Div A - Batch C Expt 5

David Daniels 202330003 38

In this experiment, I have implemented two single source shortest path algorithms (dijkstras and Bellman ford) using C++.

Time complexity

1) Dijkstras

priority queue is $O(V \log V)$

Relaxation step, due to requirement of checking all nodes is $O(V)$

∴ relaxation step for all nodes $= O(V^2)$

Thus, with adjacency matrix T.C $= O(V^2)$

Space complexity $= O(n)$ ---priority queue, dist, parent matrix

2) Bellman ford

1) converting adjacency matrix into edge list $\rightarrow O(V^2)$

running for all nodes of graph, Worst case is relaxation of all edges. Overall T.C $= O(V \cdot V^2) = O(V^3)$

Bellman ford is slower than dijkstras but works for negative weight edges

Space complexity $O(n)$ (dist, parent matrix), edge list)

The input file has many test cases.

1) Standard Positive weight graph 2) Negative weights but no cycle 3) Negative weight cycle 4) Mixed edge weights 5) Disconnected graphs