

ANALYSIS OF ROAD NETWORK USING REMOTE SENSING AND GIS DATA Udham Singh Nagar District (Uttarakhand)

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Abstract- Google earth image of Udham Singh Nagar city has been used for this study. Digitization was carried by using Shape file generated for different analysis. The network analysis tool was used to measure the efficiency of services in terms of time and distance. It also help in analyzing the gap existing in the facility, and defining service areas based on travel time and distance covered. The present study tries to analyze the potential use of network analysis Udham Singh Nagar lies in the neighborhood of the Kumaon region and was a part of the Nainital district before it was divided in October 1995.

1.INTRODUCTION

A network is a system of liner feature that has the appropriate attribute for the flow of objects. A network is a system of interconnected elements, such as lines connecting points. Examples of networks include highways connecting to cities, streets interconnected to each other at street intersections, and sewer and A GIS function called network analysis was used to calculate the time necessary for emergency vehicles to travel from the fire stations to different areas of the city. One major application of network analysis is found in transportation planning, where the issue might be to find paths corresponding to certain criteria like finding the shortest or least cost path between two or more locations, or to find all locations within a given travel cost from a specified origin. Traditionally, a GIS, represents the real world in either one of two spatial models, vector-based, i.e. points, lines and polygons, or raster-based, i.e. cells of a continuous grid surface. This study will investigate the subject of network analysis in both raster and vector GIS, in order to compare the two spatial models. It will discuss their limitations and advantages, by using a road network as an example (Transport voluntary). Network analysis is useful for organization that manages or uses networked facilities, such as utility, transmission, and transport systems. Utilities employ network models to model and analyze

their distribution systems and meter-reading routes. Municipal public works department use network to model, analyze bus and trash routes, whereas businesses use them to plan and optimize the delivery of goods and services. Network analysis can also be applied to retail store planning. For instance, solving of the driving times can aid in the determination of retail store trade areas. Network instance, solving of the driving times can aid in the determination of retail store planning. For instance, solving of the driving times can aid in the determination of retail store trade areas.

Therefore network provides the movement of people and goods, the delivery of services the flow of services as well as communication of information. Three Principal types of network analysis are network tracing, network routing and network Allocation

1 NETWORK TRACING

Network tracing determines a particular path through the network. This Path is based on Criteria provided by the user.

1.2 NETWORK ROUTING

Network routing determines the optimal path along a linear network. The selection of the Path can be based on numerous criteria such as "shortest distance," "fastest route," "no left turns" and minimum cost." The path can pass between two points or through several selected Points.

1.3 NETWORK ALLOCATION

As well as one of the most important processes in the Planning and investment activities is Network allocation. GIS has been commonly used in different fields such as tourism activities enabling people from different countries

and cultures to interact with each other. Tourism is a way of conserving the environment, creating jobs and promoting tourism. Both geographic Information system (GIS) and network Analysis are burgeoning fields, characterized by rapid Methodological and scientific advancement.

3. Location Study Area

The district is situated in between 28°59'N 79°24'E to 28.98°N 79.40°E 0Udham Singh Nagar is a district of Uttarakhand state in northern India, Rudrapur is the District Headquarters. On its north, it is bounded by the block of Nainital District . On its south west, the block shares boundaries with Uttar Pradesh. To its east lies the champawat, Nepal and Uttar Pradesh. Udham Singh Nagar lies in the neighbourhood of the Kumaon region and was a part of the Nainital district before it was divided in October 1995. The district is located in the Terai region and is part of the Kumaon Division. It is enclosed by Nainital district on the North, Champawat district on the Northeast, Nepal on the East and by Uttar Pradesh state on both the South and West

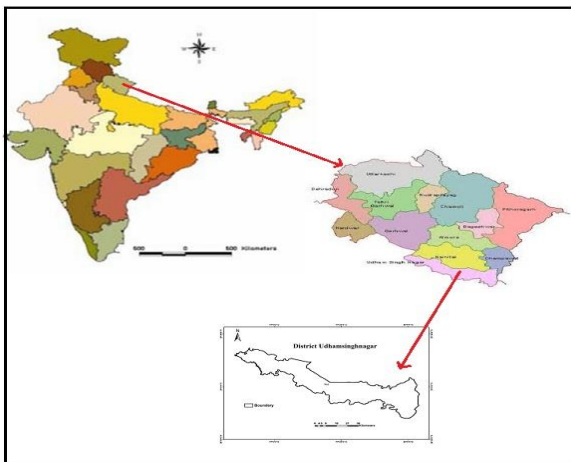


Figure-1: Location Map Udham Singh Nagar

4. NETWORK ANALYSIS

Network analysis in a GIS may be dependent on the utilities under concern, as each utility service would have customized requirement as discussed above. However, fundamental to these entire requirements would be the following analysis:

4.1 PATH DETERMINATION

Path finding is the process of calculating an optimal path through series of points in a network and simulating the flow of resources through them. Path finding function could be categorized into two major groups, the applications of which are different.

4.2 SOURCE – DESTINATION PATH

An optimal path is from a pre-defined source to a pre-defined destination. In the case, the path of least resistance is determined from the source to the destination by evaluating the link

4.2 OPTIMAL CYCLIC PATH

Mainly as an implementation of the set-covering problem, an example of which could be the Traveling salesman's Problem. In this case, the problem is to determine the optimal path after visiting all or a specified set of links in the networks. In this case, the optimal path is determined from a matrix of resistance for each pair of links in the network. The matrix is evaluated to determine the order of visiting links in the network and to define the actual path.

4.2.1 Route analysis layer

This layer contains the input network locations (stops and barriers), properties, and the resultant route or routes of a route analysis.

4.2.2 Closest facility analysis layer

This layer contains the input network locations (facilities, incidents, and barriers), properties, and the resultant route or routes of a closest facility analysis.

4.2.3 Service area analysis layer

This layer contains the input facilities and barriers, properties, and the resultant of service area Polygons and service area lines

4.2.4 OD cost matrix analysis layer

This layer contains the input origins and destinations, properties, and resultant of an OD cost matrix analysis.

4.2.5 Vehicle routing problem analysis layer

This layer contains the input network analysis objects (orders, depots, routes, depot visits, breaks, route

route seed points, route renewals, specialties, order pairs and barriers), properties, and the results of a vehicle routing problem analysis.

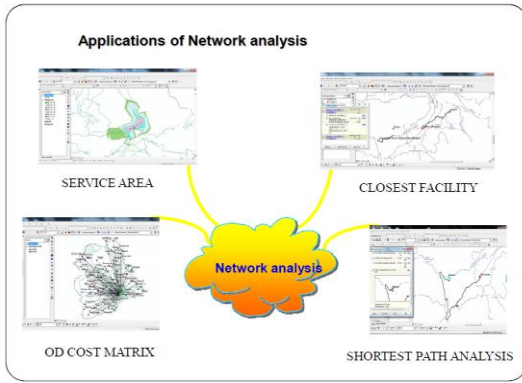


Figure-2: Application of Network Analysis

ArcGIS Network Analyst allows you to solve common network problems, such as finding the best route across a city, finding the closest emergency vehicle or facility, identifying a service area around a location, or servicing a set of orders with a fleet of vehicles.

ArcGIS Network Analyst allows you to solve common network problems, such as finding the best route across a city, finding the closest emergency vehicle or facility, identifying a service area around a location, or servicing a set of orders with a fleet of vehicles. The reason for finding the shortest path between two places is to connect by the best route which can be in terms of length or time. It is the best way to get from one location to another or the best way to visit several locations. It determines the order of location specified by the user. It can be Quickest, fastest or most scenic route depending upon impedance because it can be depend upon Impedance (cost attribute) chosen by the user.

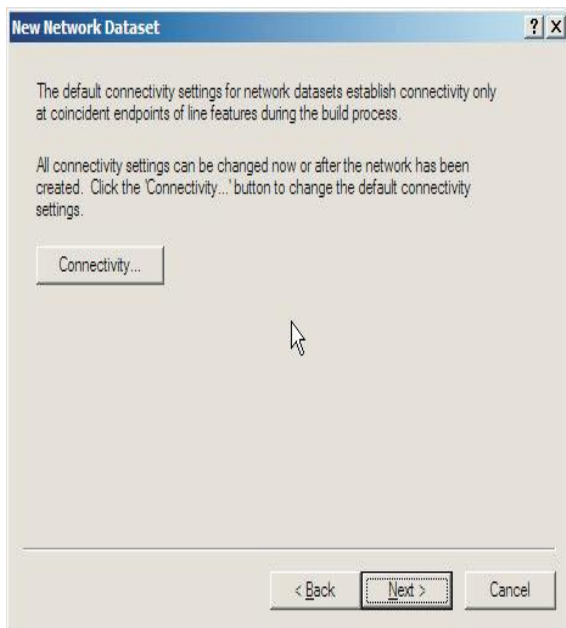


Figure-3: NETWORK ANALYSIST TOOLBAR

5.OVERVIEW OF THE NETWORK MODELNETWORK ANALYSIST TOOLBAR

4. RESULT AND DISCUSION

Network analysis is used for identifying the most efficient routes or paths for allocation of services. This involves finding the shortest or least-cost manner in which to visit a location or a set of locations in a network.

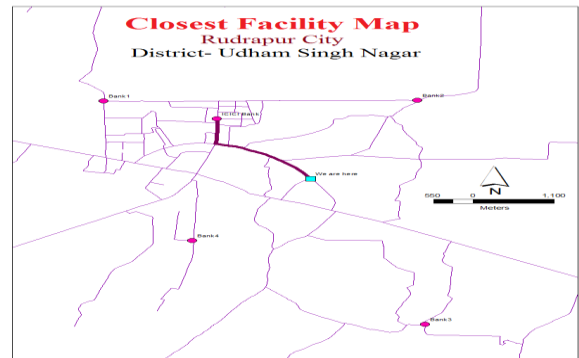


Figure-4: closest facility Map

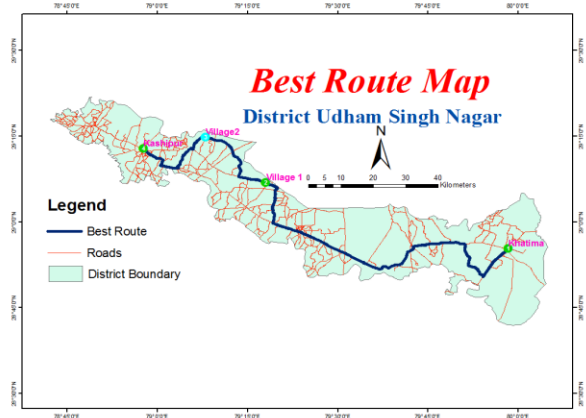


Figure-5:Best Route Map Udham Singh Nagar

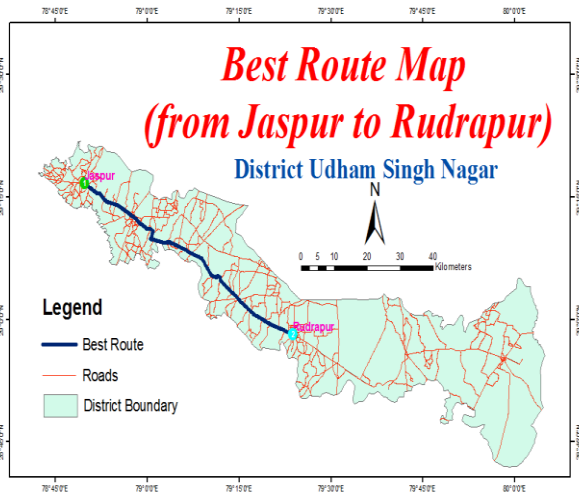


Figure-6: Best Route From Jaspur to Rudrapur

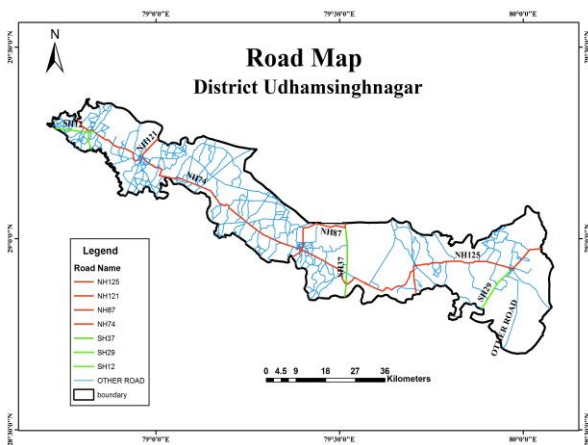


Figure-7: Road Map Udham Singh Nagar

5. CONCLUSION

This paper introduced the ArcGIS transportation data model for Udham Singh Nagar. Through the well-established vector data structure, GIS has provided an efficient means for organizing basic transportation-related data in order to facilitate the input, analysis, and display of transport networks.

The ArcGIS Transportation Data Model is designed to help in the development of transportation Applications. It does so by providing a context within which a transportation system can be described, and assisting in the development of a geodatabases. The ArcGIS Transportation Data Model takes advantage of the flexibility of Object Orientation to define entities and the relationships among those entities.

The present work was carried on with the motive of finding the shortest route. The road network of the study area is very poorly planned, they are quite narrow to allow big vehicles to move motley, most of the roads are suitable for pedestrians only.

REFERENCES

- [1] The concept of network analysis uses Dijkstra algorithm (Dijkstra, 1959) to visualize the network pattern of street structure. In the work of Napong and Fujii (2004)
- [2] Scott, N., Copper, C., & Baggio, R (2008). Annals of tourism research. Destination Network: Theory and practice in four Australian cases
- [3] Transport Network Analysis of Kasaragod Taluk, Kerala Using GIS. (Ullman, 1954).
- [4] Spear, B. D and Lakshmanan, T. r. (1988) the role of GIS in transportation planning and analysis Geographical System.
- [5] Kang-tsung chang 2008, Introduction to geographic information systems, Tata McGraw-Hill Publishing Company Limited NEW DELHI, Fourth Edition. (Chapter-18, Path analysis & Network application) pg. no.377, 383, 387 to 394.)
- [7] Nyerges, T. L (1990) Location referencing and highway segmentation in a geographical information system ITC Journal, 60(3). 27-31