

Identification of Black Spot Analysis

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Abstract

The region where the road accident occurs frequently are called as Black spot .Identifying black spot of accident zones in the developing country plays an important role in the development of an economic, industrial, social and cultural fields. Due to the increasing the number of vehicle quantity, heavy traffic occurs which results into the large number of road accidents .The major factors for accidents are driver, vehicle condition, health problem, road environment such as obstruction visibility, bad shoulder, trees and poles on the shoulder. A study work has been made in this paper regarding the black spot analysis through various research papers. It deals with the process of finding the accident black spot through various factors between the two or specified region. We can find the accident zone through the cluster and regression analysis. Through the analysis of black spot region, we can take preventive measures to avoid the road accident in the particular region by placing the danger board or any other safety measures.

Keywords— *Black spot; Accident; Cluster; regression.*

INTRODUCTION

Road safety plays an important role in the world. Road accident is one of the major problem which severely impacting the society. Accident Hazardous region in the

road are called as Black spots region. Locating the frequently accident occurring Zones as Black spots, which improve the safety of the road environment. India has the second largest road in the world. Every

year large number of road accidents are occurred in the world ,but only few road accidents are reported to the police. Due to the increasing number of vehicles population and several other factors such as over speed, drunk and drive, violating the traffic rules, improper road condition or junction designs and mechanical repair in the vehicles, driving the vehicles using cell phones, etc.. Accident is the one thing which causes more deaths than any other diseases.

In India nearly 5lakhs people are died in the road accidents occurs every year. This is a great problem for our country. The rates of Road accidents are strictly proportional to the population vehicles. Accidents are not natural but human tragedy. Therefore road safety is the only thing which saves lots of people life from the Road accidents.

Social awareness, campaigns must create awareness among the people regarding the road safety. Students, NGO's must create awareness among the people about the road safety measures. Government bodies like Regional Transport Office, traffic engineers and experts must be required to reduce the road accidents. Therefore identifying the Black spot region plays an important role in reducing the accidents in the road

environment. Recently Mr. Nitin Gadkari spokes about Road Safety and it concerns at a two day national conference held at Vishakhapatnam during August 2016. He announced that nearly 800 Black Spots or accidents zones on national highway to be fixed soon. Identifying the Black spots which helps to reduce the accident rates in the road.

Black spots in the specified region are identified through the past accident rates which occurs in that zone and other several factors such as obstruction visibility, bad shoulder, trees and poles on the shoulder, road condition etc. while identifying the black spot zones preventive measures can be taken to reduce or early avoid the road accidents. Black spot zones are calculated through the number of accidents with number of outcomes from the specified area .Based on this accident risk can be identified and denoted as Black spot zones .Based on the Black zones ,we take several measures to improve the black spot in the specified region. Recently the Government has introduced the concept of Green India in the Road to improve the Road environment and ensures the road safety.

Related work

Government of India which focus on the Black spot identification, to reduce the

accident rates. Following are some of the research papers.

1. "Study on the forecasting method of Traffic Violation Black Spot", by Hu Jiaying, Chen Van, Sun Zhanquan, Liu Wei 2010 which uses the support vector machine method to forecast the traffic violation Black spot.
2. "Research on Identification Method for Road Accident Black Spots with Ordinal Clustering Method", by haifeng Jiang, changcheng Li 2011 which uses the clustering method to identify the Road accident black spots.
3. Accident analysis & blackspot identification from chandani chowk to KJEI Campus, Pune –A Case Study "by Jitesh Dhule1, Rutuja, Gawade, Amol Pawar, Swapnil Borge, Nazim Ansari, Shadaab Sayyed 2017 which uses the accident density method, weighted severity index.
4. "Black Spot Analysis on National Highways", by A.N. Dehury, A.K. Das, A.K. Pattnaik 2013 which uses the accident frequency method.
5. "Identification of Black spots and junction improvements in Vishakhapatnam city", studied about the city Vishakhapatnam in India in Andhra Pradesh. It is the second largest city in Andhra Pradesh with an area of 550 km², it is primarily an industrial city, apart from being a port city. The traffic volume of Visakhapatnam city is about 59% of the total traffic volume of the district Gopala raj, 2011. The term Black Spot is used to describe locations that have a higher average accident rate. The identification, analysis and treatment of road crash black spots are widely regarded as one of the most effective approaches to road crash prevention. Generally hazardous locations are selected on the basis of formal road safety audits.
6. "Identification of Accident Black Spots for National Highway Using GIS", in this they were studied about traffic in Muzaffarnagar and Meerut. Muzaffarnagar District is bounded by Meerut District to the south and Haridwar District to the north. The data were collected from police stations and survey of

topographical map has been studied. After that the Ground Control Points with the help of Global Position System has been found out & then the black spots has been identified by using Critical Crash Rate Factor Method.

7. "Black Spots Analysis On Pune - Bangalore National Highway", identified accidental Black Spots on a section 820 km-830 km of NH-4 by studying the accidental data provided by National Highway Authority of India NHAI during year 2014-2015. They used Weighted Severity Index WSI and Accidental Density Method ADM for identification of Black Spots. By considering all the parameters of Accidental Density Method ADM they found black spots at chainage 821.2 km, 823 km, 824.1 km, 825.3 km and 829.1 km.

Based on these research papers, Black spot analysis has been takes place to identify the Black spot region in order to reduce the road accident. These Research paper describes various methods to identify the Black spot zones or accident zones. This paper provide the analysis for identifying the black spot zones in the specified region

through the accident risk. Based on the results, road crash prevention has been made in the specified region for improving the black spot or accident zones which reduce the road accident risk.

PROPOSED METHODOLOGY

In this section, Black spot analysis can be identified from the data collected and using the algorithms such as regression and clustering black spot analysis can be identified.

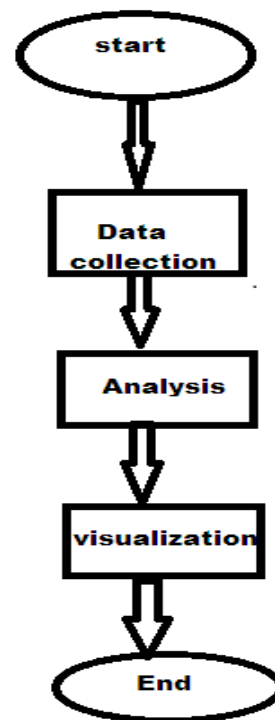


Fig1: Basic block diagram.

A. Data Collection:

The data are collected based on the accident rate which occurs in the state wise in India. It consists of total number of

accident occurred in the manner of state wise along with latitude and longitude which helps to identify the location of the particular accident zones or danger zone.

B. Alogrithm:

Based on the collected data, analysis of black spot zones has been takes place. We propose an algorithm such as regression and clustering for analysing the accident risk in the specified zone.

C. Visualization:

After the analysis of major accident rates in the particular zones or area in the state wise, visualization of large number accident in state wise has been takes place .For visualizing the accident rates weight severity index method are used which can

be manipulated through computing the total number of persons killed in the accident with the number of persons injured in the accident.

ANALYSIS

With the help of these algorithms, black spot analysis can be identified in an effective manner.

A. Regression:

Regression analysis is a set of statistical processes for estimating the relationships among variables. It includes many techniques for modeling and analyzing several variables.

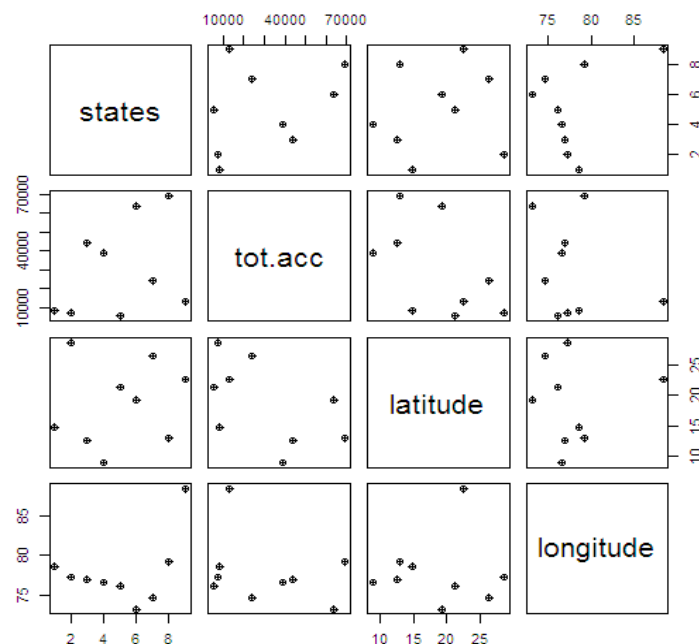


Fig 2: Regression of black spot analysis.

It is used to estimate real values based on continuous variable. We can establish relationship between independent and dependent variables by fitting a best line using regression. This best fit line is known as regression line and represented by a linear equation $Y = a * X + b$.

In this equation:

Y – Dependent Variable

a – Slope

X – Independent variable

b – Intercept

These coefficients a and b are derived based on minimizing the sum of squared difference of distance between data points and regression line. Based on the Regression algorithm accident risk can be identified with respect to state wise.

B. Clustering:

Clustering can be considered the most important unsupervised learning problem. Generally cluster is a collection of objects which are “similar” between them and are “dissimilar” to the objects belonging to other clusters. Cluster simply refers to the group of data. Based on the Clustering of data, we can obtain the Black spot analysis of particular region in state wise. Here we consider four states in India and find the

large number of accident occurs in the state using k means clustering algorithm.

The summary of data consists of the following fields such as,

States	tot.acc	latitude	longitude
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Andhra	:1	Min. : 5497	Min : 8.90
		Min. : 73.16	

Delhi	:1	1st Qu.: 8297	1st Qu.:12.92
		1st Qu.:76.13	

Karnataka	:1	Median :24072	Median :19.25
		Median :76.92	

Kerala	:1	Mean :30482	Mean :18.60
		Mean :77.86	

Madhya Pradesh	:1	3rd Qu.:44011	3rd Qu.:22.58
		3rd Qu.:78.57	

Maharashtra	:1	Max. :69059	Max. :28.67
		Max. :88.33	

Other	:3		
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K means clustering: K-means clustering is a type of unsupervised learning. The goal of this algorithm is to find groups in the data, with the number of groups represented by the variable K. The algorithm works iteratively to assign each data point to one of K groups based on the

features that are provided. Data points are clustered based on feature similarity. K-Means clustering provides better accuracy

in analyzing the black spot zones in the particular region.

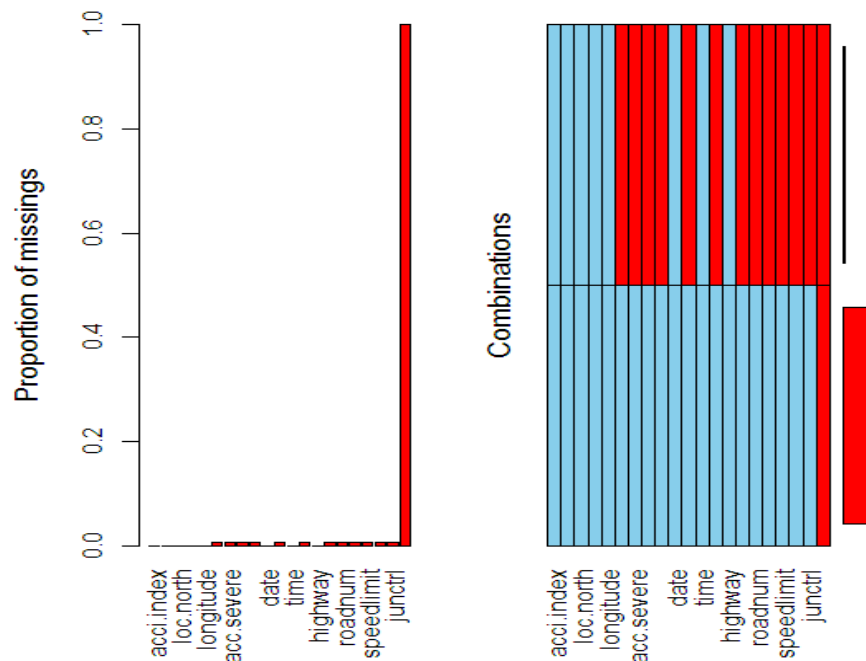


Fig3: Proportion and combination of accident records attributes.

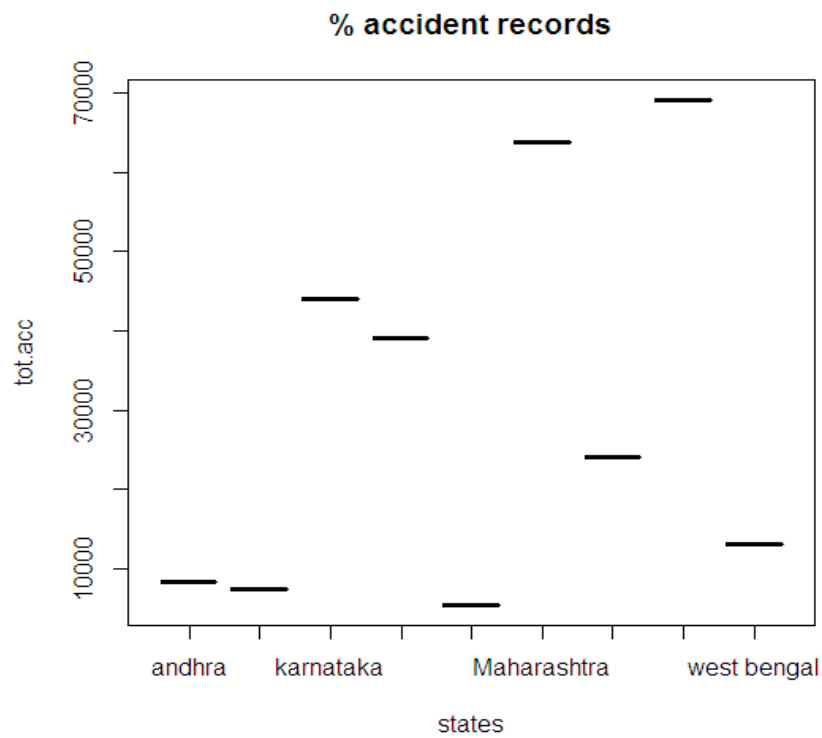


Fig4: Clustering of accident records in the state wise using K- means clustering algorithm

REPRESENTATION OF BLACK SPOT ZONES

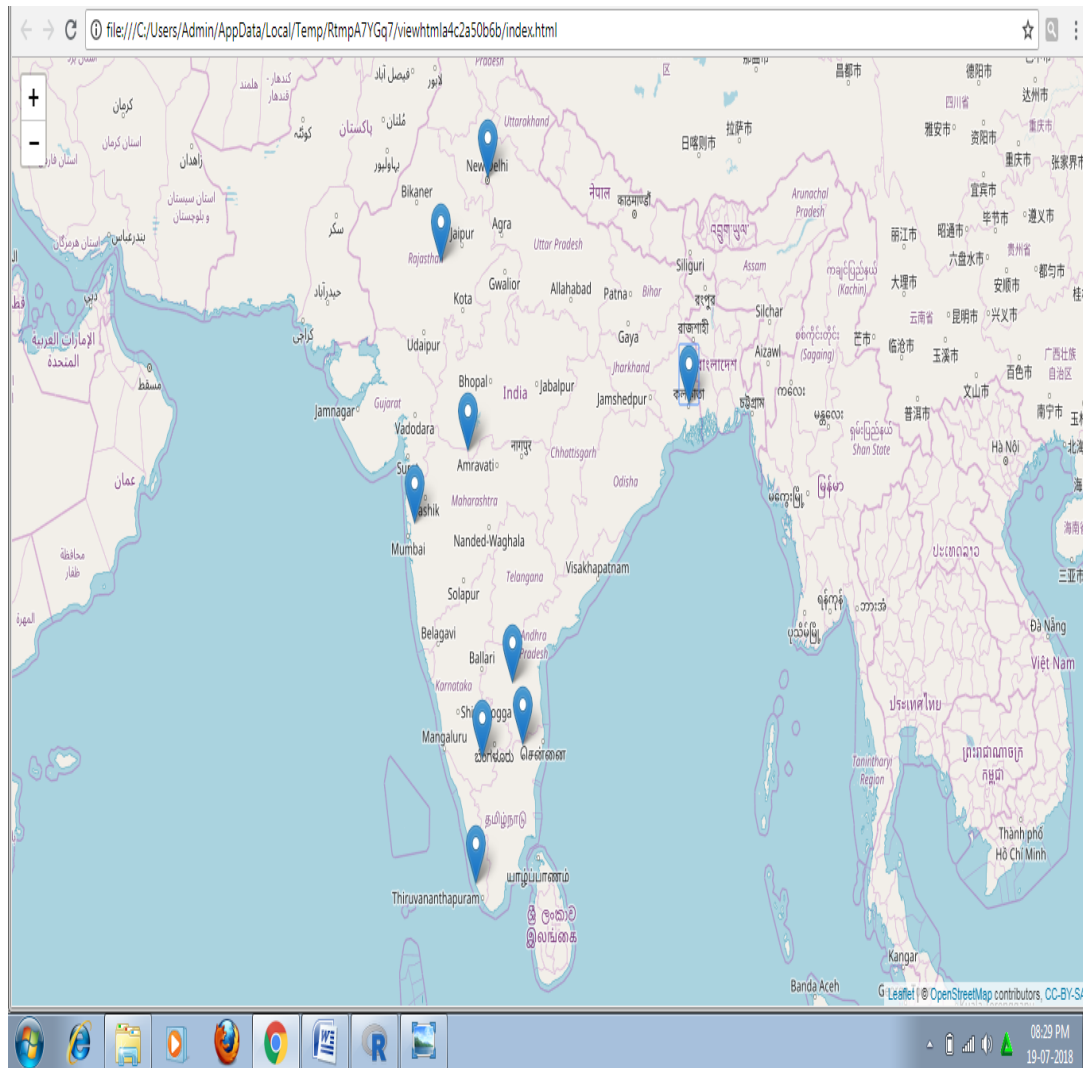


Fig5: Representation of Black spot zones in the states.

The figure shows the black spot region in the states. Representation of black spot analysis can be performed with the help of latitude and longitude of the states in India using leaflet package in r. visualization or representation of black spot zones are based on large number accidents occurred in the states. It uses the formula,

$$\text{ACCIDENT RISK} = \frac{\text{NUMBER OF ACCIDENT}}{\text{NUMBER OF OUTCOMES.}}$$

CONCLUSION

Identification of black spot analysis which helps to detect the black spot zones in various region. The major accidents are occurred from these algorithms in Tamil nadu state. From these method several

algorithm can be used to identify the black spot analysis in future.

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