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ROAD NETWORK CONNECTIVITY ANALYSIS BASED ON GIS

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Abstract *— In this paper, a brief practical review is presented on the Road network in the urban areas constitutes of the essential infrastructures for the development of the city and also to meet the demands of the people. In the present world today some of the problems faced by the citizens are mobility, accessibility, etc. As the population is increasing day by day, travel demand is also increasing consequently the need for the transportation facilities increases. But in the present situation the facilities provided are not meeting requirements. As the business activity centers are increasing at a rapid rate the functionality of the road is changing, so the existing geometrical conditions are not meeting the requirements.*

As there is a rapid increase in the traffic volumes which are almost all equal to or sometimes exceeding the capacity of the road the level of service is falling down. In the twin cities it is observed that even though geometrical conditions are according to the standards providing all the facilities they are being mis-used by the roadside business activities

Hence there is a need to improve the existing road infrastructure .To suggest the improvements over the existing infrastructure it is required that should be identified first and should find out which factor is leading to suggest the improvements. By keeping these points in view an attempt is made in this thesis to identify such localities by using behavioral model.

Keywords—*Road network, urban areas, Gis,Conectivity, behavioral model.*

I. INTRODUCTION

Transport is one of the key infrastructures of a country. A country economic status depends upon how well served the country is by its roads, railways, airports, ports, pipelines, and shipping. The rate at which a country economy grows is very closely linked to the rate at which the transport sector grows. Urbanization and economic development go together. Rapid urbanization can take place only if a country has a good transport system. This transportation is carried on a specific guided known as network. Urban road network planning demands efficient accessibility to more, better and timely information. Urbanization is taking place ever so quickly that supply cannot meet the demand and thus the society is caught in the whirlpool of change in urban development. Road network planning is an extremely complex process, combining political, socio-cultural, economic, natural and physical aspect of urban growth and development.

Utilization of land by different activities is promoting complex interactions, which are non-uniform in a time frame over a specified space occupation. The cities are facing a problem of overcrowding which is the result of high intensity of residential land uses, which is reflected in the density of houses, households, population etc. In most of the Indian cities people try to live as close to the city center which is modified by other factors such as accessibility and different socio-economic status areas and so forth. Progressive congestion forces the residents of city to face many problems of accommodation and lack of amenities. At some point of time, due to over congestion, people to move out to some new areas lying vacant at the fringe of city. As a consequence, a large number of regularized localities come up.

Road network in the urban areas constitutes one of the essential infrastructures for the development of the city and also to meet the demands of the people. The significance of urban transport facilities stems from the fact that around half of the world's population lives in urban areas, a proportion that is rising very quickly. The number of very large cities, in which transport problems are especially acute, is growing particularly rapidly. The rate of urbanization is fastest in the developing world where the resources to pay to overcome such problems are scarce.

The giant city of the future will have to try to cope with many more people wishing to make trips. City growth and transport go hand-in-hand, for transport is part of city, not just an addition to it. The primary concern is that of accessibility and

connectivity patterns of the network hence, the orientation of the network should be designed with predominant land use activity and its potentiality.

All of the above mentioned facts have to be given a serious thought because of the existing road network which is inadequate in capacity, inadequate to meet present traffic demands and need major up gradation program in addition to fresh construction.

In this context there is a need to develop land use system through proper connection of road network. The urban transportation system should be so planned to make the urban environment more attractive, improve the employ potential for urban population, in guiding and-use patterns and ensure quick movement of people and good thereby reducing trip lengths.

II. NEED FOR PRESENT STUDY

Urbanization is the major factor, which every city is facing in the contemporary world and hence the existing road network should satisfy the demand. It may be required to develop a new network system, which has to be designed in a systematic way. Hence the lead to this study has been under taken with respect to the existing infrastructure as a bade and evaluating it by considering the travel demand on all the links and junctions.
The seed of urbanization germinated first in the Indus valley around 2500B.C. The urban centers of that period were small in size and number surrounded by rural society and vast agricultural fields. Most of the cities developed during the period were walled with narrow streets tending towards central point that is place of worship, castle or palace.
During post-industrial period the urbanization grew in concomitant with industrial and technological advancement. Later on, it achieved it high acceleration due to growing impact of industrialization, modernization and changing proximities of human societies. But the highest pace of urbanization centers is one of the most impressing phenomenons of present century. Urban growth in the 19^{th} and 20^{th} centuries owed much to the introduction of sub-urban railways, tramways and latter motor buses. And although in contemporary cities road traffic is often seen more as problem than as an asset, it undoubtedly contributed to spatial expansion. Hence, the most striking feature of the urbanization process is the rapidity of growth of large and intermediate cities. Associated with this explosion are the requirements in the demands for transportation facilities in these urban centers. The requirements for travel have increased considerably, pace with the increasing demand. As a result, the transportation in urban areas has become an acute problem in India.
The rapid urbanization process in the country has resulted in an increase in demand for the urban infrastructure and services. The importance of an efficient and effective transport system to support and promote national development of urban areas needs to be stressed. The national commission on urbanization instrumental in shipping urban development and urban living. Hence, it is important appreciate the dimensions of urban travel demand and identify practical and effective policies for its planning, development, operation and management.

III. OBJECTIVE AND SCOPE OF THE STUDY

Towns are getting urbanized with an ever seen phenomenal rate. At the same time, the road network as the result of globalization, area around capital cities, major district headquarters and major infrastructure is not getting improved when compared to the urbanization rate. Obviously, this results in higher inconvenience in public life because of the limited infrastructure resources. So, it is required to study the existing road network to comment on its performance parameters, so that the respective authority can take actions needed in accordance with the demand.
In relation to above points, the objective of my project is to study and analyze the road network cantonment area, Hyderabad - A.P, and to find out the performance parameters so that the cantonment board can plan for the current and future needs.

IV. LITERATURE REVIEW

4.1 Road network for shortest path analysis using GIS

Cherkassky et al.'s Evaluation Although there have been a number of reported evaluations of shortest path algorithms in the literature (e.g., Glover *et al*. 1985; Gallo and Pallottino 1988; Hung and Divoky 1988), a recent study by Cherkassky *et al*. (1993) is one of the most comprehensive evaluations of shortest path algorithms to date. They evaluated a set of 17 shortest path algorithms. In their experiment, Cherkassky *et al*. coded the 17 algorithms using the C programming language, and tested the C programs on a SUN Sparc-10 workstation.

Cherkassky *et al*. (1993) Paper for more detailed descriptions about the implementation of the algorithms. Cherkassky *et al*. used a number of simulated networks with various degrees of complexity for evaluating the algorithms. The results of their studies suggest that no single algorithm performs consistently well on all simulated networks.

Zhan and Noon's Evaluation More recently, Zhan and Noon (1996) tested 15 of the 17 shortest path algorithms using real road networks. In their evaluation, Zhan and Noon dropped two of the 17 algorithms tested by Cherkassky *et al*. They did not consider the special-purpose algorithm for acyclic networks because an arc on real road networks can be treated bi-directional, and hence real road networks contain cycles. They also dropped the implementation using a stack to maintain labeled nodes (see the next section for descriptions about stack and labeled nodes) because they found that this algorithm is many times slower than the rest of the algorithms on real road networks during their preliminary testing. These Detailed description of the algorithms can be found in Cherkassky *et al*. (1993) and the references therein.

V. ARC VIEW 9.1 SOFTWARE

General

Arc GIS is a scalable system of GIS software produced by Environmental systems research institute (ESRI). This system contains three different products: Arc view, Arc Editor, Arc info.

Arc view

Arc view is the desktop version meant for general (non- professional) audience. It is the most popular desktop GIS software program, but it is not the only one. With the jump from Arc view 3.2 to Arc view 8.x, ESRI brought ARC view into its Arc map system so that it uses the same structure as its more sophisticated GIS products. Arc view 9 adds some functionality to Arc view 8, but the two versions in a very similar way.

Arc Editor

Arc editor includes all the functionality of Arc view, adding the ability to edit features in a multiuser geo database so that multiuser editing and versioning are possible. Arc editor also ads the ability to edit topologically integrated features in a geo database.

Introduction to Arc view9.1

Arc view 9.1 includes two separate applications: Arc Catalog, and Arc map. Although they are designed to work together, they run under separate executable files.

Arc Catalog

Works sort of like windows explorer. It is a place to browse and manage your data. You can also create and edit metadata in Arc Catalog.

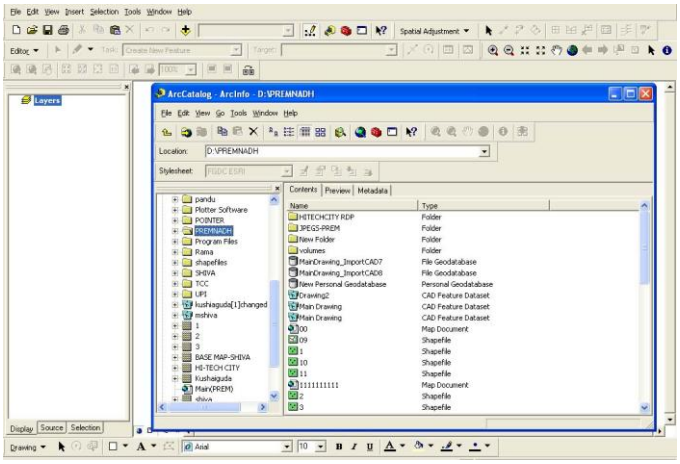


Figure 5.1 Arc catlog window

Shape files

ESRI created the shape files format in order to represent vector GIS data in a simpler format than their coverage format used in Arc Info. As with other formats of geographic data, shape files link formation about the location and shape of the map features to their attributes. Shape files are made up of three or more files that need to be stored in the same directory in order for Arc View to recognize them as shape files.

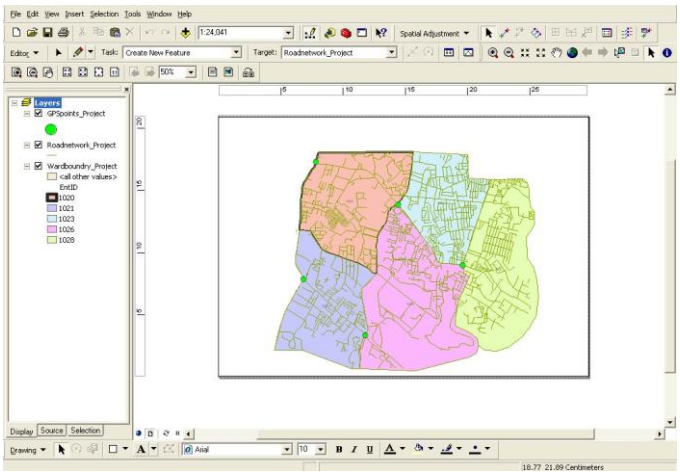


Figure 5.2 Polygons of study area in Arc GIS

The coordinates of the Study area

	NORTH			Y
1	17	0.45	0.009083	17.45908
2	17	0.45	0.001503	17.4515
3	17	0.45	0.009072	17.45907
4	17	0.433333	0.013739	17.44707
5	17	0.433333	0.009464	17.4428
6	17	0.416667	0.012389	17.42906
7	17	0.416667	0.015992	17.43266
8	17	0.433333	0.007544	17.44088
9	17	0.45	0.001431	17.45143
10	17	0.433333	0.005311	17.43864

	EAST			X
1	78	0.35	0.016075	78.36608
2	78	0.366667	0.014494	78.38116
3	78	0.35	0.016133	78.36613
4	78	0.35	0.013506	78.36351
5	78	0.366667	0.003469	78.37014
6	78	0.366667	0.008061	78.37473
7	78	0.383333	0.002903	78.38624
8	78	0.383333	0.009261	78.39259
9	78	0.383333	0.013247	78.39658
10	78	0.35	0.013775	78.36378

Data scheme

Data collection forms the very basis of any research activity and the type of data to be collected is largely dependent on the objectives of the study. The surveys for data collection are to be designed so as to fit in the framework. The resent study is aimed at developing the GIS and GPS based road network configuration. In the present case of study it requires to conduct surveys for the identification of road network and for connectivity analysis. In this case the study area chosen is cantonment area of Hyderabad. The details of the location of the study area and the types of surveys conducted are presented in the following articles.

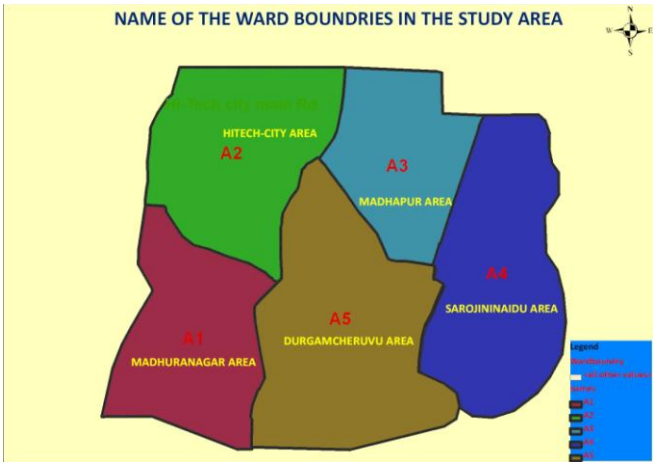


Figure 5.3 Ward Map of study Area

Surveys Conducted

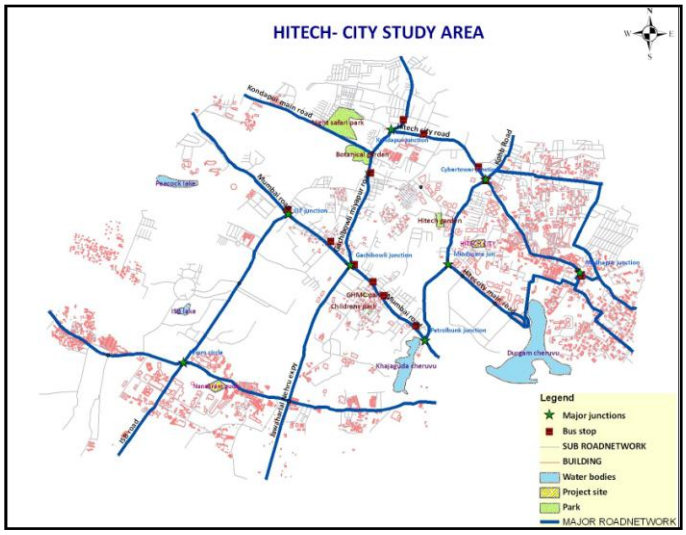
- Differential GPS Survey
- Video graphic Survey
- Road side Interviews

Table 4.1 GPS Control Points Identified In Study Area

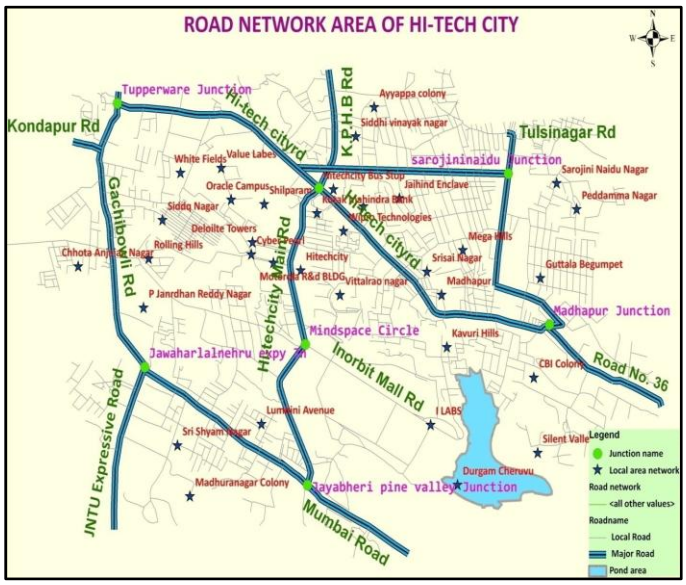
Control Point	Location	Coordinates
1	Honda Showroom	17^0 25' 43.87"N,78 ^{0}22'28.58"E
2	Rolling Hills	17^0 26'19.35"N, 78 ^{0}21'49.46"E
3	White Fields	17 ^{0}27'32.70"N, 78 ^{0}21'57.87"E
4	Kotak Mahindra bank	17 ^{0}27'05.52"N, 78 ^{0}21'52.06"E
5	Guttala Begumpet	17 ^{0}26'27.14"N, 782 ^{0}3'33.52"E

Generation of base map

All the features that are imported from CAD and generated in GIS are spatially referenced and projection to form a base map of the study area. All the feature classes are overlaid and the base map generated is shown in figure below.



Base Map of Cantonment Area



VI. CONCLUSIONS

- The lengths and areas of the five wards are calculated separately and then the deficiency and road densities are calculated for each ward.
- The various areas for each ward are calculated for Built up area.
- Minor junctions, Major junctions are identified in the five wards.
- The different Lengths of the roads, areas of each ward is calculated through Arc GIS.
- Road densities are calculated for the principle, sub arterials, collector streets, and local streets.
- Network connectivity analysis is done for Excellent, good, satisfactory for each ward.

Recommendations

- Width deficiency is main problem to road network, so we should increase the width of the road as per AASTHO and IRC.
- In order to ensure a sustained rural development in the area, there is the need to increase the level of provision of road network facilities.
- A well maintained transport route promotes socio-economic and infrastructural development. Furthermore, roads should be constructed to link up the numerous areas to each other and to their various districts.
- Road network connectivity analysis was done by assessing the nature of road network provision Consequently the analysis was done by using software's like Auto Cad, Arc Gis.

References

- Kadiyali l.R, "Traffic Engineering and Transportation planning" , Khanna publishers, 1999.
- Meharam D.S., Urban Land Use And Development planning problem and solutions, paper presented at the National seminar on Future citied- Urban Vision 2021, October 6-7, 1997.
- Lakshmana Rao K.M., Chandra Sekhar.G, "GIS" oriented Transportation Planning.
- Khanna S.K., and Justo CE..G., "Highway Engineering", Nem Chand and Bros, Roorkee, 1991.
- Verma.S.S, "Urbanization and Regional Development in India", 1998.

