12 Link State Routing Protocol

12.1 Aim

Implement and simulate algorithm for Link state routing protocol.

12.2 Theory

The Link State Routing Protocol is used to find the best route for sending a packet to another router from a source router.It uses Dijkstra's algorithm to find the shortest path between the source router and every other router.It first considers an unvisited node with shortest distance from source vertex.Then we find the shortest paths from this node to every other node and saves that distance in the distance vector.This is repeated for every other unvisited node and the distance is printed.

12.3 Algorithm

Algorithm 1 Dijkstra's Algorithm
---
  procedure DIJKSTRA
      Enter the number of nodes & source node in the network N & S respectively
      Enter the cost matrix cost
      Initialise the distance matrix with the distance of nodes from source node
      visited[S] = true
      for int i = 0;i<N;i++ **do**
          minimum = INT_MAX
          for int j = 0;j<N;j++ **do**
              if !visited[j] **then**
                  if minimum>distance[j] **then** x = j minimum = distance[j]
                  end if
              end if
          end for
          visited[x] = true
          for int j = 0;j<N;j++ **do**
              if !visited[j] **then**
                  if minimum+cost[x][j]<distance[j] **then**
                      distance[j] = minimum+cost[x][j]
                  end if
              end if
          end for
      end for
      for int i = 0;i<N;i++ **do**
          print distance[i]
      end for
  end procedure

12.4 Code

Server

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


int main(){
    int N,S;
    cout<<"Enter the number of nodes in the network & the source node \n";
    cin>>N>>S;
    vector<int> distance(N);
```

```
13      vector<bool> visited (N, false);
14      int cost[N][N];
15      cout<<"Enter the cost matrix\n";
16      for(int i = 0;i<N;i++)
17          for(int j = 0;j<N;j++)
18              cin>>cost[i][j];
19      for(int j = 0;j<N;j++)
20          distance[j] = cost[S][j];
21
22      int minimum,x;
23      visited[S] = true;
24      for(int i=0;i<N;i++){
25          minimum = INT_MAX;
26          for(int j = 0;j<N;j++){
27              if(!visited[j])
28                  if(distance[j]<minimum){
29                      x = j;
30                      minimum = distance[j];
31                  }
32          }
33          visited[x] = true;
34          for(int j = 0;j<N;j++){
35              if(!visited[j]){
36                  if((minimum+cost[x][j])<distance[j])
37                      distance[j] = minimum +cost[x][j];
38
39
40              }
41          }
42
43      }
44      cout<<"The shortest distance from node:"<<S<<" to other nodes
        is ";
45      for(int i = 0;i<N;i++)
46          cout<<distance[i]<<" ";
47
48      return 0;
49
50  }
```

12.5   Output

```
Enter the number of nodes in the network & the source node
3 1
Enter the cost matrix
0 1 5
1 0 2
5 2 0
The shortest distance from node:1 to other nodes is 1 0 2
```

12.6   Result

Link State Routing Protocol was implemented using C++.The compiler version is 8.2.1.