Assignment

(Lab-09 Floyd Warshall)

Sub Code: CSE246

Sec: 03

Course Title: Algorithm

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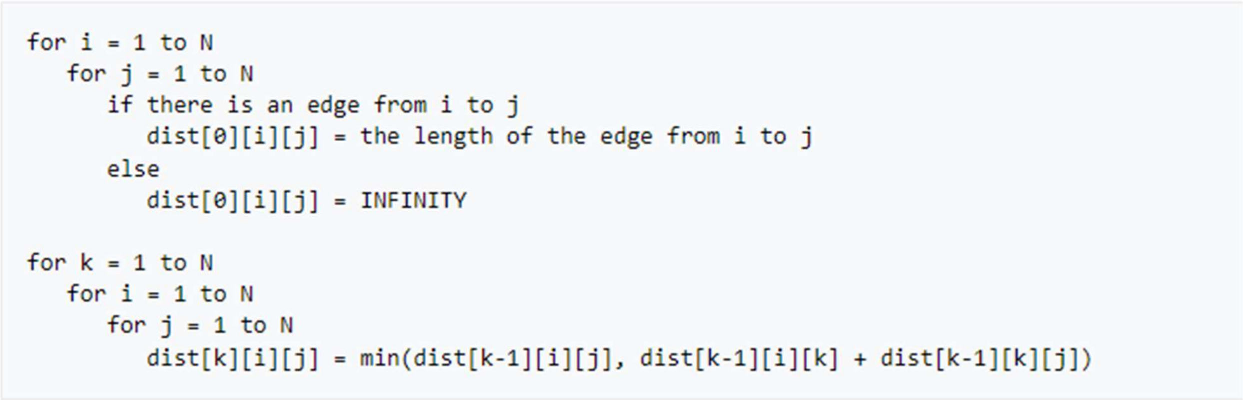
Problem statement: Implement Floyd Warshall algorithm in a weighted directed graph to find all pair shortest paths. Print the all-pair shortest paths.

Theory : For each vertex pair in a weighted directed graph, the Floyd-Warshall method is a common approach for determining the shortest path. In the all-pair shortest path issue, we must discover all shortest pathways from each vertex in the graph to all other vertices.

As input, we'll use a directed weighted graph G (V, E). And then, from the supplied graph, we create a graph matrix. The graph's edge weights are included in this matrix.

Now, let’s jump into the algorithm:



```
for i = 1 to N
   for j = 1 to N
      if there is an edge from i to j
         dist[0][i][j] = the length of the edge from i to j
      else
         dist[0][i][j] = INFINITY

for k = 1 to N
   for i = 1 to N
      for j = 1 to N
         dist[k][i][j] = min(dist[k-1][i][j], dist[k-1][i][k] + dist[k-1][k][j])
```

Then, at the diagonal points of the matrix, we enter textbfmathsf0. The edge weights from the input graph are used to fill the remaining places.

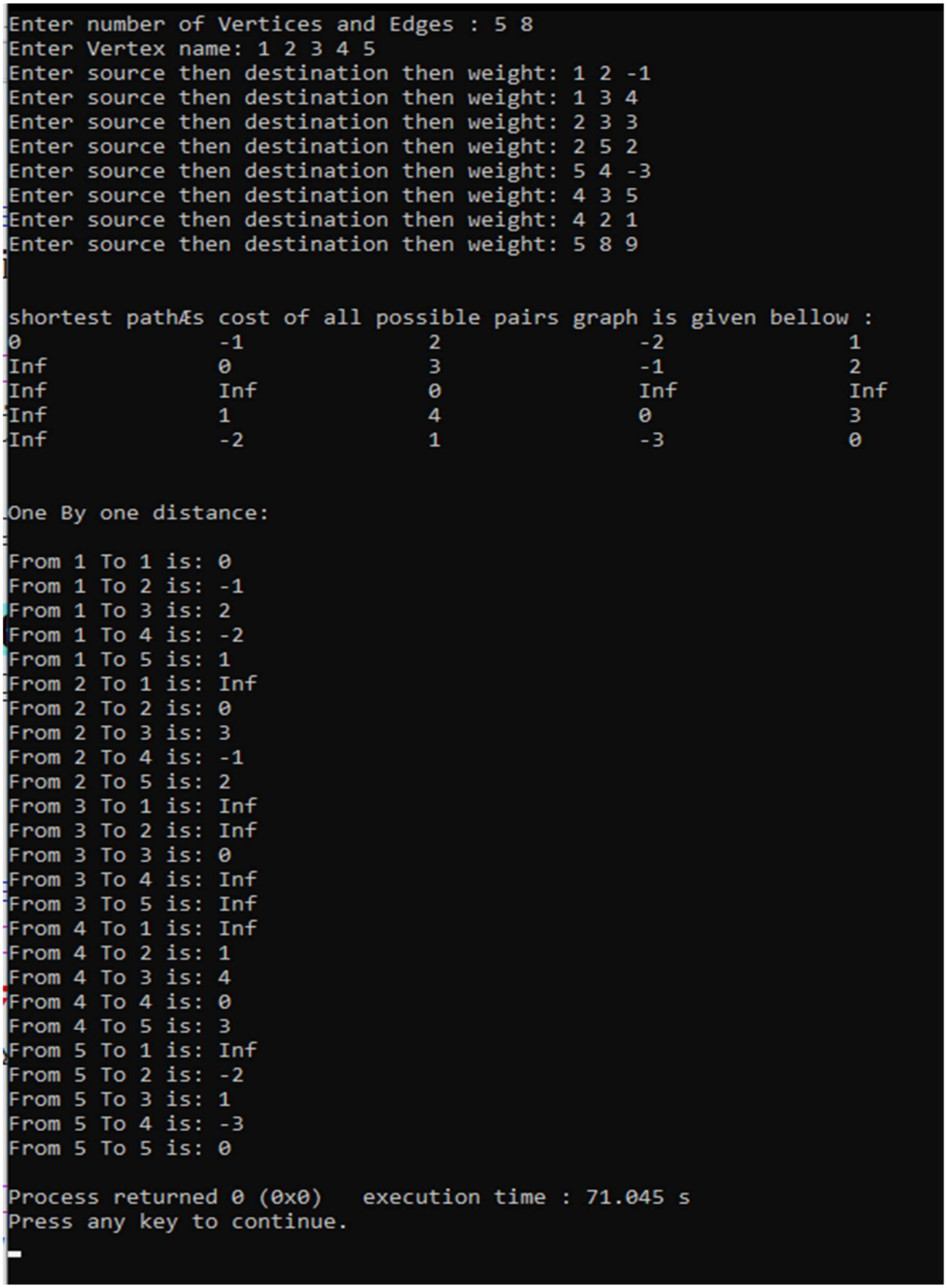
After that, we must calculate the distance between two vertices. While looking for

Code:

```
#include<iostream>>

using namespace std;

int nameArray[100];

void warshall(int graph[100][100], int n){

    for(int m=0; m < n; m++){

        for(int i = 0; i < n; i++){

            for(int j = 0; j < n; j++){

                if(graph[i][m] != 666 && graph[m][j] != 666){

                    graph[i][j] = min(graph[i][j], graph[i][m] + graph[m][j]);

                }

            }

        }

    }}

int checkVertexLocation(int u1, int n){

    for(int i = 0; i < n; i++){

        if(nameArray[i] == u1){

            return i;

        }

    }

}


int main(){
```

```
int graph[100][100], w, nvertice, nedge;
int c, s, e;
cout << "Enter number of Vertices and Edges : ";
cin >> nvertice >> nedge;
for(int i = 0; i < nvertice; i++){
    for(int j = 0; j < nvertice; j++){
        if(i == j){
            graph[i][j] = 0;
        } else{
            graph[i][j] = 666;
        }
    }
}   cout << "Enter Vertex name: ";
for(int i = 0; i < nvertice; i++){
    cin >> c;
    nameArray[i] = c;
}   for(int i = 0; i < nedge; i++){
    cout << "Enter source then destination then weight: ";
    cin >> s >> e >> w;
    graph[checkVertexLocation(s, nvertice)][checkVertexLocation(e, nvertice)] = w;
}   warshall(graph, nvertice);
cout << "\n\nshortest path’s cost of all possible pairs graph is given bellow : \n";
for(int i = 0; i < nvertice; i++){
    for(int j = 0; j < nvertice; j++){
            if(graph[i][j] != 666){
                cout << graph[i][j] << "\t\t";
            }
            else{
                cout << "Inf\t\t";
            }
        }
        cout << "\n";
    }
    cout << "\n\nOne By one distance:\n\n";
    for(int i = 0; i < nvertice; i++){
        for(int j = 0; j < nvertice; j++){
            if(graph[i][j] != 666){
                cout << "From " << nameArray[i] << " To " << nameArray[j] << " is: " << graph[i][j] << "\n";
            }       else{
                cout << "From " << nameArray[i] << " To " << nameArray[j] << " is: Inf\n";
            }
        }
    }
}
```

Result:



```
Enter number of Vertices and Edges : 5 8
Enter Vertex name: 1 2 3 4 5
Enter source then destination then weight: 1 2 -1
Enter source then destination then weight: 1 3 4
Enter source then destination then weight: 2 3 3
Enter source then destination then weight: 2 5 2
Enter source then destination then weight: 5 4 -3
Enter source then destination then weight: 4 3 5
Enter source then destination then weight: 4 2 1
Enter source then destination then weight: 5 8 9


shortest pathÆs cost of all possible pairs graph is given bellow :
0               -1              2               -2              1
Inf             0               3               -1              2
Inf             Inf             0               Inf             Inf
Inf             1               4               0               3
Inf             -2              1               -3              0


One By one distance:

From 1 To 1 is: 0
From 1 To 2 is: -1
From 1 To 3 is: 2
From 1 To 4 is: -2
From 1 To 5 is: 1
From 2 To 1 is: Inf
From 2 To 2 is: 0
From 2 To 3 is: 3
From 2 To 4 is: -1
From 2 To 5 is: 2
From 3 To 1 is: Inf
From 3 To 2 is: Inf
From 3 To 3 is: 0
From 3 To 4 is: Inf
From 3 To 5 is: Inf
From 4 To 1 is: Inf
From 4 To 2 is: 1
From 4 To 3 is: 4
From 4 To 4 is: 0
From 4 To 5 is: 3
From 5 To 1 is: Inf
From 5 To 2 is: -2
From 5 To 3 is: 1
From 5 To 4 is: -3
From 5 To 5 is: 0

Process returned 0 (0x0)   execution time : 71.045 s
Press any key to continue.
```

Conclusion: Floyd-Warshal performs the same in calculations and in determining rectangular calculations and frameworks. For phase j ≥ 1, as may be the case, the rectangular calculation determines the more rapidly related structure due to the reduction of the sum of the calculations.

==The End==