any alphabet letter to compute possible path for the dwarves to the destination.

Running the program:

Open the terminal and go to the folder of your project. Once there, compile the main.cpp file with g++: g++ -o main main.cpp

Run the main exec file with 3 arguments: map or fullmap and any of the following minimizing function: “hops” for minimum hops, “distance” for minimum distance, “time” for minimum time, and trolls for minimum trolls, for instance, and addresses or fulladdresses: ./main map hops addresses.

The address file matches with the map file, and fulladdresses with the fullmap file. The output is such:

The minimum hops from C for the dwarves are:

Nori can go from E to destination:

going through 1 hops, travelling 300 km, for 120 hours, collecting 8 pieces of gold, encountering 2 trolls.

...

Average hops: 1.625, distance: 943, time: 575, gold: 9.875, trolls:4.5

Performance Analysis:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Average of Variables | Min hops | Min distance | Min Time | Min trolls |
| HOPS (map.txt) | 1.62 | 1.625 | 1.75 | 2.125 |
| HOPS (fullmap.txt) | 3.2 | 3.28 | 3.2 | 3.2 |
| DISTANCE (map.txt) | 942.85 | 942.85 | 957.14 | 1214.286 |
| DISTANCE (fullmap.txt) | 1057.69 | 800 | 1107.69 | 1107.69 |
| TIME (map.txt) | 575 | 575 | 567.5 | 657.5 |
| TIME (fullmap.txt) | 135.2 | 140 | 104.4 | 135.6 |
| GOLD (map.txt) | 9.875 | 9.875 | 11 | 12.875 |
| GOLD (fullmap.txt) | 8.92 | 10.52 | 7.88 | 6.6 |
| TROLLS (map.txt) | 4.5 | 4.5 | 4.375 | 3.2 |
| TROLLS (fullmap.txt) | 8.92 | 11.56 | 9.6 | 7.4 |

We can see the following correlations: the minimum hops and minimum distance travelled yield similar results for both files, the minimum trolls paths are also minimal in gold and are the ones with largest number of hops(30 % more hops). The minimum time paths is only significantly more performant in the large data set (fullmap.txt), with an improvement of over 25% compared to the other algorithms.