National University of Computer and Emerging Sciences

Laboratory Manual #12

for

Data Structures Lab

(CL 2001)

Department of Computer Science
FAST-NU, Lahore, Pakistan

Introduction

Objectives

After performing this lab, students shall be able to:

1.Dijekstra

QUESTION NO 1

1. *Create a set sptSet (shortest path tree set) that keeps track of vertices included in the shortest path tree, i.e., whose minimum distance from the source is calculated and finalized. Initially, this set is empty.*
2. *Assign a distance value to all vertices in the input graph. Initialize all distance values as INFINITE. Assign the distance value as 0 for the source vertex so that it is picked first.*
3. *While sptSet doesn't include all vertices*
    1. *Pick a vertex u which is not there in sptSet and has minimum distance value.*
    2. *Include u to sptSet.*
    3. *Update the distance value of all adjacent vertices of u. To update the distance values, iterate through all adjacent vertices. For every adjacent vertex v, if the sum of the distance value of u (from source) and weight of edge u-v, is less than the distance value of v, then update the distance value of v.*

Question NO 2

Task: Write a C++ program that implements Dijkstra's algorithm in three different ways:

1. *Using an array-based priority queue.*
2. *Using a binary heap-based priority queue.*
3. *Without using a priority queue.*

Your program should:

- *Define a class **Graph** with suitable member functions and data members to represent a graph.*
- *Implement Dijkstra's algorithm in three separate functions within the **Graph** class, each corresponding to one of the approaches mentioned above.*
- *Read a graph from a text file "graph_data.txt", which contains the number of vertices, followed by the edges and their weights.*
- *For each implementation, find the shortest path from a given source vertex to all other vertices.*