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LATUR TOWN ROADWAYS NETWORK ANALYSIS AND PLANNING BY USING GIS AND RS

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ABSTRACT

Roadways Network Analysis of Latur City by using Geographic Information System and remote sensing, the study is performed to analyze the Roadways network. With the help of advanced technology i.e. Remote Sensing (RS) and Geographic Information Systems (GIS), a Roadways network analysis within these surroundings has now become a common practice in many application areas. But the Roadways network, which is one of the spatial features and which is to be greatly analyzed using GIS. The main problem in the Roadways network analysis is the less quality and lack of maintenance plans. This is because of the insufficient funds for infrastructure.

GIS can help to store, manipulate, and analyses physical, social, and economic data of a city. Planners can then use the spatial query and mapping functions of GIS to analyses the existing situation in the city. Through map overlay analysis, GIS can help to identify areas of conflict of roadways network with the environment by overlaying existing maps. Areas of environmental sensitivity can be identified using remote sensing and other environmental information. The implementation of newly evolving technologies such as Geographic Information System (GIS) can help to improve the decision-making process in this area for better use of the available limited funds. Geospatial technologies offer adequate opportunities in studying, quantifying and monitoring urban systems both in spatial and temporal aspects. The paper reviews the applications of GIS technology for Roadways network analysis of Latur City.

KeyWords

GIS, Remote sensing (RS), Network, Roadways, Town planning, Analysis, Maps.

I. INTRODUCTION:

Geographic Information System (GIS) is a computer system build to capture, store, manipulate, analyze, manage and display all kinds of spatial or geographical data. GIS applications are tools that allow users to perform spatial query, analysis, edit spatial data and create hard copy maps. In simple way GIS can be define as an image that is referenced to the earth or has x and y coordinate and its attribute values are stored in the table. These x and y coordinates are based on different projection system and there are various types of projection system. A geographic information system (GIS) lets us visualize, question, analyze, and interpret data to understand relationships, patterns, and trends. (ESRI)

GIS can effectively use for the management of roadways networks and traffic problems. Today's population along with the road traffic is increasing exponentially. The advantages of GIS make it an attractive option to be used to face the emerging traffic problems. By creating an extensive database that has all the traffic information such as speed data, road geometry, traffic flow and other spatial data and processing this information will provide us the graphical bigger picture for the traffic management.

In urban planning, Roadways network analysis plays an important role to make better decisions. A GIS can be used to monitor transport network, conditions of a network, shortest or best route to reach destination and closest services. The benefit of GIS is not only user-friendly access and display, but provides spatial analysis. This Spatial analysis can be used to identify more data to discover new relationships.

Geographic Information Systems (GIS) technology is more useful in management functions and decision support systems which are more helpful in the planning process of urbanization. These RS and GIS application can support a variety range of planning, analysis and decision support system operations that can make extraordinary effect to the development and growth of urban areas [1]. Instead of finding the

optimal solutions for urban problems, brave approaches must be developed on the usage of empirical problems, making it capable of supporting the dynamic requirements of the urbanization. It is not possible to make relationship between the crossing attribute data with respect to the topological and spatial relationship. To identify the spatial link between Transport Network and Town planning, an existing database is useful. In traditional GIS a Toposheets were the only medium which were available to visualize the Transport network [2]. Generally Roadways planning consists of various individual modules. These modules can be Road type (width of road), path management, traffic management and accident related data. As per the population within that area the transport network structure should be redesigned. This may be to increase road width, make one ways, and identify the parking area. The use of GIS technology in development of Urbanization; the Roadways information system and management can provide a very strong solution. Information related to Roadways network is used in the efficient planning, designing, construction, maintenance and management of the transport system [3]. Latur city Network consist a National Highway, State Highway, District Road, Major city Road & so on. In this study we will focus on Latur city road network.

II. LITERATURE REVIEW

Geographic Information Systems (GIS) technology is more useful in management functions and decision support systems which are more helpful in the planning process of urbanization. These RS and GIS application can support a variety range of planning, analysis and decision support system operations that can make unusual effect to the development and growth of urban areas. Instead of finding the optimal solutions for urban problems, bold approaches must be developed on the usage of investigative problems, making it capable of supporting the dynamic requirements of the urbanization [4,5,6,7]. The following operations are required to generalize a road network.

1. Classification: It identifies an object and makes groups according to properties. For easier selection and more accurate roads depends on the good classification.

2. Selection: Select particular road at the target scale.

3. Elimination: Eliminate shorter road of a certain length.

4. Simplification: selected roads can be simplified to reduce the details. Ex. Remove extraneous bends of roads.

5. Typification: This is manual editing approach. It reduces the Network density and simplifies the distribution and the pattern of the network.

6. Symbolization: To represent features on maps, graphic marks are used. Ex. Road Name, Road Number.

III. METHODOLOGY

In first phase of methodology the acquisitions of preferred data should be done. The data such as topographic sheets like 1:50,000 or satellite images with good resolution or aerial photographs. If Toposheets are there then it should be scan with the defined resolution suggested. It should be Digitize with a defined zoom level, so all the features can be digitized in number of layers. In next phase perform the GPS survey for maximum ground control points of every Area of Interest (AOI) on the known roads / important places. If there is another registered image then image to image registration should be performed. And if the administrative boundary is there, then it should clip the selected area according to administrative boundary. In Quantum GIS 1.7.0, it is possible to extract the region of interest (ROI). This ROI consist two

types of features the first one is polygon feature and second one is line feature. The polygon feature represents the Latur City boundary, from this City Boundary was extracted. The line feature represents the Transport Network of Latur City. By using the Latur City boundary, the road line feature were clipped and saved with a different name, so it shows

only the Road Network which comes within the Latur City boundary, shown in Fig. 1. Methodology of Roadways Network Analysis [4, 7].

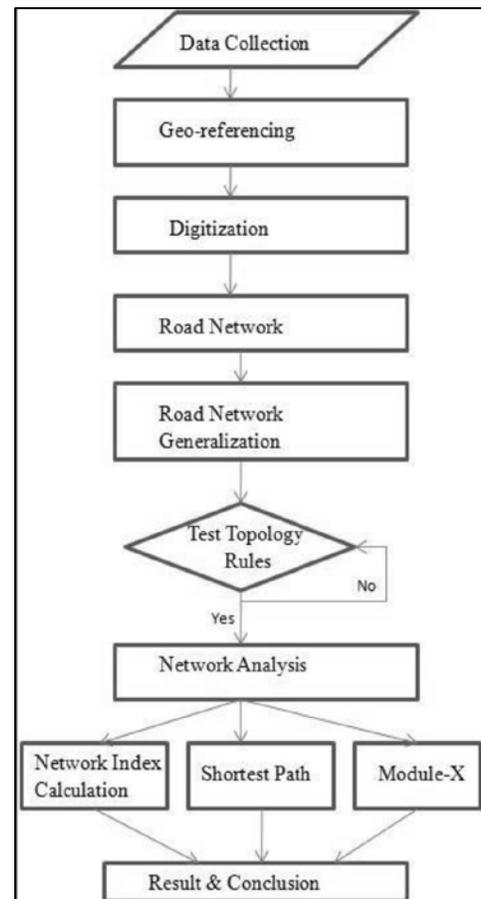


Fig.1. Methodology of Roadways Network Analysis

A. Extraction of AOI

After the collection of data, the first step was performed in Quantum GIS 1.7.0 is used to extract the interested region. The interested feature has two types of features the first one is polygon feature and second one is line feature. In this data the polygon feature contains the City boundary of Latur, and Line feature contains the road Network of Latur City. By using Quantum GIS 1.7.0 software, Latur City boundary was extracted from the Latur district boundary. This task is performed using attribute data. After this clip the road network with Latur City,

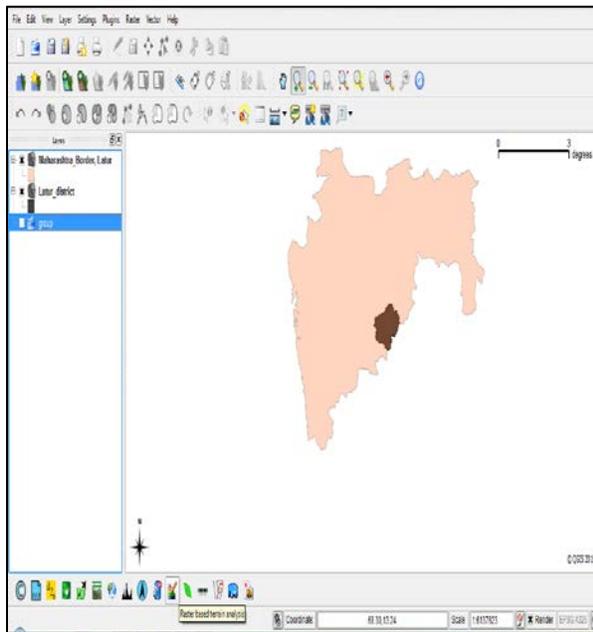


Fig 1.1: Extraction of Latur City from Maharashtra State

which shows only those roads network which comes within the Latur City boundary. For this purpose an Analysis (Clip) tool was used. This tool is used to cut out a piece of one feature class using one or more of the features in another feature class. By using this tool we get Transport Network, which comes within the Latur City boundary only [4, 6, and 7].

B. Road Generalization

The next step is a Road Generalization. These geometric operations are involved selection, merge, symbolization, elimination etc. The Road Network data having a category Road Type, like 'National Highway', 'State Highway', 'District Road', 'Major City Roads' and 'sub Roads'. By using this classification the selection process was performed. So only those roads are there which is 'National Highway', 'State Highway', 'District Road' and 'Major City Roads', it means the 'Sub Roads' and those roads are having null value are removed. This process is nothing but Elimination process [6], [7].

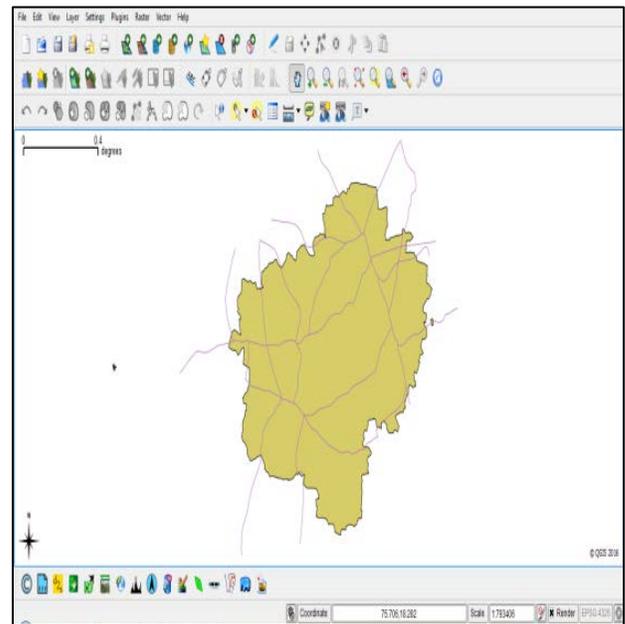


Fig. 1.2: Road Network of Latur

IV. CONCLUSION

By using GIS software display all the spatial and attribute data about – the road, road type and land use, administrative/ constitutional boundaries etc. It also performs the network analysis on that, so the accuracy of the data will be good and it can be used for further processing. The network analysis is more important because, data can be used in multiple application area like shortest path, tour analysis, etc. After detection of road network with the help of GIS application, still for more accurate network analysis road generalization process should be performed. If there are any errors, it can be removed by applying topological rules. Now the resultant network is perfect for the analysis. The study reveals that the Latur City is good in Roadways facilities; also it reveals the importance of GIS in the field of administration for the Local Governments especially the Municipal Corporation government bodies.

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