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Road Network Managment & Congestion Evaluation Study

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ABSTRACT

Geographical Information System (GIS) is found to be a multipurpose tool that can be employed for a variety of tasks related to bus transport. GIS network provides a set of tools to build network data sets consisting of the features and their attributes necessary to model the flow of resources through the network. Transport problems are getting more and more dynamic due to changes in our complex social, economical, and physical world. Transport researchers and managers around the world have been under increasing pressure to improve understanding about these changes and act efficiently to make decisions in transportation field considering the data and knowledge generated due to spatio-temporal and socio-economic changes. The range of models that need to be employed has expanded rapidly and the integration of transport models and technologies such as GIS has become major requirement in process of transport planning. GIS can be applied to service network like water supply, power, supply, sewage etc. In this paper a case study of Mehsana city intra-city road network for determining the congested links with an objective to study the existing capacity supply of road network. The congested network is identified based on V/c ratio and volume data have been presented using TransCAD-GIS.

Keywords : GIS, network, capacity, TransCAD-GIS

1. INTRODUCTION

In India due to rapid urbanization travel demand is increasing, urban transport system development is not keeping pace with the demand and the negative impact of such unbalance development is actually felt today. The quality of life in these centers is adversely affected. There is an urgent need for setting direction of growth, allocation of resources, and coordination of action and operations through a well defined and comprehensive national urban transport policy. Urban public transport in the Indian context is the bus transit services in mega metropolis like Bombay, Calcutta, and Delhi along with local train, tramway and metro rail respectively. Economic activities in cities require large scale movement of persons which is at present largely based on personalized transport in developing countries like India it is easy to increase vehicle ownership but it is not so easy to develop infrastructure. The key to solve the problem lies in how to create a road based public transport system and road network management and congestion evaluation. Therefore by knowing capacity of existing road network the scenario of public transport and private transport for number of person carrying as quickly as possible, efficiently and comfortably from their origin to variety of destinations, generated.

Mehsana city is currently facing several transport problems like insufficient road widths, traffic congestion, parking problems, undesirable public transport services, unorganized intermediate transportation system and inadequate mass transit. Total length of road network of Mehsana city is 38.61 km. Traffic volume on city road range from 800 pcu/day to 11120 pcu/day.

2. LITERATURE REVIEW

A modern society can be viewed, in part of a system of networks for transportation communication and distribution of energy, goods, and services. The complex structure and cost of these sub systems demand that existing facilities be rationally designed. Network analysis techniques can be of great value in the design, improvement, and rationalization of complex large scale systems. The road network management problem faced by country is becoming complex. In the total road network of nation, the problems are of inadequate capacity, immediate repair operation, management and addition of new links at crucial locations. The services and performance levels of existing road in the country lag far behind the advantage in motor vehicle technology. The maintenance cost of existing road structure rising, which is serious concern for authorities responsible for their upkeep under tight budgetary constraints. The road user's movement and safety on these roads is complex problem. To understand this, the network database created in GIS makes integrated highway information system for various network management purpose including safety and efficiency of passenger and fright/goods movement.

GIS database brings information related to networks spatial spread, capacity, inventories, quality and traffic attributes like traffic volume, speed and crash events. The description of a transportation network in a computer model can be undertaken at different levels of details and requires the specification of its structure, its properties or attributes relationship between those properties and traffic flows. (Ortuzar et al 2001). The elements of the network data model are divided in to two main themes or group (Ubomir, F, 2006).

3. METHODOLOGY

The methodology developed for present study is presented



4. DATA COLLECTION AND ANALYSIS

Based on above methodology the detailed classified traffic volume data have been collected and converted in to pcu/ day. The volume is compared with design capacity in pcu/

day, volume capacity (V/c) ratio have been calculated. The links with V/c \geq 0.80 is considered congested links. The data is given in Table 1.

Table 1: Traffic volume, capacity and Volume capacity (V/c) ratio									
Sr. No	Capacity (c)	Traffic volume (V)	V/c	Congested link	Sr. No	Capacity (c)	Traffic volume	V/c	Congested link
1	10000	10530	1.05	1	28	2500	2550	1.02	28
2	10000	10530	1.05	2	29	2500	2550	1.02	29
3	1500	1140	0.76		30	2500	2550	1.02	30
4	1500	1140	0.76		33	10000	10530	1.05	33
5	1500	1140	0.76		34	10000	10530	1.05	34
6	10000	10530	1.05	6	35	1500	1180	0.79	
7	1500	1250	0.83	7	36	1500	1180	0.79	
8	1500	1350	0.9	8	37	1500	1180	0.79	
9	1500	1350	0.9	9	38	1500	1180	0.79	
10	1500	1350	0.9	10	39	1500	1180	0.79	
11	1500	1350	0.9	11	40	1500	1180	0.79	
12	1500	1350	0.9	12	41	1500	1180	0.79	
13	10000	10530	1.05	13	42	1500	1180	0.79	
14	1500	1350	0.9	14	43	1500	1180	0.79	
15	1500	1350	0.9	15	44	6000	7800	1.3	44
16	1500	1120	0.75		45	6000	7800	1.3	45
17	1500	1230	0.82	17	46	6000	7800	1.3	46
18	1500	1320	0.88	18	47	2500	1510	0.6	
19	1500	1320	0.88	19	48	2500	1510	0.6	
20	10000	10530	1.05	20	49	2500	1510	0.6	
21	10000	10530	1.05	21	50	2500	1510	0.6	
22	1500	1400	0.93	22	51	2500	1510	0.6	
23	10000	10530	1.05	23	52	2500	1510	0.6	
24	2500	2550	1.02	24	53	10000	10530	1.05	53
25	2500	2550	1.02	25	54	4000	3240	0.81	54
26	2500	2550	1.02	26	55	4000	3240	0.81	55
27	2500	2550	1.02	27	56	4000	3240	0.81	56

5. TRAFFIC VOLUME

Volume of traffic on different link has been obtained by secondary survey at different location of study area. There is large difference of volume on different link ID. Link ID no. 53 ,70,80,82,88,89,127,135,136,139,140,143, has maximum traffic volume and link ID no 278,279, has minimum traffic volume. Volume capacity ratio (V/c) shown in Fig 2. Traffic volume on different link is shown in Fig 3, Volume Capacity ratio greater than 0.80 indicate congested links.



Fig. 2: Traffic Volumes /Capacity Ratio



Fig. 3: Maximum Traffic Volume Link on Various Links

6. FINAL RESULTS

Out of 279 links with 206 node points have been studied. Congested link are listed as 1,2,6,7,8,9,10,11,12,13,14,15,20,21,22,23,24,25,26,27,28,29,30,33,34,44,45,46,53,54,55,56,57,58,59,62,63,64,65,66,67,68,69,70,71,72,73,74,75,77,80,82,83,84,85,86,87,88,89,93,94,95,102,103,104,105,106,107,108,109,121,122,123,124,127,128,129,130,131,132,133,134,135,136,139,140,143,157,162,169,170,171,172,173,174,175,176,179,180,181,182,183,184,185,186,187,188,189,190,

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191,195,196,200,205,207,208,211,212,214,235,259,265,266 ,267,268,270,272,273,274,275.

To remove/reduce congestion on identified links traffic management strategies to be adopted or capacity enhancement measures to be taken. Alternatively bus transport/ mass transport shall be adopted to reduce number of vehicles to move persons.

7. CONCLUSION:

Use of TransCAD helps easy identification of congested links on network map. Decision makers have ease of decision making due to all data available at a time in map.

8. RECOMMENDATIONS

- Detailed O-D survey to be carried out to decide desire of movements of people for optimization and use of road links.
- Route adjustment to be made based on change in demand by continuous study of transportation used by people of area.

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