Modern Operating Systems and Computer Network

Lab Assign. 1

Oct 14, 2025

Question:

Q. Write a C++ program to implement Dijkstra's Single Source Shortest Path Algorithm for a graph represented using an adjacency matrix.

Number of vertices: 5

Edges:

0 1 4

0 2 8

1 4 6

2 3 2

3 4 10

Source vertex: 0

Code:

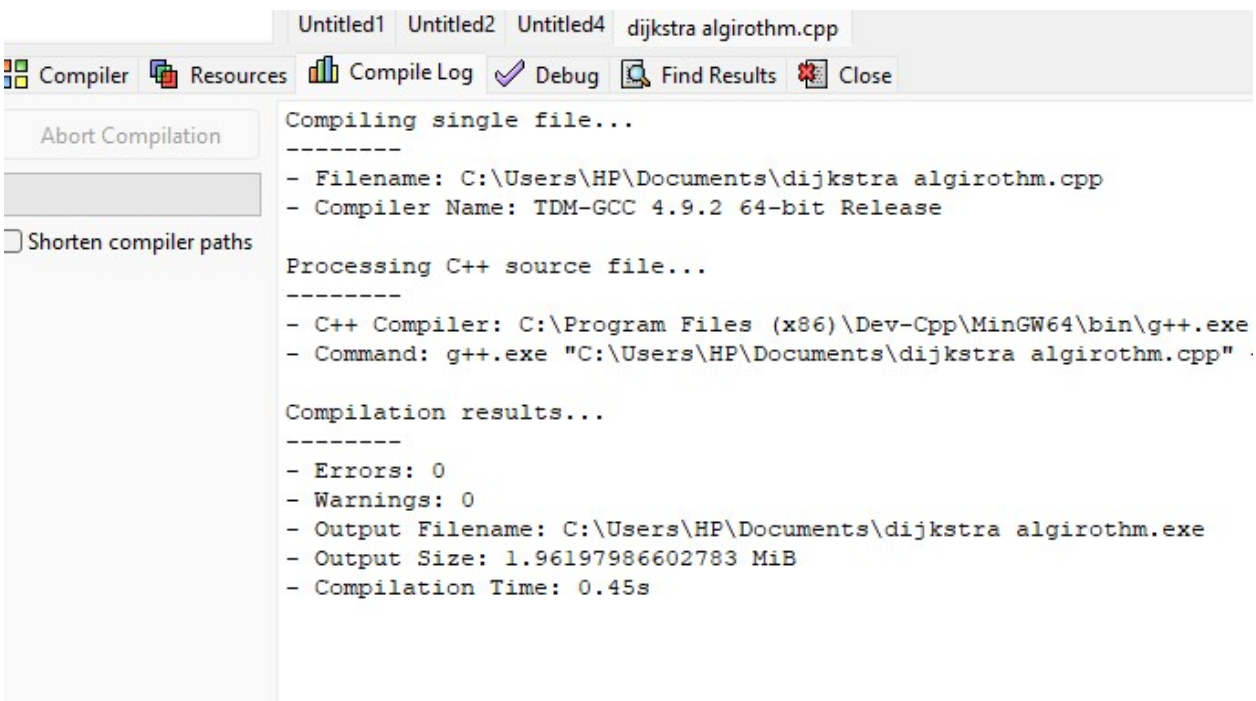
```
#include <iostream>
#include <vector>
#include <queue>
#include <climits>
using namespace std;

vector<vector<vector<int> > > constructAdj(vector<vector<int>> edges, int V) {
    vector<vector<vector<int> > > adj(V);  // Declare the adjacency list
```

```
    // Fill the adjacency list
    for (const auto &edge : edges) {
        int u = edge[0];
        int v = edge[1];
        int wt = edge[2];
        adj[u].push_back({v, wt});
        adj[v].push_back({u, wt});
    }

    return adj;
}



// Returns shortest distances from src to all other vertices
vector<int>dijkstra(int V, vector<vector<int>>&edges, int src){

    // Create adjacency list
    vector<vector<vector<int>>> adj = constructAdj(edges, V);

    // Create a priority queue to store vertices that are being preprocessed.
    priority_queue<vector<int>, vector<vector<int>>,
                    greater<vector<int>>>pq;

    // Create a vector for distances and initialize all distances as infinite
    vector<int>dist(V, INT_MAX);

    // Insert source itself in priority queue and initialize its distance as 0.
    pq.push({0, src});
    dist[src] = 0;
```

```
    // Looping till priority queue becomes empty (or all distances are not finalized)
    while (!pq.empty()){

        // The first vertex in pair is the minimum distance vertex, extract it from priority queue.
        int u = pq.top()[1];
        pq.pop();

        // Get all adjacent of u.
        for (auto x : adj[u]){

            // Get vertex label and weight of current adjacent of u.
            int v = x[0];
            int weight = x[1];

            // If there is shorter path to v through u.
            if (dist[v] >dist[u] + weight)
            {
                // Updating distance of v
                dist[v] = dist[u] + weight;
                pq.push({dist[v], v});
            }
        }
    }

    return dist;
}

// Driver program to test methods of graph class
int main(){
```

```
    int V = 5;
    int src = 0;

    // edge list format: {u, v, weight}
    vector<vector<int>> edges = {{0, 1, 4}, {0, 2, 8}, {1, 4, 6},
                                 {2, 3, 2}, {3, 4, 10}};

    vector<int> result = dijkstra(V, edges, src);

    // Print shortest distances in one line
    for (int dist : result)
        cout<<dist<< " ";

    return 0;
}
```

Compiler:



Output:

```
C:\Users\HP\Documents\dijks

0 4 8 10 10
--------------------------------
Process exited after 0.7448 seconds with return value 0
Press any key to continue . . .
```