MINI PROJECT- DATA STRUCTURES

REPORT

CLOSEST METRO STATION

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PROBLEM STATEMENT

It makes a challenging task for the people to figure out the nearest metro station from a certain point because the Delhi metro reaches only some parts of the city. This project helps the people to find the nearest metro station from their current metro station location.

INTRODUCTION

It tells about your nearest Metro station all over globe using geo coordinates, and even tells you the route to your final metro station.

This project aims at finding the nearest metro station from the current location. All the data about the metro and their coordinates will be stored in a file and retrieved from it using file handling. We will use the concept of graph to store the coordinates of metro station retrieved from file. This uses the 'haversine' formula to calculate the great-circle distance between two points – that is, the shortest distance over the earth's surface. Then we apply Dijkstra's algorithm to search for the shortest path that covers all the main locations on the city map.

LIST OF DATA STRUCTURES AND ALGORITHM USED IN THE PROJECT

Arrays, Dijkstra Algorithm, File Handling, Geocode (API), Haversine Formula, Graph

DETAILED DESIGN OF THE PROJECT

When we run the file "code.exe" from the "Minor_project" folder, we see some options to choose. Written below-

WELCOME

Find Out Your Nearest Metro Station!!

Press 1 to find the list of all metro stations

Press 2 to find route to your desired metro station

Press 3 to find the nearest metro station

Press 4 to print reference coordinates to their stations

Press 5 to exit

IMPLEMENTATION DETAILS

First we use the Geocode API and File Handling to get all latitude and longitudes of all metro stations which were written and saved in the file earlier. Then we took data from the API with the help of File handling using “ifstream” we put the data in some selected files named “latitudes.txt”,” longitudes.txt”,” metro_reference.txt”,” metro_station.txt” in which we have latitudes , longitudes and names of all selected metro stations. Then our next task was to make graph filled with distance between every 2 nodes from the list of metro stations, for that we make some functions. We created the n*n(approx 50 metro stations) Matrix, in the matrix we stored distance between every connected node, using “Haversine Formula” to calculate distance between Geocoordinates.

Hence, the graph is created. Then we ask user to choose any option given in the

“DETAILED DESIGN OF THE PROJECT”, when we press “1” , it uses file handling to open a file named “metro_station.txt” and then the file pointer from the starting to the “End of file”, prints all the lines using “getline( )” function.

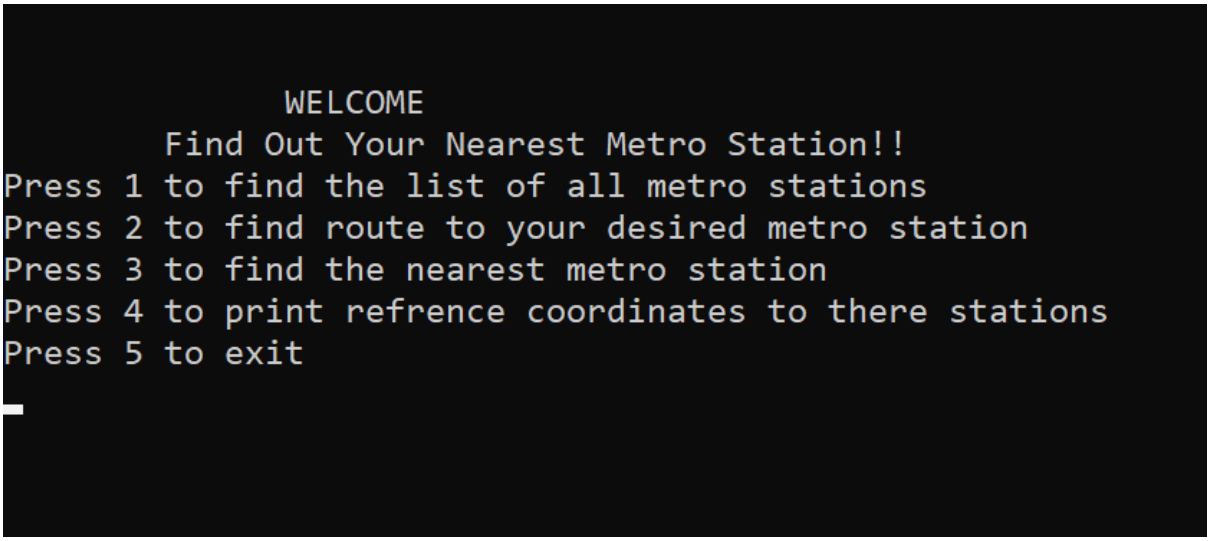
And then when we press “2” , program asks user to enter his current metro station and the metro station he wants to visit. Then the program calls the function “make_matrix” which makes graph/matrix which stores distance explained above. Then after that “Dijkstra(a,root,final)” function is called, this function prints the shortest path between the “root” node to the “final” node, in this we use the function “printlist( )” which uses file handling to print the name of the node i.e. Name of the Metro station. And also prints the distance of the whole route.

And when we press “3”, it asks user to enter his current geo coordinates i.e., Latitude and Longitude, then the program finds the nearest metro station from the entered geo coordinates.

And when we press “4” , it uses file handling to open a file named “metro_reference.txt” and then the file pointer from the starting to the “End of file”, prints all the lines using “getline( )” function. In this we have details of all the names, latitudes and longitudes of all metro station stored.

And when we press “5”, the “break” statement is called, which exits the while loop i.e., leaves the program.

RESULTS



```
1
Enter choice:Noida Electronic City
Noida Sector 62
Noida Sector 59
Noida Sector 61
Noida Sector 52
Noida Sector 34
Noida City Centre
Golf Course
Botanical Garden
Noida Sect 18
Noida Sect 16
Noida Sect 15
New Ashok Nagar
Mayur Vihar Ext
Mayur Vihar-I
Akshardham
Yamuna Bank
Indraprasta
Supreme Court
Mandi House
Barakhamba
Rajiv Chowk
RK Ashram Marg
Jhandewalan
Karol Bagh
Rajendra Place
Patel Nagar
Shadi Pur
Kirti Nagar
Moti Nagar
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Ramesh Nagar
Rajouri Garden
Tagore Garden
Subash Nagar
Tilak Nagar
Janak Puri East
Janak Puri West
Uttam Nagar East
Uttam Nagar West
Nawada
Dwaraka Mor
Dwarka
Dwarka Sector - 14
Dwarka Sector - 13
Dwarka Sector - 12
Dwarka Sector - 11
Dwarka Sector - 10
Dwarka Sector - 9
Dwarka Sector - 8
Dwarka Sector - 21
Dwarka Sector - 21
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Press 1 to find the list of all metro stations
Press 2 to find route to your desired metro station
Press 3 to find the nearest metro station
Press 4 to print refrence coordinates to there stations
Press 5 to exit
2
Enter choice:Write Your current metro station, by choosing the index from the list
0
You choosed metro station- Noida Electronic City
Now choose your destination-
6
You choosed metro station- Noida City Centre
The shortest route is-
Vertex   Distance
0 -> 6   7.49178
Path is :
 Noida Sector 62
 Noida Sector 59
 Noida Sector 61
 Noida Sector 52
 Noida Sector 34
 Noida City Centre
```

```
             WELCOME
       Find Out Your Nearest Metro Station!!
Press 1 to find the list of all metro stations
Press 2 to find route to your desired metro station
Press 3 to find the nearest metro station
Press 4 to print refrence coordinates to there stations
Press 5 to exit
3
Enter choice:Write Your current location, by choosing your current latitude(between -180to+180)
66.76
Write Your current location, by choosing your current longitude(between -180to+180)
77.23
Nearest metro station from your location is- Subash Nagar
Press 1 to find the list of all metro stations
Press 2 to find route to your desired metro station
Press 3 to find the nearest metro station
Press 4 to print refrence coordinates to there stations
Press 5 to exit
```

```
Press 1 to find the list of all metro stations
Press 2 to find route to your desired metro station
Press 3 to find the nearest metro station
Press 4 to print refrence coordinates to there stations
Press 5 to exit
4
Enter choice:metro stations                                     Latitude        Longitude
Noida Electronic City                                   28.627941       77.37493
Noida Sector 62                                         28.627981       77.3648567
Noida Sector 59                                         28.6075627      77.3683319
Noida Sector 61                                         28.5960875      77.3683319
Noida Sector 52                                         28.5874806      77.3683319
Noida Sector 34                                         28.5838004      77.3597194
Noida City Centre                                       28.5747806      77.3567233
Golf Course                                             37.0561339      -95.9179603
Botanical Garden                                        36.2068298      -96.0621449
Noida Sect 18                                           28.570317       77.3218196
Noida Sect 16                                           28.5773799      77.3144936
Noida Sect 15                                           28.585037       77.3116409
New Ashok Nagar                                         28.5891169      77.3020569
Mayur Vihar Ext                                         28.6146243      77.3121575
Mayur Vihar-I                                           28.6083697      77.293112
Akshardham                                              40.2533659      -74.5774575
Yamuna Bank                                             28.6232773      77.267911
Indraprasta                                             51.0640823      7.0038584
Supreme Court                                           41.6577137      -95.3177505
Mandi House                                             33.4145557      -111.9109164
Barakhamba                                              28.6286321      77.2269889
Rajiv Chowk                                             28.632986       77.219374
RK Ashram Marg                                          28.63922        77.2085967
Jhandewalan                                             28.6472827      77.2028368
Karol Bagh                                              28.6550458      77.1888201
Rajendra Place                                          28.6432533      77.1779925
Uttam Nagar West                                        28.6217542      77.0558111
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Rajendra Place                          28.6432533      77.1779925
Patel Nagar                             28.6554182      77.16462
Shadi Pur                               28.651027       77.1562196
Kirti Nagar                             28.6493776      77.1436998
Moti Nagar                              28.6623452      77.1410809
Ramesh Nagar                            28.65109        77.1326969
Rajouri Garden                          28.6417002      77.1224529
Tagore Garden                           28.648876       77.1096829
Subash Nagar                            32.7449706      74.8455958
Tilak Nagar                             28.6389315      77.0866811
Janak Puri East                         28.6330298      77.0866711
Janak Puri West                         28.6294195      77.0776578
Uttam Nagar East                        28.6248053      77.0653064
Uttam Nagar West                        28.6217542      77.0558111
Nawada                                  24.8866859      85.5434572
Dwaraka Mor                             28.6191983      77.0322963
Dwarka                                  22.2441975      68.9684562
Dwarka Sector - 14                      28.6038371      77.0290995
Dwarka Sector - 13                      28.598662       77.0348573
Dwarka Sector - 12                      28.5937647      77.0434934
Dwarka Sector - 11                      28.5914547      77.0492504
Dwarka Sector - 10                      28.5849492      77.0582844
Dwarka Sector - 9                       28.5744621      77.0652246
Dwarka Sector - 8                       28.5720379      77.070837
Dwarka Sector - 21                      28.5522057      77.0583048
Dwarka Sector - 21                      28.5522057      77.0583048
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CONCLUSION

After Completing the project named ("Nearest Metro Station"), we can conclude following points.

-> In this project we tried to find out the shortest distance from your given location to destination.

->We used file handling to read latitude, longitude and metro station.

->We used Haversine Formula” to calculate distance with Geocoordinates of connected nodes.

->For finding shortest path, we implemented Dijkstra algorithm .