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Application Of Gis In Transportation Engineering

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Abstract

When so many parameters are to be connected with Transportation network like travel time, speed, road resistance, turning movements, etc. For such a big network GIS (Geographic Information System) proves itself as an efficient tool for solving such a network problems quickly and with a great precision. The GIS Software is determining the optimal routes or Best routes from one origin to many destinations kind of problem, with an objective of minimizing travel distance and travel time of users. Constrains taken into consideration were impedance for intersections, type of road and speed. GIS emerged as better tool for getting solution of such complex problems very accurately and rapidly.

Keywords: GIS, Optimal routes, Transportation

Introduction:

A country's transportation system represents development stage of country. But at the same time highly developed countries are facing higher problems of transportation management and spending lots money and effort for solving those problems. Growing traffic congestion, the need to preserve the environment, and the problems of road safety are the main reasons for many cities worldwide to consider new initiatives in public transit systems. The complexities of building and operating the transport system efficiency and safely have out stripped the ability of past experience and professional judgment alone to provide solutions. If a country is to satisfy the transport infrastructure requirement in consonance to its developmental pace, decisions must be based on a more reliable, updated, relevant, easily accessible and affordable information. Better information does not guarantee better decision making capability but its absence surely precludes it. The application of GIS to a diverse range of problems in Transportation engineering is now well established. It is a powerful tool for the analysis of both spatial and non-spatial data and for solving important problems of networking. Shortest path analysis is an essential precursor to many GIS operations. (Zhan (1996) has worked on this and explored the use of fast shortest path algorithm on extensive road networks. (Pathan 1994) has evaluated the possibilities of optimization, in which the optimum routes, travel time, travel distance and cost for defined paths and for the optimum paths was determined for few transport services. (Guruswamy 1989) has also evaluated the GIS techniques for route optimization. Finding out the optimal route for emergency services and that for time taken for service is on top most priority. (Steven 2003) has developed a genetic algorithm to optimize a bus transit system serving an irregularly shaped area with a grid street network. The total cost function is minimized subject to realistic demand distribution and street pattern. (Crowson et al. 1997)

Material and Methods:

A geographic information system that includes the street maps for the three-country service region, the route system, and the bus stop locations. Information to perform communication, analysis, planning and service assurance. Previous studies have highlighted the need for tools to assess the impact of interventions on the bus network and the accessibility of the system. (Belinda 2003) concludes that using GIS, the analysis of transport disadvantage and accessibility is possible. Assesses the spatial impact of hypothetical network changes on populations residing within the city bus network area. Within the GIS environment, data sets are displayed in a range of innovative ways (3-D, grid and other thematic maps) to facilitate data interpretation. (Zhong-Ren Peng and Ruihong Huang 2000) present web-based transit information system design that uses Internet Geographic Information Systems (GIS) technologies to integrate Web serving, GIS processing, network analysis and database management. A path finding algorithm for transit network is proposed to handle the special characteristics of transit networks, e.g., time-dependent services, common bus lines on the same street, and non symmetric routing with respect to an origin/destination pair. The algorithm takes into account the overall level of services and service schedule on a route to determine the shortest path and transfer points. A framework is created to categorize the development of transit information systems on the basis of content and functionality, from simple static schedule display to more sophisticated real time transit information systems. A unique feature of the reported Web based transit

information system is the Internet-GIS based system with an interactive map interface. This enables the user to interact with information on transit routes, schedules, and trip itinerary planning. Some map rendering, querying, and network analysis functions are also provided. The spatial impact of hypothetical network changes on populations residing within the city bus network area. Within the GIS environment, data sets are displayed in a range of innovative ways (3-D, grid and other thematic maps) to facilitate data interpretation.(Marius Theriault et al. (1999) presents a modeling and simulation procedure to evaluate optimal routes and to compute travel times for each individual trip of an OD survey database. Postal codes provide accurate locations within street blocks for each trip beginning and end point. Using ESRI GIS software, the procedure finds the best routes through a topological road network. Each road is characterized by a maximal speed related to the functional class of the road, to its location in rural or urban areas, and to the distance from the nearest school. Turn and transfer penalties govern movements at the intersections. Moreover, the procedure calculates the number of persons traveling on every road to estimate traffic congestion. Through these review study it is concluded that it is possible to combine GIS and transportation modeling to estimate travel time of urban commuters. This could help measuring temporal constraints of households in planning their daily activities.(Ali M. (2003) has focused on the two related issues of employment distribution and access to transit services. It is primarily concerned with identifying some of the major employment centers in the county and how they may be understood within the context of a polycentric metropolitan area. Using census of population and housing, a number of analyses were performed that identified some of the major employment centers and sub centers in the metropolitan areas. A GIS-friendly software is used that allows calculations of various clustering patterns for major employers. This software performs an NNH (nearest neighbor hierarchical) spatial clustering routine that group's data points together on the basis of spatial proximity (using a threshold distance and the minimum number of points required for each cluster).

Conclusion:

There are ample evidences of applying the recent advances in satellite based remote sensing and GIS technology in various fields of civil engineering. India's space programmed ensuring continuous availability of RS (Remote Sensing) data and launching of future satellites carrying high spatial and spectral resolution sensors can go a long way in providing useful information required for civil engineering applications. Transportation and its management are inherently geographical activities requiring the handling of multiple forms of spatial data. GIS and simulation models have contributed to the identification and evaluation of potential solutions for Transportation problems during the past decade. GIS have expanded the number of ways information can be presented and thereby extended their accessibility, and many of the most popular spatially distributed data sets can now be accessed via the Internet. Similarly, there has been a steady increase in the number and variety of functions incorporated in GIS that are suited to Transportation and its management applications. GIS Technology has also influenced the development and implementation of Transportation models at several different levels. There are a lot of advantages for using GIS in Transportation engineering such as the ability to produced more quickly, repeatable, they can be used with the visualization tools commonly found in GIS to develop customized maps and tables and effective road network. As anything in life, GIS has some obstacles such as, high development cost is that both GIS databases and simulation models and obstacle hydrologists have to become GIS experts to solve problems. I believe that these obstacles will be reduced as soon as more scholars understand deeply this new rising technology. Also additional technical experiments must be done to test hydrological models built using GIS to reduce errors and to show the promising benefits of this technology to scientists doubting its advantages.

References:

1. Ali M.(2003), 'Polycentricity and transit service', transportation research paart A, volume 37, issue 10, pp 841-864.
2. A.V.Bhambulkar, Isha.P. Khedikar (2011) , 'Municipal solid waste (msw) collection route for laxmi nagar by geographical information system', International Journal of Advanced Engineering Technology,Vol.II,Issue IV,pp 102-109
3. Belinda (2003), 'A PTAL approach to measuring changes in bus service accessibility', transport policy, volume 10, issue 4, pp 307-320
4. Bhambulkar Ashtashil .(2011) , 'Municipal solid waste collection routes optimized with arc gis network analyst', international journal of advanced engineering sciences and technologies volume no. 11, issue no. 1, pp 202 – 207
5. Crowson (19997), A GIS for public transit', ESRI conference, San Diego, CA.
6. Guruswamy V. (2000) 'Optimal route analysis using IGS', MapIndia2000, at http://www.GISdevelopment.net.
7. Laplame G. (1992) 'A geographic information system for transportation applications', communications of the ACM 1992; (35): page 80-88.

8. Marius T. (1999), 'Modelling commuter trip length and duration within GIS: application to an O D survey', journal of geographic information and decision analysis, vol 3,issue 1, pp 40-56.
9. Papacostas C. (2004), 'GIS application to the monitoring of bus operations' http://www.eng.hawaii.edu/~csp/Mygis/busgis.html
10. Pathan (1994), 'Optimization of Transportation Routes using GIS techniques'
11. Sankar R (2003), 'Optimization of bus stop locations using GIS as a tool for Chennai city – a case study' MapIndia conference.
12. Steven C. (2003), 'Optimization of multiple route feeder bus service - an application of GIS'. Journal of Transportation Research Board 2003(3).
13. Zhong R. (2000), 'Design and development of interactive trip planning for web-based transit information systems', tranporation research part C, volume 8, issue 1-6, pp 409-425

Books:

14. ARC/INFO GIS Manuals, 'Environment System Research Institute, Redlands, USA'.
15. Ashtashil Bhambulkar , 'Geographic Information System (GIS) – An Effective Tool In Solid Waste Management ',LAP LAMBERT Academic Publishing GmbH& Co.UK.