Description:

C code implementation of Dijkstra's algorithm to find the shortest paths from a given startnode to all other nodes in a graph and reports the execution time.

Source Code:

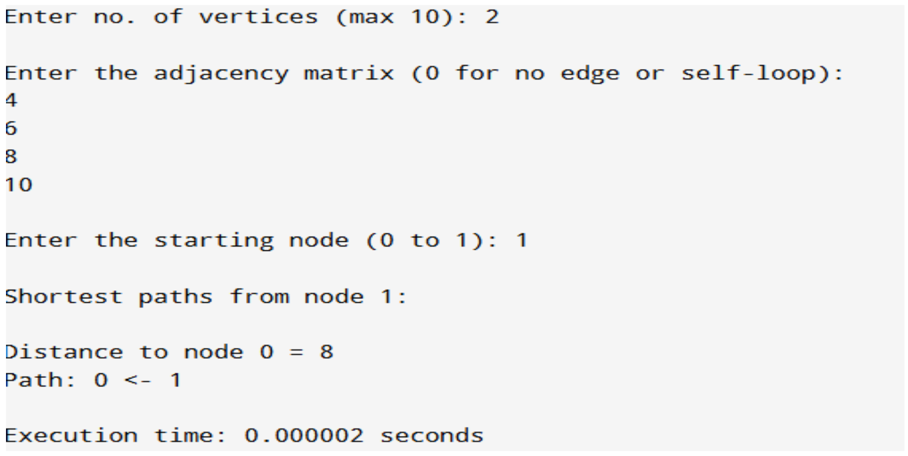
```
#include<stdio.h>

#include<conio.h>

#define INFINITY 9999

#define MAX 10

#include<time.h>


void dijkstra(int G[MAX][MAX],int n,int startnode);

int main()

{

int G[MAX][MAX],i,j,n,u;

clock_t start,end;

   double cpu_time_used;

   start=clock();

printf("Enter no. of vertices:");

scanf("%d",&n);

printf("\nEnter the adjacency matrix:\n");

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

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

scanf("%d",&G[i][j]);

printf("\nEnter the starting node:");

scanf("%d",&u);
```

```
dijkstra(G,n,u);
end=clock();
cpu_time_used=((double)(end-start))/CLOCKS_PER_SEC;
printf("Execution time:%f seconds",cpu_time_used);
return 0;
}

void dijkstra(int G[MAX][MAX],int n,int startnode)
{
	int cost[MAX][MAX],distance[MAX],pred[MAX];
	int visited[MAX],count,mindistance,nextnode,i,j;
	//pred[] stores the predecessor of each node
	//count gives the number of nodes seen so far
	//create the cost matrix
	for(i=0;i<n;i++)
		for(j=0;j<n;j++)
			if(G[i][j]==0)
				cost[i][j]=INFINITY;
			else
				cost[i][j]=G[i][j];
	//initialize pred[],distance[] and visited[]
	for(i=0;i<n;i++)
	{
		distance[i]=cost[startnode][i];
		pred[i]=startnode;
		visited[i]=0;
```

```
          }
          distance[startnode]=0;
          visited[startnode]=1;
          count=1;
      while(count<n-1)
      {
      mindistance=INFINITY;
      //nextnode gives the node at minimum distance
      for(i=0;i<n;i++)
      if(distance[i]<mindistance&&!visited[i])
      {
      mindistance=distance[i];
      nextnode=i;
      }
      //check if a better path exists through nextnode
      visited[nextnode]=1;
      for(i=0;i<n;i++)
      if(!visited[i])
      if(mindistance+cost[nextnode][i]<distance[i])
      {
      distance[i]=mindistance+cost[nextnode][i];
      pred[i]=nextnode;
      }

      count++;
  }
```

```
//print the path and distance of each node
for(i=0;i<n;i++)
if(i!=startnode)
{
printf("\nDistance of node%d=%d",i,distance[i]);
printf("\nPath=%d",i);
j=i;
do
{
j=pred[j];

printf("<-%d",j);
}while(j!=startnode);

}
}
```

Output:



```
Enter no. of vertices (max 10): 2

Enter the adjacency matrix (0 for no edge or self-loop):
4
6
8
10

Enter the starting node (0 to 1): 1

Shortest paths from node 1:

Distance to node 0 = 8
Path: 0 <- 1

Execution time: 0.000002 seconds
```