**EXPERIMENT NO. 6**

**Problem statement:**

There are flight paths between cities. If there is a flight between city A and city B then there is an edge between the cities. The cost of the edge can be the time that flight takes to reach city B from A, or the amount of fuel used for the journey. Represent this as a graph. The node can be represented by airport name or name of the city. Use adjacency MATRIX representation of the graph.\*/

|  |  |
| --- | --- |
|  | #include<iostream>  #include<queue> |
|  | #include<stack> |
|  | using namespace std; |
|  | class Graph |
|  | { |
|  | string city[10]; |
|  | int a[10][10]; |
|  | int n; |
|  | public: |
|  | void input(); |
|  | void display(); |
|  | void BFS(); |
|  | void DFS(); |
|  | }; |
|  | void Graph::input() |
|  | { |
|  | cout<<"\nEnter no. of cites: "; |
|  | cin>>n; |
|  | cout<<"\nEnter the names of cities: "; |
|  | for(int i=0 ; i<n ; i++) |
|  | cin >> city[i]; |
|  | cout<<"\nEnter the distances: "; |
|  | for(int i=0 ; i<n ; i++) |
|  | for(int j=i ; j<n ; j++) |
|  | { |
|  | if(i==j) |
|  | { |
|  | a[i][j] = 0; |
|  | continue; |
|  | } |
|  | cout<<"\nEnter the distance between " << city[i] <<" and " << city[j]<< " : "; |
|  | cin >> a[i][j]; |
|  | a[j][i] = a[i][j]; |
|  | } |
|  | } |
|  |  |
|  | void Graph::display() |
|  | { |
|  |  |
|  | for(int i=0 ; i<n ; i++) |
|  | { |
|  | cout<<"\n"; |
|  | for(int j=0 ; j<n ; j++) |
|  | { |
|  | cout<<a[i][j] << "\t"; |
|  | } |
|  | } |
|  | } |
|  |  |
|  | void Graph::BFS() |
|  | { |
|  | cout<<"\n\nBFS Traversal: "; |
|  | queue<int> q; |
|  | int visit[n]; |
|  | for(int i=0 ; i<n ; i++) |
|  | visit[i] = 0; |
|  | string start; |
|  | int index; |
|  | cout<<"\nEnter starting city: "; |
|  | cin>>start; |
|  | for(int i=0 ; i<n ; i++) |
|  | if(start == city[i]) |
|  | index =i; |
|  |  |
|  | visit[index] = 1; |
|  | cout<<city[index]<<" -> "; |
|  | int current = index; |
|  | while(1) |
|  | { |
|  | for(int i=0 ; i<n ; i++) |
|  | { |
|  | if(a[current][i]!=0 && visit[i] == 0) |
|  | { |
|  | visit[i] = 1; |
|  | q.push(i); |
|  | cout<<city[i]<<" -> "; |
|  | } |
|  |  |
|  | } |
|  |  |
|  | if(q.empty()!=0) |
|  | break; |
|  |  |
|  | else |
|  | { |
|  | current = q.front(); |
|  | q.pop(); |
|  | } |
|  | } |
|  | } |
|  |  |
|  | void Graph::DFS() |
|  | { |
|  | cout<<"\n\nDFS Traversal: "; |
|  | stack<int> s; |
|  | int visit[n]; |
|  | for(int i=0 ; i<n ; i++) |
|  | visit[i] = 0; |
|  | string start; |
|  | int index; |
|  | cout<<"\nEnter starting city: "; |
|  | cin>>start; |
|  | for(int i=0 ; i<n ; i++) |
|  | if(start == city[i]) |
|  | index =i; |
|  | s.push(index); |
|  | visit[index] = 1; |
|  | int current = index; |
|  | cout << city[index]<<" -> "; |
|  | while(1) |
|  | { |
|  | for(int i=0 ; i<n ; i++) |
|  | { |
|  | if(a[current][i]!=0 && visit[i]==0) |
|  | { |
|  | s.push(i); |
|  | cout<<city[i]<<" -> "; |
|  | visit[i] = 1; |
|  | current = i; |
|  | i=0; |
|  | } |
|  | } |
|  |  |
|  | if(s.empty()!=0) |
|  | break; |
|  |  |
|  | else |
|  | { |
|  | current = s.top(); |
|  | s.pop(); |
|  | } |
|  | } |
|  | } |
|  | int main() |
|  | { |
|  | Graph g1; |
|  | int choice; |
|  | MENU: |
|  | cout<<"\n\nGRAPH TRAVERSAL"; |
|  | cout<<"\n1. Input data"; |
|  | cout<<"\n2. Display data"; |
|  | cout<<"\n3. DFS Traversal"; |
|  | cout<<"\n4. BFS Traversal"; |
|  | cout<<"\n5. Exit"; |
|  | cout<<"\nEnter your choice: "; |
|  | cin >> choice; |
|  | switch(choice) |
|  | { |
|  | case 1: |
|  | g1.input(); |
|  | break; |
|  | case 2: |
|  | g1.display(); |
|  | break; |
|  | case 3: |
|  | g1.DFS(); |
|  | break; |
|  | case 4: |
|  | g1.BFS(); |
|  | break; |
|  | case 5: |
|  | return 0; |
|  | default: |
|  | cout<<"\nInvalid choice.Try again!"; |
|  | } |
|  | if(choice != 5) |
|  | goto MENU; |
|  | return 0; |
|  | } |