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Programming Assignment #4

- What is the complexity of Dijkstra's algorithm implementation in this assignment?
    - The time complexity is O(ElogV). It is O(ElogV) and not O((E+V) log v) because E > V.
- Run the TestTime file (it'll take some time) and analyze the output in accordance with the complexity above.
    - The test time program shows us that the more vertices and edges that we have in the graph, the longer average time it takes for dijkstra's to run over the 250 sources. Furthermore, in general we typically see that when there are more vertices we have more unreachable vertices excluding the IL file. Overall, it seems that this algorithm is in fact running in the time complexity mentioned above.

In particular, do the following:

– Check the DijkstraPlot excel sheet provided to you. The number of vertices and edges are provided in columns C and D for each of the states. Write the formula for the complexity in column E. In particular, if you have claimed that the complexity in the previous question is O(M2), then formula in cell E5 = D5 ∗ D5.
– Plot the times that you get or each of the states in the cells E20 through E29
– Once you fill in the formula/numbers in the columns above, you should obtain two graphs. Do they look similar or different?

The plots look very similar to one another which signifies that the complexity is in fact O(ElogV).

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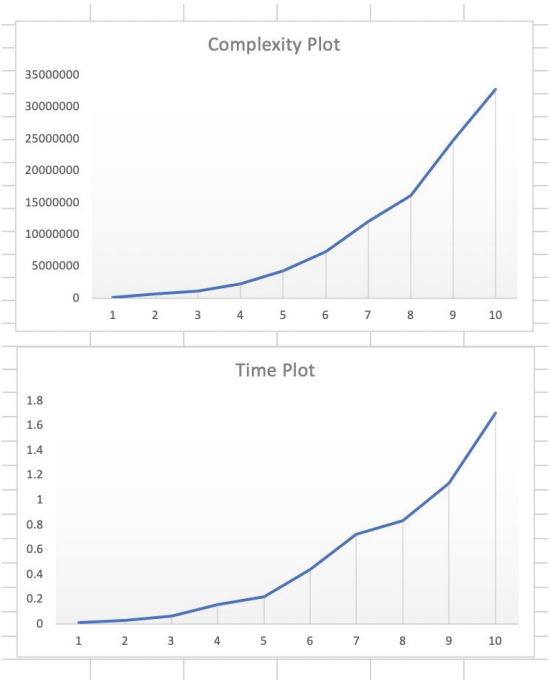

*** Time Test Dijkstra ***

Loading DC.len...
Graph size: numVertices = 9559; numEdges = 29818
Running Dijkstra for 250 sources
Avg no. of unreachable vertices is 74
Avg time is 0.007052 secs

Loading RI.len...
Graph size: numVertices = 53658; numEdges = 138426
Running Dijkstra for 250 sources
Avg no. of unreachable vertices is 3827
Avg time is 0.027904 secs

Loading VT.len...
Graph size: numVertices = 97975; numEdges = 215116
Running Dijkstra for 250 sources
Avg no. of unreachable vertices is 6894
Avg time is 0.058772 secs

Loading SD.len...
Graph size: numVertices = 212313; numEdges = 519244
Running Dijkstra for 250 sources
Avg no. of unreachable vertices is 13594

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Avg time is 0.153564 secs

Loading MA.len...
Graph size: numVertices = 308401; numEdges = 770328
Running Dijkstra for 250 sources
Avg no. of unreachable vertices is 19870
Avg time is 0.219264 secs

Loading WI.len...
Graph size: numVertices = 519157; numEdges = 1270872
Running Dijkstra for 250 sources
Avg no. of unreachable vertices is 12702
Avg time is 0.435068 secs

Loading IL.len...
Graph size: numVertices = 793336; numEdges = 2025634
Running Dijkstra for 250 sources
Avg no. of unreachable vertices is 2897
Avg time is 0.719204 secs

Loading FL.len...
Graph size: numVertices = 1048506; numEdges = 2661102
Running Dijkstra for 250 sources
Avg no. of unreachable vertices is 11859
Avg time is 0.831416 secs

Loading CA.len...
Graph size: numVertices = 1613325; numEdges = 3978298
Running Dijkstra for 250 sources
Avg no. of unreachable vertices is 30512
Avg time is 1.131988 secs

Loading TX.len...
Graph size: numVertices = 2073870; numEdges = 5168318
Running Dijkstra for 250 sources
Avg no. of unreachable vertices is 53011
Avg time is 1.696024 secs