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Modern Traffic Management Techniques for National Highways

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Abstract : An Accident is a rare, multifactor event preceded by a situation or event wherein one or more road users failed to cope with road environment results vehicle collision. The location in a road where highest number of traffic accidents occurs is called a Black Spot[5]. In this study, an effort has been made to identify the accident prone zones within Coimbatore district using GIS. For this purpose, the road accident data for the year 2015 pertaining to Coimbatore district have been used. Accident particulars like date, location, type of vehicle involved, number of persons injured or died were included in the GIS database. The aim of the work is to locate the accident prone area on the national highways and to identify the high rate accident locations and safety deficient areas. The weighted overlay functions available in the spatial analyst extension of the Arc GIS software were applied to identify the accident prone areas in Coimbatore district during the year 2015. The kernel density was applied to identifying the accident patterns, the road geometry measured in the accident prone locations to find out the causes for the accident. Based on the result, suggestions were provided to minimize the traffic congestion. The present study attempts to identify the most vulnerable accident black spots in Coimbatore district.
Keywords : GIS, Black spots, Weighted Overlay**.**

1.0 Introduction

A transportation system should satisfy the perceived social and economic needs of the user, as the need changes transportation system itself evolves and problems occur if it became inadequate[9]. The critical problem that an urban area faces is the traffic congestion which occurs when the demand exceeds the capacity[3,8]. Main cause of congestion is oversaturation and the situation worsens if an incident occurs. General congestion management measures include a wide range of data collection, system monitoring, identifying and evaluating transportation control measures. These types of measures and management can be done effectively with the help of latest advancements in GIS and GPS.With the speedy improvement in road infrastructure of developing countries, urban traffic is continuously increasing[4]. 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[1,2]. 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.

1.1 Study Objectives

The objectives of this study are:

- To determine the various factors that influences traffic congestion.
- To estimate the congestion using the model developed.
- To use GIS as a tool for effective congestion dissemination and management.

1.2 Literature Review

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

1.3 Study Area

The study area selected is Coimbatore in the state of Tamil Nadu. Coimbatore is the second upcoming smart city in India and is called as Manchester of South India. The longitude of Coimbatore lies between 76º65' E – 77º 29' E. The latitude lies between 10 º 22' N – 11 º 41' N. The total area of Coimbatore is 471 Square kilometers. The study area is shown in Figure1

Figure 1: Study Area

2.0 Methodology

Here, the open series Road network map which is available in survey of India is digitized in suitable scale to implement the prioritize model. The accident factors are as follows

- Road Way
- Gender
- Nature of Accidents
- Type of vehicle Involved
- Peak/Non peak Hour
- Working day/ Holiday

In order to model the mentioned factors and achieve the desired result, a step by step procedure as given below is adopted.

- Scan the map containing the desired road network and input this image to Arc View for digitizing.
- Digitize the road network with due considerations for separation of every link and assign id number to every link.
- Export the road attribute table generated in dbase format so that it can be imported by Arc view.
- Join the road attribute table to the digitized road map and prioritize the road network for accident occurrence using total weights assigned to every link.

3.0 Analysis Using Gis

The factors influencing the accidents were rank as minimum.

A. Weighted Overlay Analysis

Table 1: Accident Count

Police Station	No of Accident	%
B1bazaar	11	1.971326165
Kattur	138	24.7311828
Kuniyamuthur	22	3.94265233
Peelamedu	194	34.76702509
Podhanur	12	2.150537634
RS Puram	18	3.225806452
Race Course	6	1.075268817
Ramanathapuram	12	2.150537634
Rathapuri	6	1.075268817
Saibaba Colony	10	1.792114695
Saravanampatty	81	14.51612903
Selvapuram	9	1.612903226
Singanallur	30	5.376344086
Ukkadam	5	0.896057348
Variety Hall	4	0.716845878

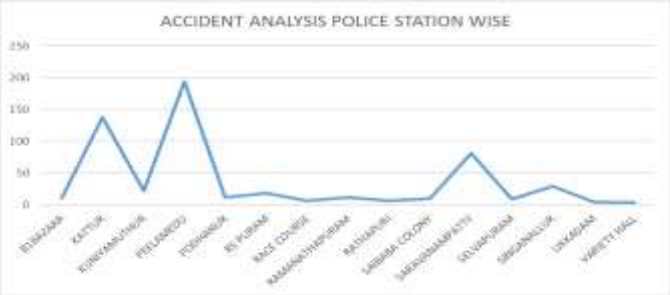

Fig 2 Graph showing the Variation of accidents in each

Police Station

From the figure Peelamedu ranks first in accident high risky zone, kattur as second accident risky zone and saravanampatty as third risky zones. Other zones are the safest zone were accident count is minimum.

Fig3.MapShowing location of accident spot

The Accident spot for past two years were collected and the rank were allotted to find the high, medium and low risk zones is are shown below.

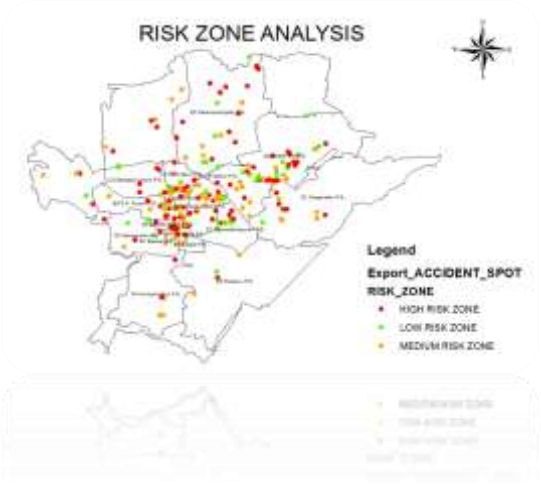

Fig 4Risk zone analysis

Fig.5Accident Based on Police station

4.0 Result and discussion

The study was an attempt to find out the most vulnerable accident locations or the black spots in Coimbatore districts making use of GIS. The Weighted Overlay Analysis method was used to rank the accident locations. Based on the analysis, Fun Mall were identified as most vulnerable accident locations and suggested some possible alternative or corrective measures to improve the transportation system.

The suggestions to reduce the accidents are

1. Location of Speed Brake
2. Provide footpath on both the sides of the road for the safety of pedestrians.
3. Provided Suitable Place for Ring road Formation
4. Take suitable enforcement measures to reduce the speed of vehicles.
5. New Bus Stop Location for Fun Mall

Fig 6Reason for Accident Risk Zone Spot in Coimbatore

5.0 Conclusion

Methodology for traffic congestion solutions in the paper includes the various steps and use of GIS technology. It integrates the network analyst tool, and field experiment. The priority results are utilized in evaluating congestion points according to roads direction. Results obtained from these tools compare alternate improvement strategies, and solutions thus giving the best possible solution. ArcGIS is a collaborative that allows using, creating, and sharing maps, apps, and data, including authoritative base maps. Finally, a service area investigation has been performed based on Weighted overlay analysis to define the congestion points according to roads direction. This methodology could help planners in managing the distribution of the future services, and re-assigning roads directions to mitigate congestion points at all parts of Coimbatore city.

6.0 References

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