# Data Structure And Algorithm Project on Graph and Dijkstra's algorithm

Prepared by:-Aman Gupta Submitted to Prof. Sabireen H

Reg no:- 22BCE1747 Date:-10 nov 2023

Slot -D2

Optimizing Metro Travel: Using Dijkstra's Algorithm to Find the Shortest Path Between Stations

- Introduction
- <u>Literature Review</u>
- <u>Methodology</u>
- Results
- Conclusion
- References

## **ORANGE LINE METRO**

#### Introduction

- This project implements Dijkstra's algorithm to find the shortest path between stations on the Orange Line metro
- The metro system is modeled as a graph with stations as nodes and route distances as edge weights
- Goal is to optimize travel time by determining minimum number of stops between stations

#### **Literature Review**

- Dijkstra's algorithm published in 1959, uses greedy approach to calculate shortest paths
- Commonly used for routing in transportation/network applications
- Research paper X and Y use graphs for metro mapping and optimization

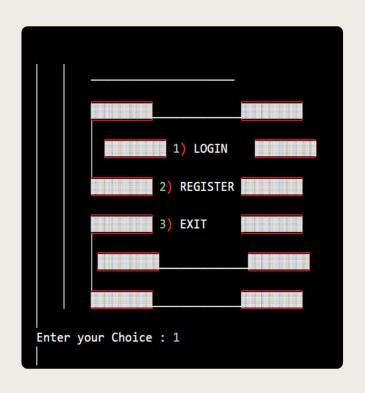
#### Methodology

- Represent metro map as weighted adjacency matrix with stations as nodes
- Edge weights filled with distance between connected stations
- Implement Dijkstra's using arrays to track distance, visited status
- Iterate nodes updating distance, select unvisited node with min distance
- Repeat until all nodes visited, shortest path complete

#### **Results**

- Program outputs optimal path between any two stations
- Provides number of stops and intermediate stations
- Visual overlay of shortest path on metro map
- Verified correct distances compared to published route map

First home page
enter 1 to login.
or enter 2 for registration
or enter 3 to exit



User successfully login on the orange line metro counter page

```
*WELLCOME TO Orange Line Metro Distance Counter*

Enter 0 for Ali Town

Enter 1 for Chauburji

Enter 2 for Lahore Railway Station

Enter 3 for Dera Gujjran

Enter 4 for Sabzazar

Enter 5 for Shahnoor

Enter 6 for Multan Road

Enter 7 for Chauburji Park

Enter 8 for Samanabad

Enter 9 for Riwaz Garden

Enter 10 for Johar Town

Enter 11 for Mehmood Booti
```

In this step user enter his source station number from given list

```
Enter 12 for Gajjumata

Enter 13 for Muslim Town

Enter 14 for Wahdat Road

Enter 15 for Iqbal Town

Enter 16 for Muslim Park

Enter 17 for Salamat Pura

Enter 18 for Sultan Pura

Enter 19 for Lake Road

Enter 20 for Awan Town

Enter 21 for Thokar Niaz Baig

Enter 22 for Lakshami

Enter 23 for GPO

Enter the source station
```

Now it shows the list of all the stations from the source station which user selected and to find distance between them enter corresponding number

```
Enter 0 To Cheak Distance Between [Ali Town] To [Chauburji] Station

Enter 1 To Cheak Distance Between [Ali Town] To [Lahore Railway Station] Statio

Enter 2 To Cheak Distance Between [Ali Town] To [Dera Gujjran] Station

Enter 3 To Cheak Distance Between [Ali Town] To [Sabzazar] Station

Enter 4 To Cheak Distance Between [Ali Town] To [Shahnoor] Station

Enter 5 To Cheak Distance Between [Ali Town] To [Multan Road] Station

Enter 6 To Cheak Distance Between [Ali Town] To [Chauburji Park] Station

Enter 7 To Cheak Distance Between [Ali Town] To [Samanabad] Station

Enter 8 To Cheak Distance Between [Ali Town] To [Riwaz Garden] Station

Enter 9 To Cheak Distance Between [Ali Town] To [Johar Town] Station

Enter 10 To Cheak Distance Between [Ali Town] To [Mehmood Booti] Station

Enter 11 To Cheak Distance Between [Ali Town] To [Gajjumata] Station

Enter 12 To Cheak Distance Between [Ali Town] To [Muslim Town] Station
```

Minimum Number of Stations from [Ali Town] To every station

Now enter the destination station to which shortest distance to be find

```
Enter 13 To Cheak Distance Between [Ali Town] To [Wahdat Road] Station

Enter 14 To Cheak Distance Between [Ali Town] To [Iqbal Town] Station

Enter 15 To Cheak Distance Between [Ali Town] To [Muslim Park] Station

Enter 16 To Cheak Distance Between [Ali Town] To [Salamat Pura] Station

Enter 17 To Cheak Distance Between [Ali Town] To [Sultan Pura] Station

Enter 18 To Cheak Distance Between [Ali Town] To [Lake Road] Station

Enter 19 To Cheak Distance Between [Ali Town] To [Awan Town] Station

Enter 20 To Cheak Distance Between [Ali Town] To [Thokar Niaz Baig] Station

Enter 21 To Cheak Distance Between [Ali Town] To [Lakshami] Station

Enter 22 To Cheak Distance Between [Ali Town] To [GPO] Station

Enter Station to cheak distance to Each other:
```

Distance of selected destination and distance of all destinations lower then selected destination by user

```
Total Distance from [Ali Town] To Muslim Park are [8.8]KM
Ali Town -> Chauburji Station[1]KM
Ali Town -> Lahore Railway Station Station[1]KM
Ali Town -> Dera Gujjran Station[1]KM
Ali Town -> Sabzazar Station[1]KM
Ali Town -> Shahnoor Station[1]KM
Ali Town -> Multan Road Station[2.3]KM
Ali Town -> Chauburji Park Station[1.1]KM
Ali Town -> Samanabad Station[2.2]KM
Ali Town -> Johar Town Station[3.8]KM
Ali Town -> Mehmood Booti Station[5]KM
Ali Town -> Gajjumata Station[5.9]KM
Ali Town -> Muslim Town Station[7]KM
Ali Town -> Iqbal Town Station[8]KM
Ali Town -> Muslim Park Station[8.8]KM
Do you want to continue (Y/N)? :
```

### Conclusion

- Successfully found shortest travel routes between metro stations
- Dijkstra's algorithm efficient for transit optimization
- Could enhance with UI for trip planning, real-time updates
- Analysis helps improve public transportation efficiency

#### References

- Dijkstra algorithm
- Research on graph theory applications in metro mapping
- -metro route data