

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

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

Reg no:- 22BCE1747

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Slot -D2

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

- Introduction
- Literature Review
- Methodology.
- 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

[illegible]

User successfully login on the orange line metro counter page

```

*WELCOME 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 Gujran
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 11 for MEHMOOD BOOTI
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
0
```

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

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

Enter 0 To Cheak Distance Between [Ali Town] To [Chauburji] Station
Enter 1 To Cheak Distance Between [Ali Town] To [Lahore Railway Station] Station
Enter 2 To Cheak Distance Between [Ali Town] To [Dera Gujran] 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
```

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:
15
```

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 Gujran 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 -> Mahmood 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)? :
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

-----END OF PROJECT-----