Habib University

CS 102– Data Structures & Algorithm
Spring' 2021

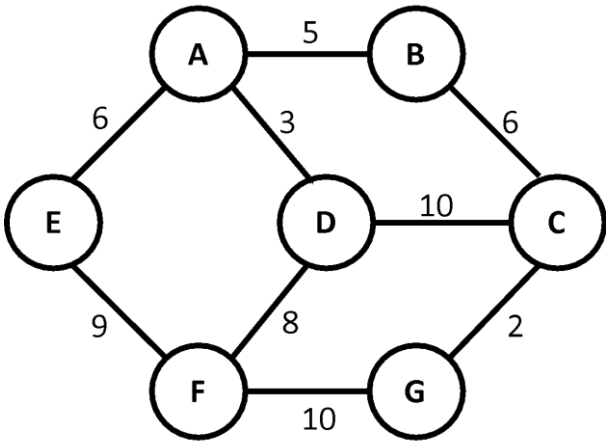
Lab# 12

Dijkstra Algorithm

Objectives: In this lab, we will implement the Dijkstra algorithm and apply it to solve real-world problems.

Exercise # 1: Dijkstra's Algorithm

(a) Write a function named ***getShortestPath (graph, from, to)*** that takes a graph as an input and estimates the shortest distance between a node **"from"** to a node **"to"**.

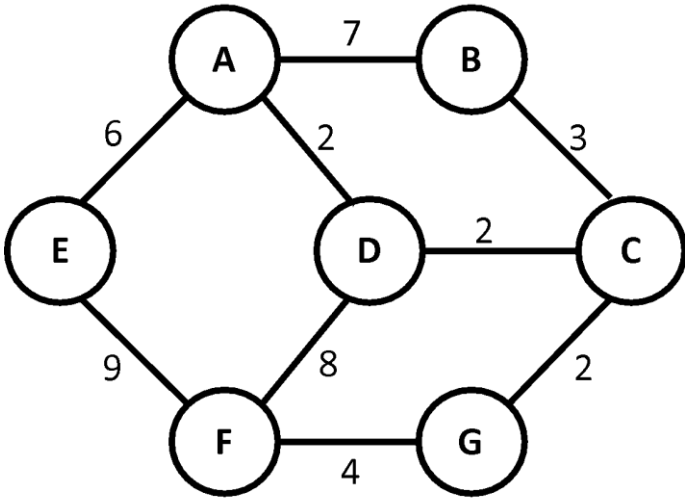
Example 1 :	
Input	Graph: Adjacency list of the following graph.  From: A To: G
Output	[(A, B), (B, C), (C, G)] That is, the output shows that the shortest path to reach "G" from "A" is through the nodes B and C.

(b) You are given a CSV file that contains a list of different cities in northern areas of Pakistan and their distances. Not all of the cities are directly connected which is represented by -1 in the distance matrix.

i. Load the given dataset in the form of a graph (adjacency list)

ii. Estimate the shortest distance between Islamabad and Kaghan.

Exercise # 2: Modify ***getShortestPath (graph, from, to)*** function so that if there is more than one minimum path from source node to destination node, it gives you the one with the minimum number of edges.

<table>
<tr><td>Example 1 :</td><td></td></tr>
<tr><td>Input</td><td>Graph: Adjacency list of the following graph.
 

From: A
To: F or B</td></tr>
<tr><td>Output</td><td>[(A, F)]
That is, the distance from A to F is 10 both through the following path
A→D→F,
A→D→C→G→F
the correct answer is A→D→F

[(A, B)]
That is, the distance from A to B is 7 both through the following paths
A→B,
A→D→C→B
the correct answer is A→B</td></tr>
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