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COMP 2370

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Program 6 Run Time Analysis

1. Input Counts and Run Time Results

These tables show the relevant data points for this program. On the far left are the input values for each of the War And Peace text files, as well as the number of vertices multiplied by the number of edges for a consistent increasing input factor. The running times of each algorithm for each file are displayed in the next two columns. Bellman-Ford clearly begins to grow faster with larger inputs, and while Dijkstra’s increases, it does so much more slowly.

The last few columns are intended to indicate how quickly the input and running times increase. The input increases at a relatively constant rate of about 3.2 or 3.1, while the algorithms increase in time at more varying rates. These cells are calculated by dividing the current row by the row above, for each respective column, which is why there is no value for the first input file.

Bellman-Ford has a running time of O (V\*E), where V is the number of vertices and E is the number of edges in a graph. This implementation of Dijskra’s is not as fast as possible, because Java’s Priority Queue class does not dynamically change ordering when a priority level changes. With such an implementation (using a Fibonacci heap), the running time could be O(V lg V + E).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Inputs | | | Running Time | | increase factor - inputs | increase factor - time | |
| vertices | edges | V\*E | Bellman-Ford | Dijkstra's | V\*E | Bellman-Ford | Dijkstra's |
| 719 | 1420 | 1020980 | 0.0729166400 | 0.0052083335 |  |  |  |
| 1171 | 2840 | 3325640 | 0.2968750000 | 0.0351562500 | 3.257301808 | 4.071430 | 6.750000 |
| 1906 | 5680 | 10826080 | 0.3593750000 | 0.0000000000 | 3.255337319 | 1.210526 | 0.000000 |
| 2993 | 11346 | 33958578 | 3.0937500000 | 0.0156250000 | 3.136738136 | 8.608696 | ########## |
| 4824 | 22692 | 1.09E+08 | 3.1093750000 | 0.0625000000 | 3.22352155 | 1.005051 | 4.000000 |
| 7708 | 45377 | 3.5E+08 | 29.3281250000 | 0.0937500000 | 3.195195325 | 9.432161 | 1.500000 |
| 11765 | 90758 | 1.07E+09 | 44.2968750000 | 0.1562400000 | 3.052807095 | 1.510389 | 1.666560 |

1. Graphs

These graphs display the running time of the two algorithms as the input size increases.