

Find The Shortest Route With The Help Of Network Analyst

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Abstract—Network Analysis is a network based spatial data analyst tool in gis for giving us routing service area and shortest route to calculate the distance.By Using Opensource data Open Street Maps I done network analysis for Karachi city of Pakistan to find the shortest distance and service area between different point of interest.(destination)

Keywords—Gis, Opensource, Qgis,NetworkAnalyst,OSM,Arcgis

INTRODUCTION (KARACHI,SIDNH, PAKISTAN)



Karachi is the city of Pakistan and it's a province of Sindh.Karachi is major commercial and industrial part where as it is located on the coast of Arabian sea and also indus river pass from it .Karachi have also railway system in terms of transportation where there goods are pass from city to interior and they have also sea port.Karachi have more than

2000 schools and more than 90 university both private and government Karachi university is the primary institution of higher education system. Karachi population as of 2021 have estimation of 16459000. So they have good transportation and road infrastructure.

METHODOLOGY

I started preparing the road network and point of interest digitized with the help of google earth satellite image and giving information that is attribute information such as name of road .In gis there are three type of geometry that is line ,point and polygon so I digitized roads with the help of line features in opensource qgis software and point of interest in point geometry giving attribute like which place it is of each geometry spatial feature on their attributes and prepare the road network of Karachi.I randomly selected point of interest to find out the best shortest route with the help of network analysis tool in arcgis Network Analysis (Shortest Path).

Data Preparation

Network analysis shortest path tool is calculated the shortest or fastest path based on the road geometry. The below map showing the shortest route between govt college formen and zubaida heights. the speed limit on that road is 40 KM

.We can also calculate the time the formula to calculate the time =velocity/distance. The shortest distance covered is 590 meters and it's a residential area of liaquatabad so there speed limit is 40 so we found the time covered with ideally if car is going on the speed of 40 so they covered in the approximate less than 1 minute.

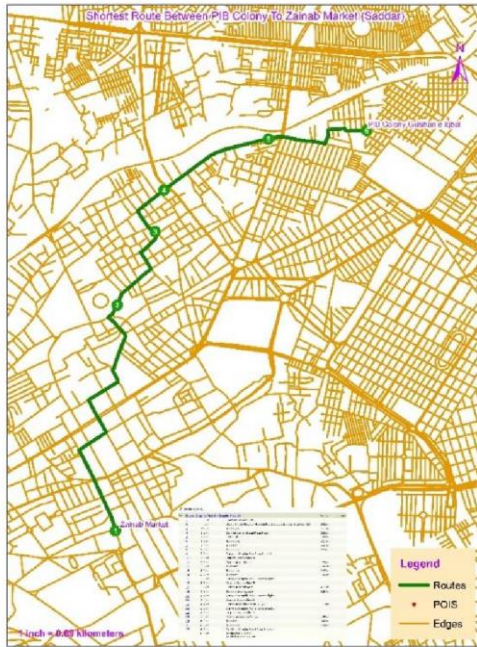
Building Network Topology

There are necessary steps in building network analysis that your geometry is accurate snapping wise and there are no topological errors in it .By using topology tool and data reviewer tool I make my data perfect for topology by using different topology methods such as line must not overlap with others line must not intersect with other line and from data reviewer tool invalid geometry checking .The road network is line feature so we used line topology on it.

B.Shortest Route Between Places



1. The above map showing shortest route between Govt College Formen to Zubaida heights the best possible short route. The direction table on layout also showing the distance and directions so that we can know the exact direction on the road.



The above map showing the shortest route between PIB Colony to Zainab Market. At The speed of 40 Km/Hr the person arrived in less than 1 minute covered the distance 5.5 KM.



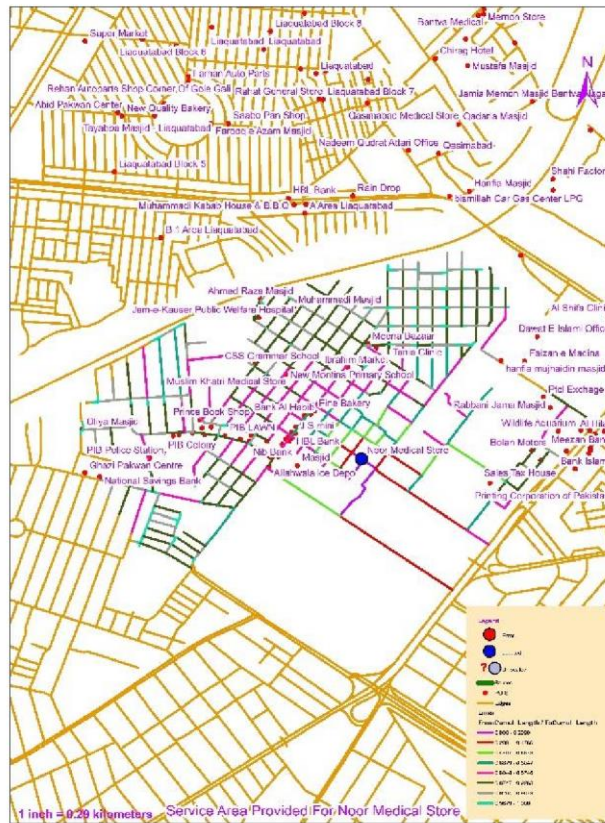
The above map showing the shortest route between famous restaurant nandos to teen Haiti chowk to get the best possible short route if there are no restriction between these path roads.

Service Area

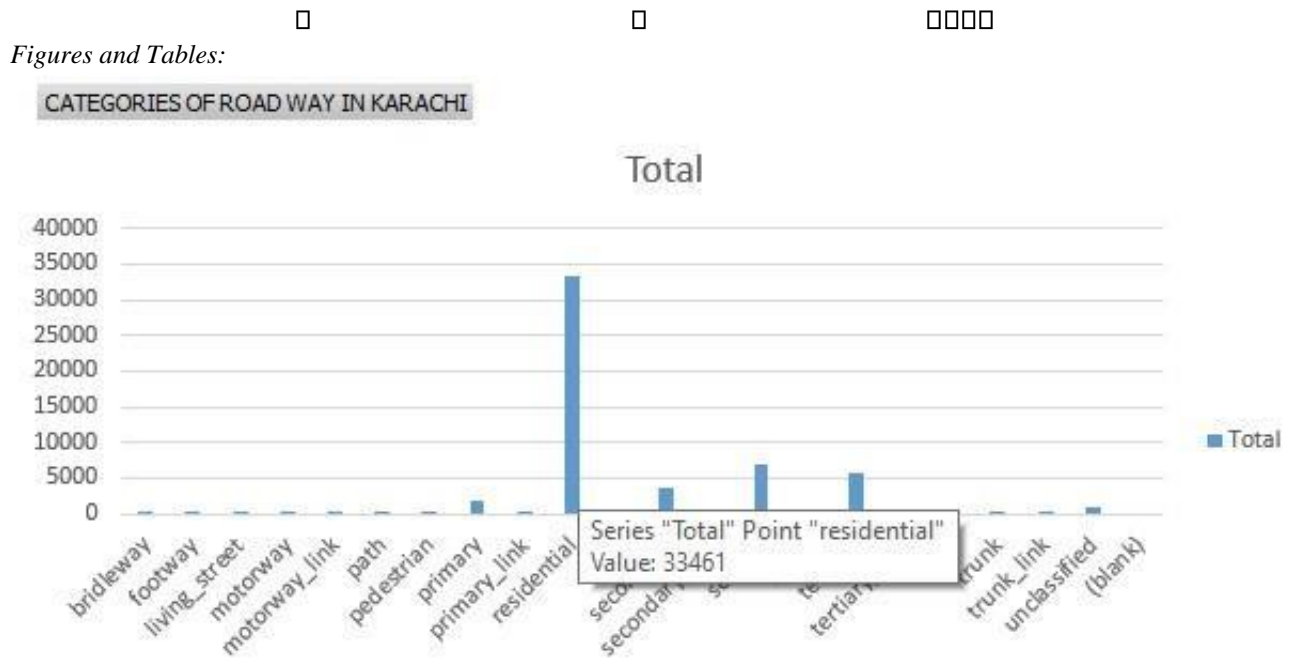
Network analyst tool service area help to identify how many people or how much land is within neighborhood or region.



The above map showing the service area of urdu bazar location with in 5 km range how many area they covered or provide facilities .The blue lines on map showing the range of routes.



The above map showing the service area of noor medical store. Its showing cumulative length divided into different 8 classes to define more range of it.



The above graph showing bar graph distribution of roads in Karachi the vertical axis showing type of roadway categories where as horizontal axis showing length in km.

Karachi is industrial and residential area so residential roads are much higher as compare to other categories.

| CATEGORIES OF ROAD WAY IN KARACHI | |
|-----------------------------------|----------|
| type | Total |
| bridleway | 16.00 |
| footway | 151.00 |
| living_street | 150.00 |
| motorway | 435.00 |
| motorway_link | 225.00 |
| path | 1.00 |
| pedestrian | 3.00 |
| primary | 1810.00 |
| primary_link | 238.00 |
| residential | 33461.00 |
| road | 500.00 |
| secondary | 3609.00 |
| secondary_link | 188.00 |
| service | 7028.00 |
| steps | 3.00 |
| tertiary | 5660.00 |
| tertiary_link | 299.00 |
| track | 114.00 |
| trunk | 164.00 |
| trunk_link | 108.00 |
| unclassified | 926.00 |
| (blank) | |
| Grand Total | 55089.00 |

The above table is showing categories wise roadway distribution of Karachi network road measure unit is kilometer .Total network area is 55089 approximately.By using qgis and excel we can find out our road length . their accurate location and by this we can also planned that how much infrastructure length wise we needed to built .

Conclusion:

By using network analysis we can find the shortest route and this technique will benefit for health care industry,fire emergency industry and tracking industry to get accurate location in gis.By doing different analysis we not only find service area which is benefit for Pharma industry and grocery industry to get the real result from which area their product are selling and where they want more products supply and demand will know visually and mathematically.