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Traffic Management by using GIS

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Abstract-The trend of urbanization, population increase and the increase in number of registered vehicles induces pressure on traffic movements and makes living in urban area more difficult. General congestion related data collection and congestion management measure is labor intensive and a heavy investment is needed for these mitigation measures. Latest technologies like GIS will help to analyze the live traffic situation and suggest the cost effective measures to mitigate the congestion. This report briefly present the traffic problems (In the different intersections in Mumbai), there causes and possible solutions to ensure free flow of traffic. The project attempts to quantify the intersection of huge traffic congestion and accidental damage. Expected project output will be the recommendation for better traffic management using GIS tool on the basis of data collected, analysis and design. GIS is effectively used for data collecting, data analyzing and result displaying process.
Keywords-Vehicle count**,** Rotary, Congestion Management, GIS Application, Modeling.

I. INTRODUCTION

India is the second most populous country in the world and a fast growing country. It is estimated that over 6 million people travel on road daily in Mumbai city. According to world health organization (WHO), road traffic accidents are responsible for leading cause of death. The total number of accidents recorded in India for year 2007 is 479.2 thousands and number of persons killed is 114.4 thousands, out of this Mumbai recorded 18.5% of the total accidents in the country. In year 2008, the total number of reported accidents in Mumbai was 30,242 out of which 621 were fatal.

The total number of motor vehicles in Mumbai and its suburbs has touched the figure of 18.73 lakh, which is about 11% of the total motor vehicles registered in the state. The latest economic survey of Maharashtra tabled in the state legislature on Tuesday revealed that as of January 1, 2011, the number of vehicles registered in Maharashtra was 170.30 lakh, which means about 15,200 vehicles per lakh population. (Source DNA)

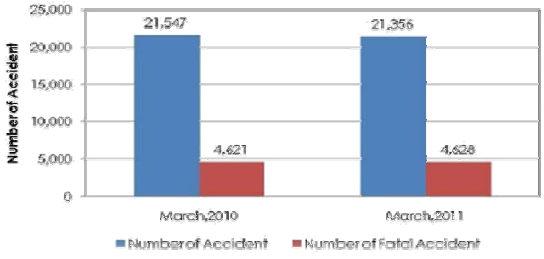

Fig.1Accident Data during 2010 to 2011 (Source: By SRUT)

Table.1 growths of vehicles in Mumbai city (Source: MCGM)

Year	Growth of total vehicles in lacs
1971	1.52
1981	3.09
1991	6.23
2001	10.30
2011	16.00

Increasing traffic congestion creates lots of stresses on traffic department of Mumbai; most of the time traffic congestion and hence overall management get collapsed. For inventing and implementing new solution on such problems it is necessary to get current traffic data and right decision making tool. GIS is one of the management decision making tool which analyses stores huge amount of data efficiently and effectively. Expected project output will be the recommendation for better traffic management using GIS tool on the basis of data collected, analysis and design.

II. LITERATURE REVIEW

The literatures review was done to find the various key parameters of congestion at traffic rotary, existing methodologies that were adopted for congestion modelling and the existing GIS application in the area of management.

III. METHODOLOGY AND STUDY AREA

The methodology adopted for the study is:

1. Identification of parameters which affect traffic congestion.
2. Selection of study corridor.
3. Collection of data.
4. Design and analysis
5. Application of GIS for traffic management.

IV. DATA COLLECTION

Using Manual counters: It is the most traditional method. In this case trained observers gather traffic data that cannot be efficiently obtained through automated counts e.g. vehicle occupancy rate, pedestrians and vehicle classifications. The most common equipment used are tally sheet, mechanical count boards and electronic count board systems.

Table.2 growths of vehicles in Mumbai city

1.Kasheli To Bhiwandi											
Day	**Day Vehicles**				**Night Vehicles**				**Total**	**Vehicles**	
	Right	**Straight**	**Left**	**Day Total**	**Right**	**Straight**	**Left**	**Night Total**		**per Hr**	**per min**
Day 1	17902	18726	0	36628	7474	7855	0	15329	51957	2165	36
Day 2	19204	17497	0	36701	6568	8108	0	14676	51377	2141	36
Day 3	18663	17880	302	36845	8200	8586	126	16912	53757	2240	37
Range	**51-52%**	**49%**	**0.5-1%**	**36725**	**47-48%**	**50-52%**	**0-1%**	**15639**		**2182**	**36**
2.Mankoli To Anjur Chowk											
Date	**Day Vehicles**				**Night Vehicles**				**Total**	**Vehicles**	

	Right	Straight	Left	Day Total	Right	Straight	Left	Night Total		per Hr	per min
Day 1	22624	0	24179	46803	3263	12	4076	7351	54154	2256	38
Day 2	21914	0	23563	45477	3176	11	3516	6703	52180	2174	36
Day 3	21977	0	23838	45815	3248	15	3847	7110	52925	2205	37
Range	**47-49%**	**0**	**51-53%**	**46032**	**44-46%**	**0**	**52-56%**	**7055**		**2212**	**37**

3.Bhiwandi To Kasheli

Date	Day Vehicles				Night Vehicles				Total	Vehicles	
	Right	Straight	Left	Day Total	Right	Straight	Left	Night Total		per Hr.	per min
Day 2	0	18162	8282	26444	0	5476	2725	8201	34645	1444	24
Day 3	0	17809	8116	25925	0	5858	2598	8456	34381	1433	24
Range	**0**	**68-69%**	**31-32%**	**26185**	**0**	**66-70%**	**30-34%**	**8329**		**1438**	**24**

V. DESIGN AND ANALYSIS

According to IRC-65-1976 Recommended practice for traffic Rotaries following design steps are carried out to find out the dimensions of the rotary parameters and capacities of the rotary at Anjur chowk T point.

Table.3 Design Steps for Rotary at Anjur chowk T point

Sr No.	Design elements	Dimension	Remark
1	Design speed:- The normal practice is to keep the design speed as 30 and 40 kmph for urban and rural areas respectively.		
2	Entry, exit and island radius		
	Entry Radius (In m)	20	30kmph is the speed generally suitable for urban area according to **IRC-65-1976**
	Exit Radius (In m)	40	Kept about 1.5 to 2 times the entry curve according to **IRC-65-1976**
	Radius of central Island (In m)	26.6	1.33 times the radius of the Entry curve is generally suggested
3	Weaving length (In m)	54	minimum weaving length for 30kmph
	e1=Width of carriage way at the entry (In m)	10	(6 lanes) according to table 2 of **IRC-65-1976**

	e2=Width of carriage way at the entry (In m)	10	
4	Width of the rotary carriage way (In m)	13.5	
	w =weaving = (e1 + e2)/2 + 3:5m		
	Where e1 is the width of the carriageway at the entry and e2 is the carriageway width at exit.		
5	p=Proportion of weaving traffic		$P = \frac{b+c}{a+b+c+d}$
	Proportion of weaving traffic from kasheli to bhivandi	0.82796165	
	Proportion of weaving traffic from kasheli to mankoli	0.61065197	
	Proportion of weaving traffic from Bhivandi to kasheli	0.8195318	
6	Capacity:-		$\frac{280w(1+\frac{e}{w})(1-\frac{p}{3})}{1+\frac{w}{l}}$
Qp	Capacity of rotary=	3825.17 Vehicles per hour	

GIS will help to analyze the live traffic situation and suggest the cost effective measures to mitigate the congestion, an attempt was made to use GIS effectively for data collecting, data analyzing and result displaying process. GRAMM++ software is used for interpretation.

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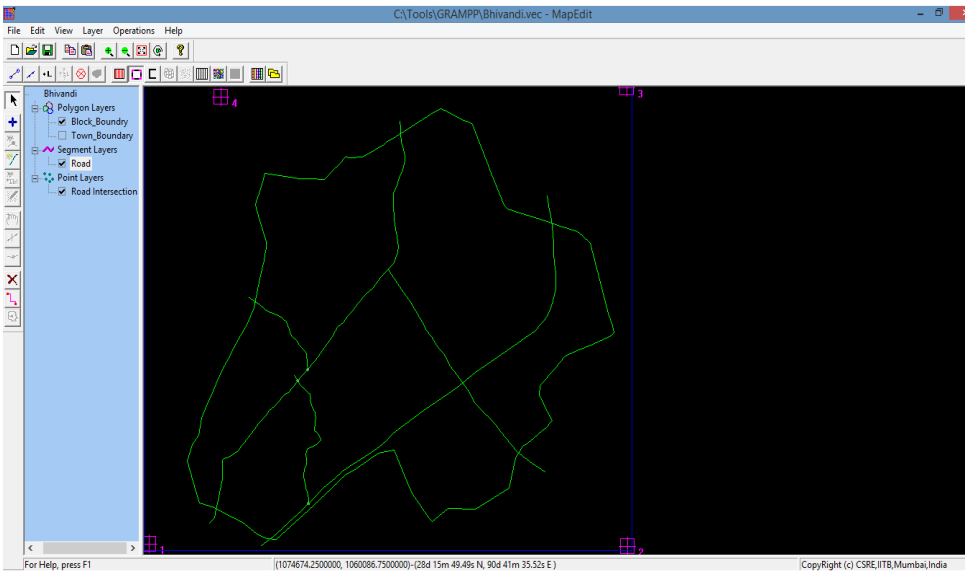
Figure 2. Study area



VI. CONCLUSIONS AND FURTHER RESEARCH

The results obtained from this study and analysis are the capacity of Anjur T rotay are 3826 pcu and with proper dimensions mentioned in the design and analysis section.
This paper discusses a prototype of a decision support tool for analyzing congestion at road intersections and conducting analysis subject to these traffic flows. The GIS software provides effective management of the detailed spatial data and the ability to visualize model results. Our current efforts are directed towards development of decision support for the road intersections planning to insure smooth traffic flow. The current prototype provides decision support for traffic management by using 'GRAM++'software. The same type of simulation model is under preparation for Navi Mumbai.

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