

Developing Thematic GIS Database Integrating Road Network Management System: A Review

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Abstract - The urban road network plays a crucial role in the urban spatial structure. It is the key city social-economy activities and transportation carrier. Know a day due to high number of vehicles and the condition of road. In running the activities, the City requires the data and information that are more accurate and relevant to the field of development planning and the availability of accurate data and information become a very important part in supporting the management and accident study of an area development planning decisions of government. Therefore, in this study will develop a thematic platform of GIS-based database applications to help government area of the City to explore and exploit the potential for economic progress and development of the road network with the administrative area for analysis of accident study and to provide/prepare GIS based information management system. Development of a GIS database that will be made to have the ability to store large volumes of data which can later be used for a variety of GIS-based application that covers some essential thematic elements, i.e. high school data base information system.

Key Words: Accessibility; Road Network Evaluation; GIS; Route, Thematic mapping, Spatial Analysis

1. INTRODUCTION

Transportation System is a critical component of urban infrastructure and the link of the city. It plays a significant role in the economic growth of that cities. An efficient route planning and accessibility facilitate and produce sustainable development. Road network data allows to enable a variety of services and source of information which include accident data analysis using thematic mapping methods. Complicated networks data of roads require analysis to expand the movement of people, goods, services, and the flow of resources in well manner. The non-spatial data of the road network is collected to develop the database (catalogue) of road network and an optimal route.. The result of analysis includes the directions to travel on that route. GIS based road management system applications are used broadly by in different areas of transportation planning and engineering, from infrastructure planning, design and management, traffic safety analysis, transportation impact analysis, public transit planning and operations to intelligent transportation systems.

2. REVIEW OF LITERATURE

Jones et al., (1996), A study on traffic accidents using GIS and spatial-temporal methods was done in 1996 in Norfolk, UK. In this study K-function analysis method was used for identifying the presence or absence of hotspot clustered. The researchers, by finding centralized clustered accidents, were able to reduce the number of accidents in these spots.

Richard C. Smith et.al,(2001), this study tries to bridge the gap between the desire to implement highway safety analysis within an organization and the development of a Geographic Information System – Transportation (GIS-T) infrastructure to support that effort which includes how GIS manages road network data and how in GIS route data are different from road network data, the benefits that GIS technology offers in general analyses, including display, spatial, and network evaluations, as well as cell-based modelling as well as the process of integrating GIS and safety data

Jemil Awel (2007), study on GIS based road network analysis in the sub city of Adis Abeba, this study is use GIS software for analysing, integrating and displaying information(data's). by using distance by taken as impedance in order to find the best path and the closest facility and that of travel time is taken as independence in order to find the service area.

Anuj Bariar¹ et al., This study present work deals with the development of geospatial database for urban planning through the use of satellite data and other collateral data under GIS environment. By using digital data is used for the various thematic layers generated include land use pattern, road network, water supply, solid waste disposal, soil map, ground water potential map, etc. and these have been integrated with socio-economic and demographic data of the city to model the urban growth of the city.

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Ritesh R Kakade (2013), Study to prepare Road Network Analysis Using Geo-informatic Technique for Akola City. This study discuss on network Analysis aims at finding solutions to routing problems related to reversibility, rate of flow, and network connectivity. It helps in finding efficient route for services to be provided like finding the closest service area like hospitals to during accidents, the to find the closest police stations to a crime scene and the closest store to a shopper's address by easily finding a modest route between the required locations or one that visits several locations, people usually tries to take as the best route.

2.1 Finding from Literature

Currently GIS is critical method for thematic map analysis for easily understand for the user and combination of road information (spatial and non spatial) together. There are some new features that are commonly encountered on road networks which may current difficulties: for example, streets with different access permissions or turning restrictions, setup a new speed breaks with in short distance in the cities and the illness of the road. The network should also can take new information and recalculating routes. To carry out such operations it is important to construct an appropriate network information. Therefore, the integral capabilities of the technology offered in a GIS were looked upon as one having a great potential to successfully accommodate to the specified requirements. In addition to this when we observe Google earth provides the route that can be followed between any two points selected, but the route would be shown by using the major roads only. But the route displayed would not consider the short paths or any obstacles; it is a major disadvantage when the route has lots of obstacles like accidents, road damage due to floods, road repair as well as establishment of new speed breakers etc. With the help of ArcGIS, it would overcome these problems by showing the shortest path weighing all the routes available between the points selected by using information on the route that is provided would be the best considering all the alternatives.

REFERENCES

- [1] [1]. Ajay D. Nagne, Bharti W. Gawali, 2013. "Transportation network analysis by using Remote Sensing and GIS a review", International Journal of Engineering Research and Applications (IJERA), May-Jun 2013.
- [2] [2]. Arnold, P., Peeters, D. and Thomas, 2004. Modeling a Rail/Road Intermodal Transportation System. *Transportation Research* (40), 25-52.
- [3] [3]. Atsuyuki Okabe, Kei-ichi Okunuki and Shinno Shiode (2006) A Toolbox for Spatial Analysis on a Network. *Geogr. Anal.*, 38(1), 57-66
- [4] [4]. Er. Sarbjeet Kaur, "Shortest path finding algorithm using ant colony optimization", *International Journal of Engineering Research & Technology (IJERT)*, June 2013.
- [5] [5]. Gopala Raju, Durga Rani K, Balaji, "Analysis of road network in Visakhapatnam city using geographical information systems" *Indian J. Innovations Dev.*, Vol. 1, No. 5 (May 2012).
- [6] [6]. Hu Weiping, Wu Chi, "Urban road network accessibility evaluation method based on GIS Spatial analysis techniques", *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, Vol. 38, Part II
- [7] [7]. http://help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#/Feature_class_basics
- [8] [8]. Idhoko K.E, Ndiwari, E. L., Ogeh, V. C., & Ikegbulam, S. C., "Urban road network analysis of Yenagoa, Bayelsa State Using GIS", *International Journal Of Engineering And Computer Science* ISSN: 2319-7242 Volume 5 Issue 1 January 2016, Page No. 15605-15615
- [9] [9]. Kevin M. Curtin, "Network Analysis in Geographic Information Science: Review, Assessment, and Projections", published in *Cartography and Geographic Information Science*, Vol. 34, no. 2, 2007, pp. 103-111.
- [10] [10]. Michael t. Winn, "A road network shortest path analysis", Northwest Missouri State University, Utah January 2014.
- [11] [11]. Mostafa Abdel-Bary Ebrahim, and hab Yehya Abed-Elhafez, "Planning road networks in new cities using GIS", *The Case of New Sohag, Egypt*, May 2011.
- [12] [12]. Praveen Kumar Rai, "Network analysis using GIS", *International Journal of Emerging Technologies in Computational and Applied Sciences (IJETCAS)*,
- [13] [13]. Ritesh R Kakade, "Network Analysis Using Geo-informatic Technique for Akola City", Maharashtra State, India, August 2013.
- [14] [14]. R. Nijagunappa, Sulochana Shekhar, B. Gurugnanam, P.L.N. Raju and Prabir De, 2007. Road Network Analysis of Dehradun City Using High Resolution Satellite Data And GIS, *Journal Of The Indian Society of Remote Sensing*, Vol. 35, No. 3.
- [15] [15]. Sikdar, P.K., Durai, B. K., Rao, I.P., and Jain, P.K. "GIS Based Highway Information System." National Seminar on "Road Transportation in India-Emerging Trends and Technologies, ROTRAN 2002, IIT Kharagpur, September 12- 13, 2002. Pp.7.57-7.69.

- [16] [16]. Sanmarga Mitra, "A Methodology for Evaluation of a City-Level Road Network for Passenger Transportation: Case Study Kolkata", International Journal of Engineering Research and Applications (IJERA), March – 2014.
- [17] [17]. Williams, H. C. W. L. (1977) "On the formation of travel demand models and economic evaluation measures of user benefit," *Environment and Planning A*, 9, 285-344
- [18] [18]. Williams, H. C. W. L. and Senior, M. L. (1978) "Accessibility, spatial interaction and the spatial benefit analysis of land use-transportation plans," in A. Karlqvist, L. Lundqvist, F. Snickars and J. W. Weibull (eds.) *Spatial Interaction Theory and Planning Models*, Amsterdam: North-Holland, 253-287.
- [19] [19]. Yigitcanlar, Tan and Sipe, Neil G. and Evans, Rick and Pitot, Matt (2007) "A GIS-based land use and public transport accessibility indexing model.", *Australian Planner*, 44(3). pp. 30-37.