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Incident Management System For Heterogeneous Traffic Conditions

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Abstract

The economic growth of any country depends upon its transportation network, comprising of road, rail and air connectivity, of these road is the critical one. A good network of road is important as it provides connectivity between rural and urban areas. Along with this, road safety is an equally important aspect. It plays a key role towards a sustainable transportation development strategy. The adverse impact of modern road transportation systems is injury and loss of life due to road incidents. While the road incident situation is improving in the high income industrialized countries, most developing countries are facing a worsening situation. The continuous socio-economic growth over the years is causing an increase in demand for transport service including road transport. With the number of vehicles on the road growing rapidly, more road conflicts develop visà- vis traffic incidents (Saxena, 2000). It is observed that most of these incidents result from human error and carelessness on the part of the drivers or pedestrians.

However, the probability of occurrence, and its severity, can often be reduced by the application of proper traffic control devices, and sound roadway design practice. The success or failure of such control devices and design specifications however, depend extensively upon the analysis of traffic incident records at specific locations. The main objective of the study is to make an assessment of incident pattern considering spatial temporal aspects in the road incident analysis according to yearly, monthly and other variations.

Introduction

The economic growth of any country depends upon its transportation network, comprising of road, rail and air connectivity, of these road is the critical one. A good network of road is important as it provides connectivity between rural and urban areas. Along with this, road safety is an equally important aspect. It plays a key role towards a sustainable transportation development strategy.

Maps are a powerful and effective way to see what patterns are occurring with accident data spatially. An analysis of the worst Casualty accident sections of road and areas using pre-determined criteria and rules for comparison. These are ranked into clear group's e.g. Top 10% band, Second Top 10% band etc. using a colour coding approach. Listings give more detailed breakdowns of data for designated groupings for more clarity and information. E.g. no. accs per grouping, length of road section, size of black area etc. The adverse impact of modern road

transportation systems is injury and loss of life due to road accidents. While the road accident situation is improving in the high income industrialized countries, most developing countries are facing a worsening situation. The continuous socio-economic growth over the years is causing an increase in demand for transport service including road transport. With the number of vehicles on the road growing rapidly, more road conflicts develop visà- vis traffic accidents (Saxena, 2000). It is observed that most of these accidents result from human error and carelessness on the part of the drivers or pedestrians.

Road Accidents in India for years 1971-98

Year	Registered Vehicles (in 1000)	No. of Accidents (in 1000)	Casualties (in 1000) Killed	Injured	Total Casualties (in 1000)	No. of Accidents per 1000 Vehicles
1971	1865	120.2	15	70.7	85.7	64.45
1972	2045	122.3	16.1	76.4	92.5	59.8
1973	2109	121.6	17.6	79.3	96.9	57.65
1974	2327	114.3	17.3	76.7	94	49.11
1975	2472	116.8	16.9	77	93.9	47.24
1976	2700	124.7	17.8	82.5	100.3	46.18
1977	3260	135.4	20.1	95.6	115.7	41.53
1978	3614	146.3	21.8	99.5	121.3	40.48
1979	4059	144.4	22.6	102.9	125.3	35.57
1980	4521	153.2	24.4	109.1	133.5	33.89
1981	5391	161.2	28.4	114	142.4	29.9
1982	6055	166.2	30.7	126	156.7	27.45
1983	6973	177	32.8	134.1	166.9	25.38
1984	7949	195	35.1	156.2	191.3	24.53
1985	9170	207	39.2	163.4	202.6	22.57
1986	10577	215	40	176.4	216.4	20.37
1987	12618	234	44.4	139	234.4	18.54
1988	14818	246.7	46.6	214.8	261.4	16.65
1989	16920	270	50.7	229.7	280.4	15.96
1990	19152	282.6	54.1	244.1	298.2	14.76
1991	21374	293.4	56.4	255	311.4	13.73
1992	23507	260.3	52.2	267.2	324.4	11.07
1993	25505	280.1	60.7	287.8	348.5	10.98
1994	27660	320.4	64	311.5	375.5	11.58
1995	30295	348.9	70.6	323.2	393.8	11.52
1996	33783	355.1	72	330	402.8	10.51
1997	37231	290.4	61	290.8	351.8	7.8
1998	40939	306	66.5	304.6	370.1	7.47

Objectives

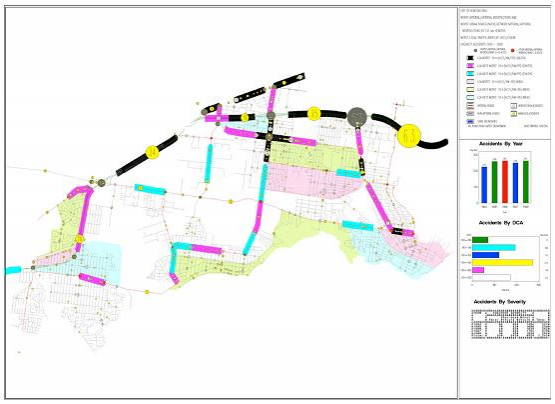
The objective of the study is to make an assessment of accident pattern considering spatial temporal aspects in the following manner.

- Road accident analysis according to yearly variations.
- Road accident analysis according to monthly variations.
- Accident analysis according to comparative vehicle wise.
- Accident analysis according to time slot wise.
- Accident analysis according to person.
- Accident analysis according to type of accident.

Study Methodology

In order to perform analysis related to road accident, a spatial database incorporating all the desired information be created. First of all, the existing road network was extracted from the toposheet and guide map. The updating of road network was carried out with the help of IRS LISS III and IKONOS Satellite data. All these information was registered on to a single layer and verified through satellite. Small discrepancies in road discontinuities were resolved by edge matching and proper editing in order to achieve a seamless digital database. The non-spatial data related to accident records available from police records were attached to the spatial data layers. A proper integration of the spatial and non-spatial was carried out by using ESRI ARC GIS.

Using the ERSI ARC GIS as the base, customized query for analysis of road accident data were defined. The query modules were designed so that a structured output as per a given set of inputs was available. If accident growth trends as per month are required the following inputs are given.



GIS GUI (Graphical User Interface)

Advantages of GIS approach

- Greater ability to target specific geographical areas
- Broad area analysis through to single point analysis possible.
- Point and click ease for building analysis

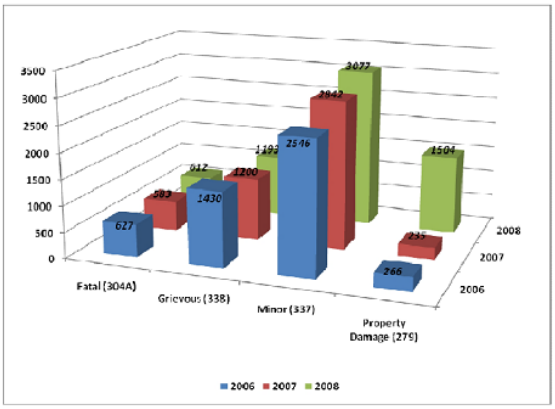
- Visual interaction available to understand patterns
- Full power of data analysis available through ACTIONS.
- Export of specific data possible through visual selection
- Additional analysis available directly using other modules
- Complex analysis can be designed in background if needed.

Identification of Black Spot

A Location whether link or node that experiences abnormal Crash frequencies, rates is considered as an Accident Black Spot. The technique that is used the study to identify hazardous Locations is known as the Critical Crash Rate Factor Method. Since traffic crashes are random occurrences and can be considered as ―Rare Events‖ it is not possible to identify hazardous locations simply on the basis of the number of crashes. Rather, the critical rate method incorporates the traffic volume to determine if the crash rate at a particular location is significantly higher than the average for the type of facility. If the crash rate of a particular location is significantly higher than the average crash rate for other locations in the jurisdiction having similar characteristics, the location is classified as an Accident Black Spot.

Accident trend (2006-2008)

Year	No. of accidents	% Increase in accidents
2006	4869	-
2007	4860	-0.18
2008	6386	31.39



Graph Showing Yearly Distribution of Accidents

Cluster Analysis

Clustering of accident black spots have been done based on two methods:

i. Injury

ii. Pedestrian Accidents

Injury Accidents

From the analysis of year wise accident data it could be observed that the rate of increase in injury accidents increases ever year. Hence it is imperative to analyze the injury accidents. Injury accidents are high and also the loss in terms of monetary value is more with injury accidents. Clustering of accidents involving injury accidents are done to identify the clusters of accident Black spots of injury accidents.

Black Spot 1 – Saidapet Kalignar Arch

Saidapet is an important administrative centre, it has a very busy sgopping market place called Bazaar Road. It is famous for its fish markets attracting buyers from far away places. Also it connects the Saidapet bus terminus with the Saidapet railway station inviting large number of vehicles and pedestrian traffic leading to accidents.

Observations from Field Study

- The subway available near the junction is faraway (more than 15 metres)

- Presently pedestrians cross the road using zebra crossing.
- The crowd from the bus terminus located near the junction also causes more traffic congestion.
- The bus stop located near the junction invites more pedestrian traffic.
- The traffic & Pedestrian movements are correctly regulated (7.00 AM to 10.00 PM) by the policemen.
- A road from the junction leads to the market and railway station invites more pedestrian traffic.

Blackspot 2 – CMBT

CMBT is located on the 100 feet Inner Ring road in Koyambedu between SAF Games village and the Koyambedu vegetable market. It is the largest bus terminus in Asia and spread over an area of 37 acres in Koyambedu. It can simultaneously station 270 buses and handle over 2000 buses and 2 lakh passengers a day. Hence inviting large number of people towards it.

Observations from Field Study

1. Merging of vehicles coming out from CMBT bus terminal.

2. Heavy bus and pedestrian traffic at the exit of the CMBT bus terminus.

3. MTC buses are involved in most of the accidents mainly during the time period of 5.30PM and 8.30PM.

4. The major cause for occurrence of accident at this junction is over speeding of vehicles.

Conclusions

The study clearly indicates that as per accident records, there is an urgent need to adopt proper traffic management procedures to check the growth of accidents. Nearly 72% of accident leads to fatal and grievous injuries. Further it will observe that number of accidents is highest in which month of the year. GIS has proved to be a good tool for analyzing multifaceted nature of accidents. While road safety is a critical issue, yet it is handled in an adhoc manner.

The two high accident prone areas were taken from the study area and statistical data were given and the remedial measures were suggested. Normally GIS based analysis would show the accident prone locations but not the statistical data. In this study a new technique have been applied using ARC GIS 9.1, it has the capability of statistical analysis for the accidents locations.

The computerization of accident investigation and analysis is necessary and this study has shown the advantages of the system to overcome the current problems of slow, inconsistent and error prone accident recording process. This system would be useful for improving the black spots and to prioritize them for taking treatment measures.

References

- *Dhir, M.P., & S.M. Sarin, 1993, Some Special Features on Traffic safety Situations in India, Proc. Int., Conf. On Road safety in Two Continents, the Netherlands, VTI Conferences I a Part 1, pp. 16-30.*
- *Environmental Systems Research Institute (2006) 'Getting Started with MapObjects 2.4*
- *Gheorghe. AV (1999), Integrated Decision Support Systems for Emergency Preparedness and Management, Annual Con of the Int Emergency Management Society, pp 151 – 162*
- *Harewood, S.I (2002) Emergency Ambulance deployment in Barbados: a multi objective approach, Journal of the Operations Research Society, Vol 53, pp 185192.*

- *Kadiyali L.R., & S. Venketesan, 1984, Traffic Accidents, forecast and remedies, Indian Highway, Vol. 12 No. 4, pp. 7-12.*
- *Nadaf, A.M., 1999, Accident and Drivers, Indian Journal of Transport Management, Vol-23, No-6, pp 361-369.*
- *Pasricha, P.S. (1997), Road Accident Management Strategies, Indian Journal of Transport Management, Oct 1997, in Road Safety- A book of readings published Centre of Road Safety, Central Institute for Road Safety, Pune.*
- *Sarin S.M., 1998, Road Traffic Safety In Indian-Issues and Challenges Ahead, Indian Highway.*
- *Saxena A., Ganesh Babu, R. K. Bajpai and S.M. Sarin, 2000, "GIS as an aid identifyaccidentspatterns,http://www.gisdevelopment.net/application/Utility/transport/GIS as an aid to identity accidents patterns.*
- *Srinivassan N., & K. Prasad, 1979, Fatal Accident Rates in Delhi, Indian Highways, Vol. 4, No. 3.*
- *Tuladhar S.B.S., & C.E.G. Justo, 1981, Analysis of Accident Rates-A Case Study, Highways Research Bulletin No. 16.*
- *Vanjeeswaran, Identifiation and ranking of High Pedestrian Crash zones using GIS, 2005 Annual ERI International User Conference, ASCE.*