CALIFORNIA STATE UNIVERSITY, FRESNO
DEPARTMENT OF COMPUTER SCIENCE

Class:	**Algorithms & Data Structures**	Semester:	**Fall 2023**

Points		Document author:	**Pratham Aggarwal**
		Author's email:	**Pratham_aggarwal@mail.fresnostate.edu**
		Laboratory number:	**Lab 12**

1. Statement of Objectives

The goal of this lab was to implement Dijkstra's algorithm for calculating the shortest distances between vertices in a structure represented by an adjacency matrix. The program was created to accept user input for the number of vertices, adjacency matrix, and source vertex. The expected outcome was a tabular display of the shortest distances. The goal of this lab was to strengthen understanding of graph algorithms. Dijkstra's algorithm is a fundamental algorithm in graph theory, and implementing it helps solidify concepts related to graph traversal and pathfinding. The significance lies in the practical application of theoretical knowledge.

2. Experimental Procedure

The experimental procedure included the following steps:

1. The structure of the Dijkstra algorithm function is defined.
2. Initializing the distance and tracking arrays
3. Implementing the main logic of Dijkstra's algorithm, including updating distances and marking visited vertices.
4. Incorporating user input into the main function for the number of vertices, adjacency matrix, and source vertex.
5. Using the specified inputs, the Dijkstra function is executed.
6. Using a tabular format to display the results

3. Analysis

The Dijkstra's algorithm implementation's output provides a comprehensive view of the shortest distances between a specified source vertex and all other vertices in the provided graph. The tabular structure of the results provides in-depth analysis. Each row in the table corresponds to a single vertex, while the columns provide the vertex index and the distance from the source vertex.

The algorithm successfully produces accurate distances, a validation conducted by cross-referencing with manually calculated distances for smaller graphs. The distances follow the fundamental principles of Dijkstra's algorithm, which updates distances progressively to determine the shortest path from the source to each vertex.

Screen shot in the end of the report.

4. Encountered Problems

In the beginning, writing the code was difficult, resulting in syntax problems. Furthermore, understanding the reasoning behind of Dijkstra's algorithm was also difficult. However, with the help of tutors and debugging, I was able to resolve the issues.

5. Conclusions

In conclusion, the effective translation of theoretical graph values into a functional program was demonstrated by the successful execution of Dijkstra's algorithm. This lab was very helpful in solidifying skills in graph algorithms and algorithm implementation.

This experiment's experience goes beyond the specific implementation, developing a connection between theoretical understanding and practical application in these algorithms. This experiment overall helped in learning new ways to implement an algorithm and how to approach one.

6. References

N/A