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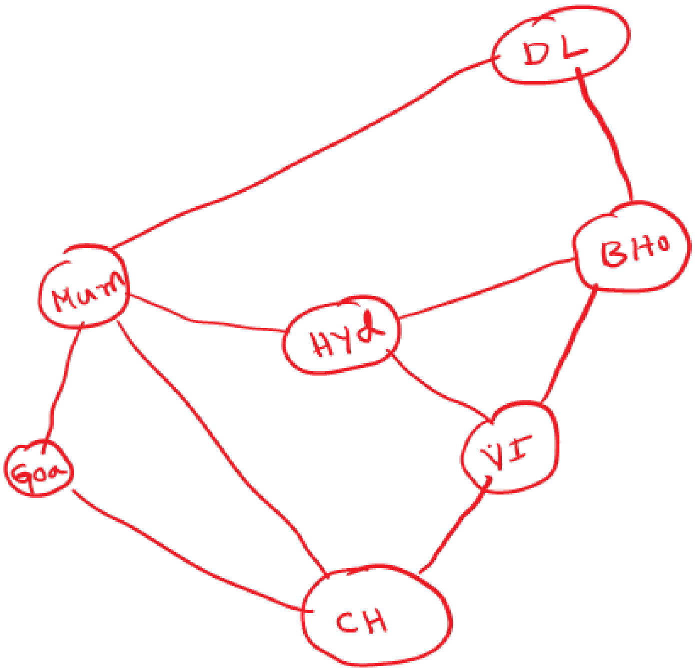
Path between two cities

Question

You have built a new robot and placed it on a city road map of India. The map is shown below. You give two different cities names to the robot. You have assigned a task to the robot to check whether a road path exists or not between the two given cities. If a path exists ask the robot to display the path. Otherwise, display -1(no path between the cities) . Write an algorithm and subsequent code(any programming language) to do the task of the robot.

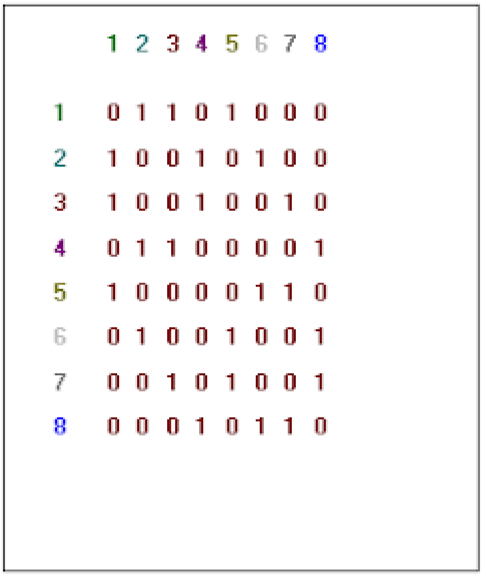


Code:-

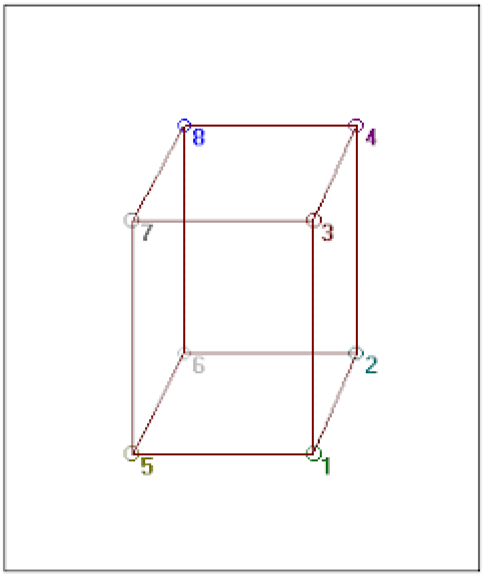
```
#include “iostream”
using namespace std;

int counter=0,cur=-1;

void print(int *parent,int i){
  if(parent[i]==i){
    cout<<i+1<<”←Origin”<<endl;
    return;
  }
  else{
    cout<<i+1<<”←"<<parent[i]+1<<endl;
    print(parent,parent[i]);
  }
}

void bfs(int **g,int v,int n,int *visited,int *list,int *parent,int
&c,int dest){
  for(int i=0;i<n;++i){
    if(g[v][i] && !visited[i]){
      parent[i]=v;
      list[++cur]=©;
      visited[i]=1;
      if(i==dest){
          c=1;
          return;
        }
    }
  }
  if(++counter<=cur)
    bfs(g,list[counter],n,visited,list,parent,c,dest);
}

int main(){
  int n,start,dest,c=0;
  cout<<”Number of cities: “;
  cin>>n;

  cout<<”Adjacency Matrix : \n”;
  int **g=new int*[n];
  int *visited=new int[n];
  int *list=new int[n];
  int *parent=new int[n];
  for(int i=0;i<n;++i){
    g[i]=new int[n];
    visited[i]=0;
    parent[i]=©;
    for(int j=0;j<n;++j)
      cin>>g[i][j];
  }

  cout<<"Starting Point: ";
  cin>>start;
  cout<<"Destination Point: ";
  cin>>dest;
  start--;
  dest--;
  list[++cur]=start;
  visited[start]=1;
  bfs(g,start,n,visited,list,parent,c,dest);
  if©{
    cout<<"Path : \n";
    print(parent,dest);
  }
  else
    cout<<-1<<endl;
}
```

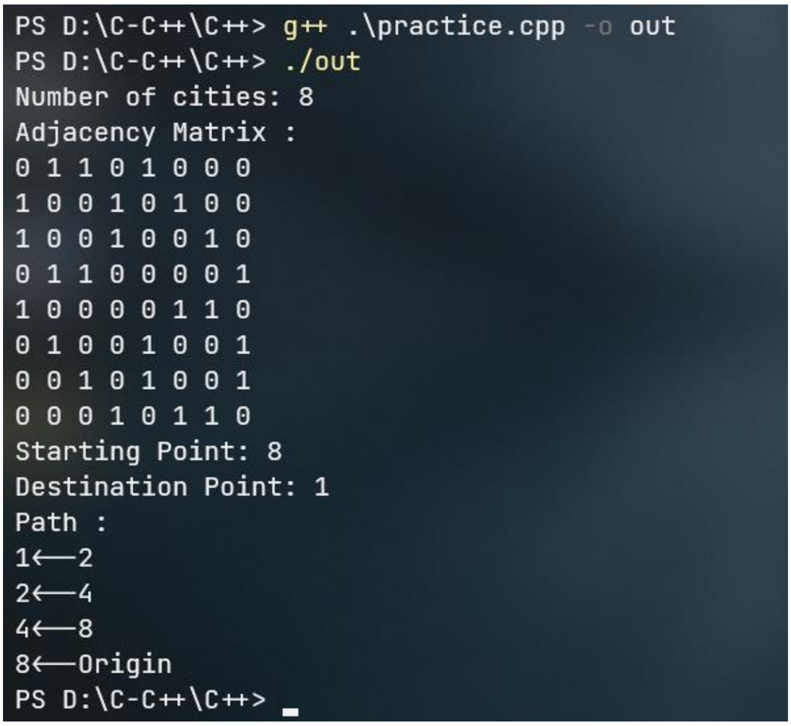
Output

Sample Image



	1	2	3	4	5	6	7	8
1	0	1	1	0	1	0	0	0
2	1	0	0	1	0	1	0	0
3	1	0	0	1	0	0	1	0
4	0	1	1	0	0	0	0	1
5	1	0	0	0	0	1	1	0
6	0	1	0	0	1	0	0	1
7	0	0	1	0	1	0	0	1
8	0	0	0	1	0	1	1	0

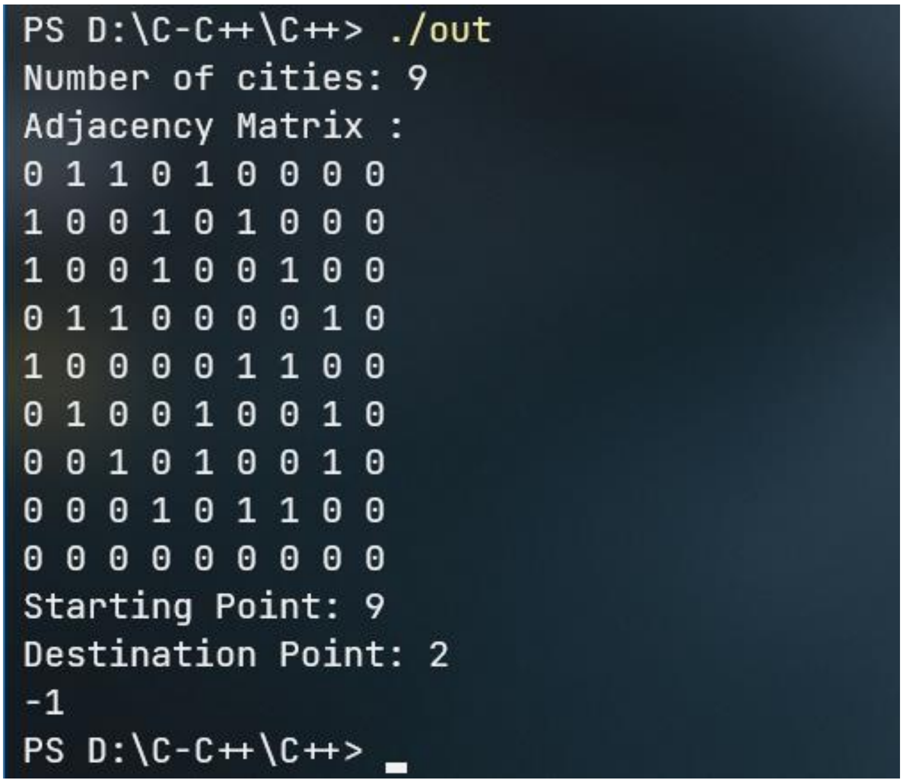




```
PS D:\C-C++\C++> g++ .\practice.cpp -o out
PS D:\C-C++\C++> ./out
Number of cities: 8
Adjacency Matrix :
0 1 1 0 1 0 0 0
1 0 0 1 0 1 0 0
1 0 0 1 0 0 1 0
0 1 1 0 0 0 0 1
1 0 0 0 0 1 1 0
0 1 0 0 1 0 0 1
0 0 1 0 1 0 0 1
0 0 0 1 0 1 1 0
Starting Point: 8
Destination Point: 1
Path :
1⟵2
2⟵4
4⟵8
8⟵Origin
PS D:\C-C++\C++> _
```

Now adding a new city which not connected to any other city

(The 9th City)



```
PS D:\C-C++\C++> ./out
Number of cities: 9
Adjacency Matrix :
0 1 1 0 1 0 0 0 0
1 0 0 1 0 1 0 0 0
1 0 0 1 0 0 1 0 0
0 1 1 0 0 0 0 1 0
1 0 0 0 0 1 1 0 0
0 1 0 0 1 0 0 1 0
0 0 1 0 1 0 0 1 0
0 0 0 1 0 1 1 0 0
0 0 0 0 0 0 0 0 0
Starting Point: 9
Destination Point: 2
-1
PS D:\C-C++\C++> _
```

(The last row & column of the matrix is full of ‘0’ because the 9th city is disconnected from everyother city hence it cannot be reached. Therefore, output is ‘-1’)