Data Structures and Algorithm

Mini Project Report

- **Project Title: -** Graph Visualizer

- **Group Members: -**

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- **Description**

The main aim of this project is the demonstrate how exactly internally the traversal in graph takes places. This project demonstrates various traversals in graph. The JavaFX library is being used to create the node structures that outer structure (circle and line). This project also finds the shortest path between two nodes or places using the Dijkstra's Algorithm.

The main traversal methods demonstrated are BFS (Breadth First Search) and DFS (Depth First Search). The Connected and Disconnected components can also be found by the user through our project. The Project updates Dynamically so the user can see the updating matrixes at the top right corner of the Output Screen. This graph can be changed or reset anytime as per the requirements. The important feature of our project is that the code is very much modular, is changes required can be done easily.The animation Speed can also be controlled by the user.

- **Data Structure Used: -**

  The Data Structure used in this project are

  1.) Priority Queue
  2.) Adjacency Matrix
  3.) Array

- **Functions in Project: -**

  1.) Add_Graph
  2.) Add_circle
  3.) Animate_DFS
  4.) Animate_BFS
  5.) Animate_Dijkstra
  6.) Connected_Components
  7.) Reset_Graph
  8.) Clear_Graph
  9.) Add_Edge_Weight

- **Algorithms Used: -**

  1.) BFS (Breadth First Search)
  This algorithm traverses through each sibling node.
  2.) DFS (Depth First Search)
  This algorithm traverses through each adjacent node
  3.) Dijkstra
  This algorithm is used to find the shortest path between any two nodes.

- **Tools Used: -**

  In this project the JavaFX library of Java is used to animate and demonstrate traversal methods.
  The library is mainly used for creating shapes like circle and line.
  The Fill color function is also used to show the current node while traversal.

- Application of Project: -

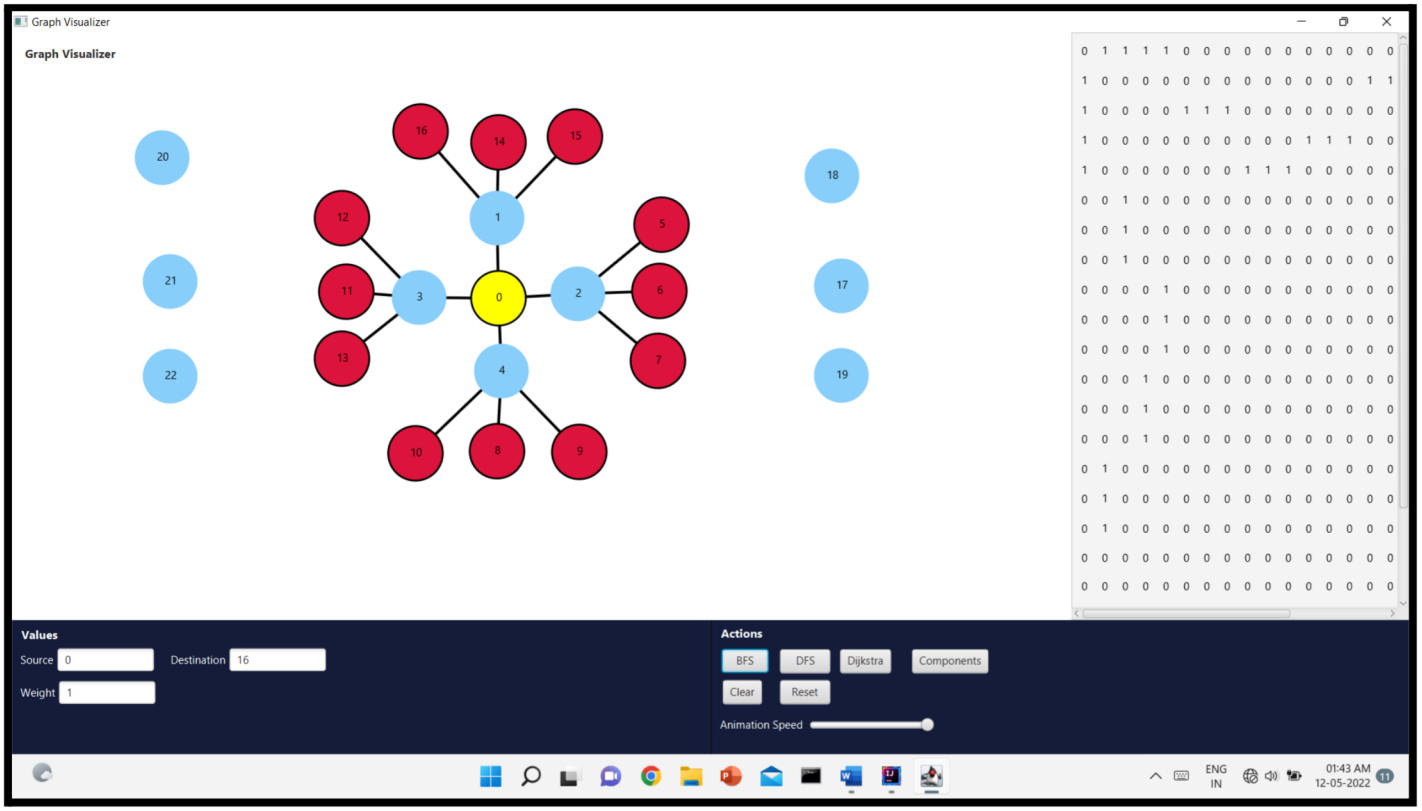
This project has effective application in computer networks so as each node can be represented as router or an intermediate sanction and the link can be multiple paths. As we know a Data packet or frame needs to travel through routers and stations to travel from source to destination via IP addresses.

Even so there are multiple pathways from one router to another through which the packet can travel. Suppose in process a router gets failed or gets disconnected, our minimum path finding algorithm will be able to find another shortest path in the network using Dijkstra's algorithm by updating the failed router link cost as Max_Value which provides maximum positive integer value in Java (2147483647) .

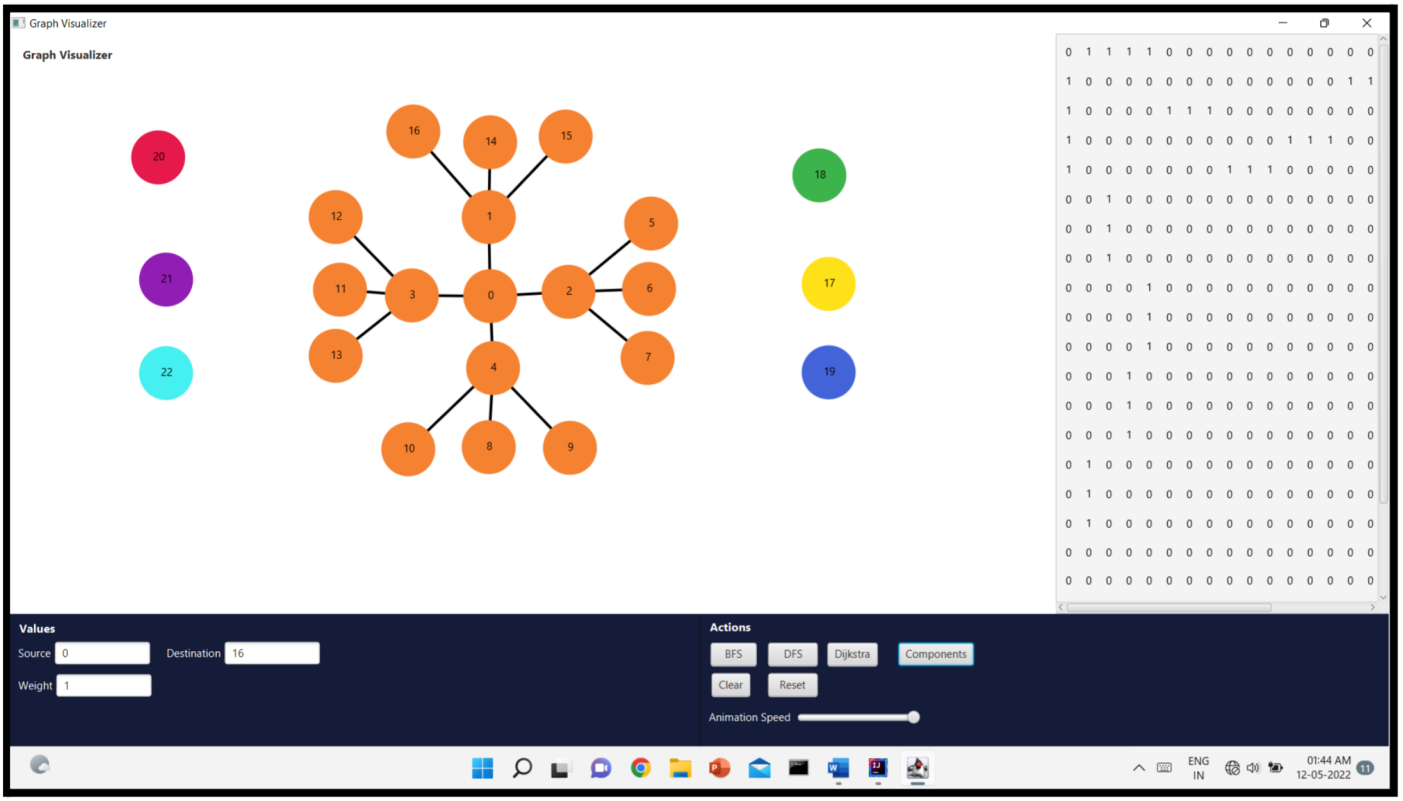
So that the same path will never be chosen as it has greatest route cost. Hence allowing the data packets to reached the destination IP addresses efficiently.

Graph used in Computer Networks

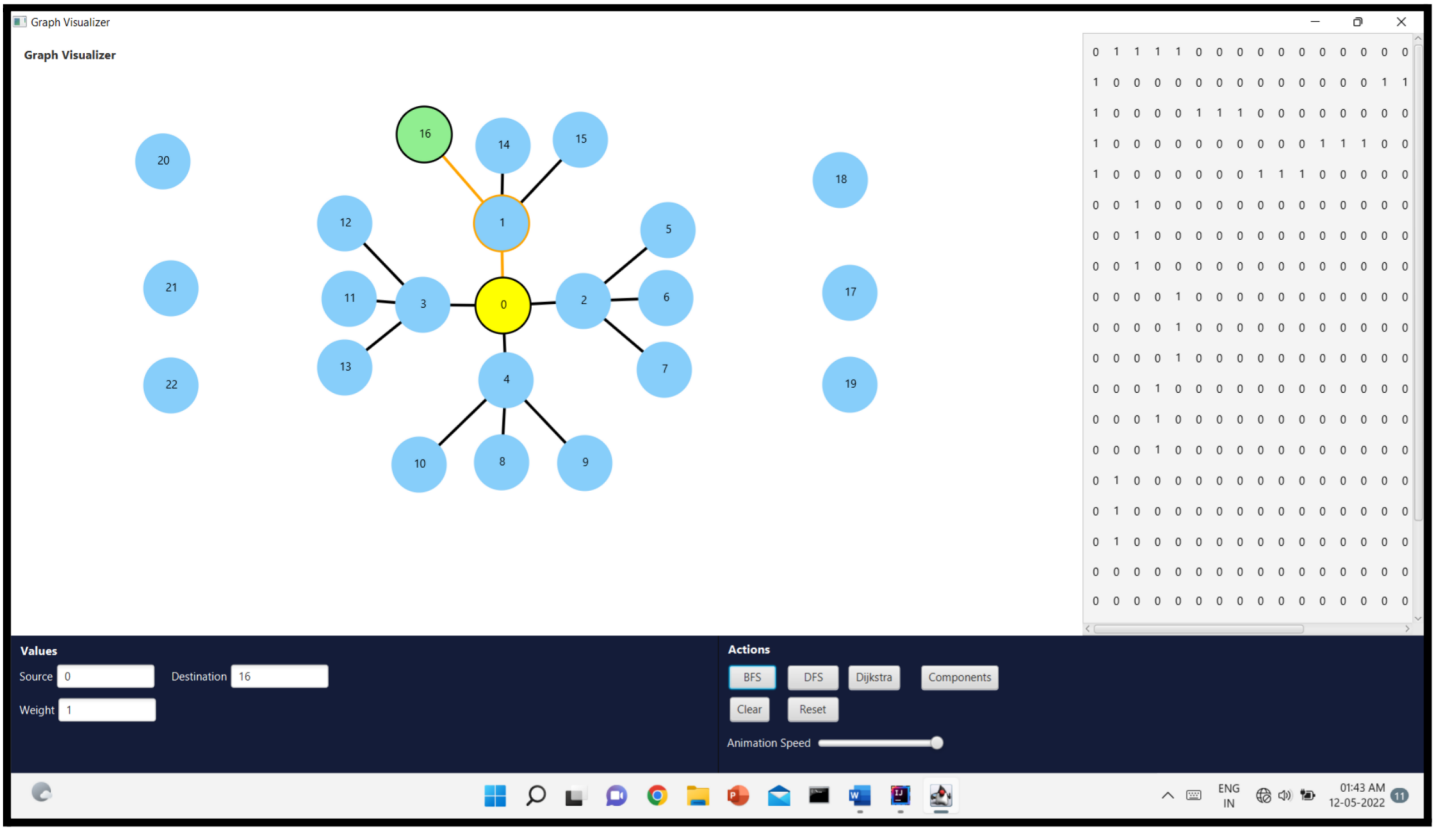
- **Conclusion using Graph**



BFS



Connected and Disconnected Components



Dijkstra's Shortest path