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Evaluating and prioritizing identifying criteria of accident- prone in Road Accidents in AHP Method (A case study : Iran, Gorgan, Golestan province, Tangrah-Minoodasht)

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ABSTRACT: Accident black spots are places in the points many accidents due to environmental factors and human factors go hand in hand; and these traffic accidents cause loss of life, inability to work and produce in society and the physical and psychological traumas which are very unpleasant consequences. The purpose of this research is to identify black spots to help assess the diagnostic criteria of individuals who are in the open field. In this regard, according to the conditions existing in Golestan province due to the presence of tourists, traffic of passengers and the central province of Khorasan and transit of goods to central Asia and China communicating via the output shaft to the east of the axis Minoodasht- Tangrah with approximate length of 65.3 km from the boarder sample for this study was discussed. After obtaining the required information (such as the map road) open –axis frequency and intensity of random factors, time of occurrence and accident conditions, traffic levels and more in the last three years 92, 93 and 94 of the organizations were investigated including the police, the province, and the transport routes between the terminals and the general directorate of roads and urban development was received. Then, according to the characteristics of the track at various locations, it was a route to 21 points segmentation and action oriented measures to help traditional approach (frequency rate of accidents, critical rate of accidents, intensity and severity rate) and were evaluated to identify black spots. According to the 50 questions presented in the format of AHP, for experts in the field of road safety and accident to different criteria and weighing, the benchmark rate to detect the intensity of black spots on case studies was defined. Black is also to point whether or not other components of the model predicted in its accident- prone black spots is in black spots and the potential to improve model predictions were used. The eleven points were accident- prone to identify and prioritize.

***Keywords*:** Black spots, AHP, Road accidents

INTRODUCTION

In the United States on a national scale, 40% of the total trips are made through out-of-town, and about 60% of all deaths occur in them.*(Persaud,Retting and Lyon,2004*) The statistics show that about 37% of the country's crashes occurred near access points(*Annual Statistic of Road Transportation,2011)* The results of Habibian studies, using the hierarchical analysis process, show that the boundaries of roadside margins and parking spaces along the routes of accesses, accesses, and intersections, tunnels, arches, and direct route range have the highest role In the event of road accidents*(Habibian,2012).*Studies show that in Iran there are more deaths in outlying urban roads.

The major part of the country's arterial ruptures is not isolated from the main two-way route *(Annual Statistic of Road Transportation, 2015)* And accidents often occur in these ways. One of the major reasons for the occurrence of accidents, the congestion of marginal applications and the number of accesses*(Highway Geometric Dessign Cod ,No.415)*. In a study conducted

by CERZADO and his colleague, the increase in access at a point in the way reduces the speed of 0/6 km / h at that point and, as a result, changes the driver's behavior*(Mwesige,2015).* Faye and et all, Dart and Mean reported that the rate of accidents in roads increases with increasing access points per mile or kilometer

One of the current requirements of human is to transport and move; nowadays transportation has an important role in global commerce, communication, social issues and the other parts and causes development, growth and flourish. In the other hands, transport sector is as foundation, development-oriented and communication loop and can be in charge of scout of sections and sub-sections the national economy of countries. One of the adverse and inevitable effects of transportation system is traffic accidents. Traffic accidents cause loss of human life, ability to work and production in society and the physical and psychological traumas. It should be noted that traffic accidents are one of influential factors in the deaths and injuries and financial damages in the world and adverse effects and consequences of social, economic and cultural arising from it threaten and damage communities severely. According to World Health Organization declaration about 1200000 persons are killed and 50000000 persons are injured annually due to traffic accidents all over the world. International standard of dead people in car accidents is declared 1 to 2.5 persons per 10000 vehicles. Now this figure is about 2 persons in European countries, about 1 person in USA, 1.4 person in Japan, 1.8 persons in Australia and in some other Asian countries such as Turkey, Thailand and Malaysia would be 5.7 to 12.7 and in Iran is from 18 to 19 people per 10000 vehicles in Iran during 2005 that is equal to 2% of GDP of country. It should be noted that traffic accidents rather than effects such as death and injury of people, can have the other negative effects such as medical costs, financial damages or making mental damages such as mental alarm of survivors of accident. In this regard during recent years some effective actions are done in field of increasing traffic safety and decreasing death and injuries due to them in country but rate of accidents and death and damages due to them was high in Iran and special actionneed to be taken in this regard. Traffic accidents' cost would be high and significant and many of people would be affected both directly and indirectly. Nowadays significant effects of traffic accidents are obvious in economic, social and sanitary aspects and its effects would be shown in real checking and analyzing. Based on economic surveys and costs in 2005, the amount of direct and indirect cost would be 180000 Billion Tomans due to traffic accidents annually. In the other hands, in sanitary and social aspects, based on Ministry of Health and Medical Education, traffic accidents are the second factor of death and the first factor of lost life in Iran (in global statistics 10^{th} category is related to this factor) and 60% of accidents leads to death and injury in traffic accidents, while in global statistics mean this figure would be 25%. Checking statistics of injuries and injured people due to traffic damages in country shows that 0.4% of people in the country are killed and injured in traffic accidents. These statistics of dead and injured people which are hospitalized are more than 30% imposing so many costs to transportation section. Death of 250000 Iranian people during 10 last years was because of traffic accidents and damages and being disability of millions people in these days, which can put this problem in list of the most important priorities for the health of country. Comparison number of dead or the injured is significant with the number of damaged people in the imposed war (250000 people) Earthquake Victims in Bam in 2003 (25000 dead and 50000 injured) is thinkable. Also, based on W.H.O prediction, more than 25% of health budgets in developing countries are paid for the victims and the injured people in traffic accidents. Studies show that most of the accidents in Iran are due to death in the metropolitan area network. The major part of the arterial pathways of the country is not separated from the main path of the two lines [Annual Statistic of Road Transportation,2015]. And accidents often occur in these ways. One of the important reasons for the occurrence of accidents is the marginal user density and the number of accesses[Highway Geometric Design Code ,No 415]. Statistics show that about 37% of rural accidents occurred near access points [Annual Transportation, 2011].

Statistic of Road In the United States on a national scale, 40% of all trips are done through out-of-town routes, but about 60% of all accidents occur in them [Persaud , Retting and Lyon,2004]. In research conducted by Crazado and colleagues showed that an increase of one point of access in a decrease of 0.6 mph at that point and thus change the behavior of drivers [Mwesige,2015]. The results of Habibian studies using the hierarchical analysis process in analyzing the hazard level of each of the road districts show that the boundaries of roadside margins and roadside parking, bridges, arches, and direct road distances respectively have the highest role In the event of road accidents [Habibin,2012].

Fee et al,1970, And Ward and Man reported that the rate of accidents on roads increases with increasing access points in miles or kilometers[Dart and Man,1970]. The results of Long and Morrison studies showed that with increasing access to routes in miles, the rate of accidents also increases [Long and Morrison. 1993]. Abdul Wahhab and Jian reached the following results in their research [Jian and Abduiwahab, 1994].

- Increasing the accessibility density is almost a linear trend in increasing the rate of accidents.
- Increasing the rate of accidents by increasing the density of access at higher speeds than lower speeds.

Anderson et al. Showed that outlying cities in Michigan, Columbia and Florida have a dramatic impact on the rate of accidents [Andersen et ai.2013] & [levinson and jerry.1997].

In this regard, current research tries to recognize and prioritize black spots on Minoudasht-Tangrah road axis in Golestan so that by recognizing these places and correcting its defects in future, the amount of road accidents would be decreased in this axis.

1. World health organization

Problem definition and the goals of research

Financial and body injuries due to traffic accident has been turned into a world'scrisis. Our country is not free of this. For the time being, lots of attempts are being pursued to decrease the number of accidents inside the country. Making suitable road structure and or repairing and or rebuilding geometric deficits that cause an increase in consent of drivers on the roads, conditions and reduction of traffic accidents. Regarding the point that 80 per cent of the traffic and 75 per cent of accidents occur upon 20 per cent of the axis of inter- city and inter- province (4) and that most accidents on 16800 km out of sum of 85000 km of the mentioned roads.Necessity of research and more investment in this case seems to be urgent. Rebuilding and repairing the present deficits in roads as identifying the accident- prone spots and on the basis of accident data in order to determine, require to amend is proposed. The accident – prone spots where are determined based on accident data, are being gradually identified and surveyed by the related organization in our country in the last few years. According to the experience of other countries removing accident from such spots that meet costly financial expenses could save many country men's life. Surveying and studying the accident-prone in Iran due to lack of a comprehensive plan in identifying and prioritizing these spots and suitable information bank whereby the identification of the country's accident- prone registered in it, and after financing and administering its data reforming actions would be in time set at a low and inadequate level whereas neither their identifying and prioritizing valid scientific methods is applied nor after spending money and lack of their immunity are evaluated their effectiveness and reduction of miserable events in these areas. In this research, one of the connecting axis of Golestan province was investigated. This axis due to holding various geographical conditions owns many accidents. As a result, this study, by using evaluation techniques and hierarchical analysis out of identifying criteria of accident- prone spots, specified its best criteria and then by partitioning the accident – prone spots, according to a specified intended criteria and its maps via software GIS has shown the amount of occurrence. Consequently, some of the subsidiary targets of this research are as follows:

- To identify accident – prone spots of the partitioned route with respect to traditional criteria for recognizing accident prone- spots.
- To determine the best the best method out of traditional criteria with the help of preparing questionnaire after consulting with experts and the AHP method.
- To present accident prediction model for preventing neither black spot nor that never be identified in the traditional methods as accident – prone spots.
- 3- Traditional ways of identifying the most important accident –prone spots (studies based on accidents).

In this section, in order to analyze the safety of the axis being studied, accident data is used. In case of using the accident-prone, a series of applicable index should be existed until by using them a criterion on the safety of roadswould be obtained. The used index in this section for doing safety analyses are completely introduced and their strength and weak points are also underlined.

1-3- Accident Frequency

Accident frequency is the simplest criterion that is used for identifying accident – prone spots. Every accident is placed in its happening spot in road network and the number of the entire reported accidents are accumulated in each intended area. Each area is devoted a frequency ranking crash (5)

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2 Accident Frequency

3 Frequency Ranking Crash

Estimation stages

1) All reported accident positions be analyzed within the period.
2) Various data population be defined.
3) The number of accidents is estimated is each era.
4) The average number of accidents in data population be also estimated.

$$f_{rp} = \frac{\sum f_j}{n} \quad (1\text{-}3)$$

In which:

Frp= average number of accident

Fj= frequency of accidents belonging to j point of a data population

N= number of accident- prone spots

5) Determining the least accidents frequency that justifies the safe explanatory analysis

6) Those points where whose accidents frequency out of legal threshold (between 1/5 to 3 equals the average of accidents in data population) be more as an accident- prone would be introduced (the number of legal threshold can be change according to the expert).

2-3- Accident rate

Based on the definition, accident rate is a ratio between the number of accidents and amount of traffic jam. This method has been targeted both upon the bulk of traffic jam and sum of the number of accidents.

For arcs (route length), followed accident rate out of the number of accidents is the bulk of traffic and the level length. In knobs (intersections, accident prone) the followed accident rate is stated as size as millions of vehicles worked for the longitudinal spots of roads and the number of accidents as size of millions of entering vehicles into the knobs or intersections.

Estimation stages

1) The position of all reported accidents be identified within the analysis area.
2) Various data communities be defined.
3) For data population accident rate is estimated in each area.

$$R_j = \frac{F_j \times 10^6}{365 \times PL_j Q_j} \quad (2\text{-}3)$$

In which:
Rj= accident rate in the area j (accident over million vehicle km)
Fj= number of accidents in the area j (within the analysis period)
P= analysis period (year- based
Lj= area level length j (kilometer)

Q1= Average of annual daily traffic of the area (AADT)
Note: for intersections and accident- prone spots, L is not regarded in the above –mentioned relation and; the R unit is the accident over million vehicles
4. Average of accident rate should be estimated for the data population

$$R_{rp} = \frac{\sum F_j \times 10^6}{365 \times P \sum L_j \times Q_w} \quad (3\text{-}3)$$

Where:
R_{rp}= accident mean rate (accident on million vehicles/ kilometers)
F_i= number of accidents in area j
Q_w = The annual weighted average of daily traffic (AADT)

$$Q_w = \sum \frac{(Q_j \times L_j)}{\sum L_j} \quad (4\text{-}3)$$

Q_j= AADT of area j
5) Determining the minimum of accident rate that justifies detailed analysis of safety.
6) Sections that its accident rate is exceeded admissible threshold (between 1.5-3 times of accidents mean in statistical population) are introduced as accident-prone section. (The amount of threshold can be changed according to expert).
3-4-4 the method of accidents crucial rate

This criterion provides the ability to conduct quality using the methods that are extended separately. This method compares the rate of accident in one area to the rate of computational group accidents from areas where have similar features (Statistical population). This method is included a simple statistical test that is used in a special situation related to the rate of accidents such as intersection. This method determines whether the rate of accidents in an area is significantly more than accident mean rate in the other similar areas [5]:
The steps of computations:

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4. Accident rate

1) The position of all accidents reported is determined during the analysis.
2) Various statistical societies are defined.
3) For ach statistical population
- The rate of accidents is determined in each area (point).
- The accident mean rate is accounted for statistical population.
4) The crucial accidents rate is determined in each area:

$$R_{cj} = R_{rp} + k\sqrt{\frac{R_{rp} \times 10^6}{36525 \times PL_j Q_j} + \frac{1 \times 10^6}{7305 \times PL_j Q_j}}$$

(5-3)

Where:

R_{cy} = the crucial accidents rate in area j (number of accident on million vehicles/ kilometers)

R_{rp}= the mean rate in similar areas (number of accident on million vehicles/ kilometers)

K= statistical constant

1.036 for 85% confidence level

282/1 for one reliance level 190

1/645 for one reliance level 195

2/326 for one reliance level 99%

Note: for intersections or accident-prone spots, L is not considered for the above relation and the K unit, accident is over million vehicles.

4. Comparison of accident rate and crisis rate of each one of places (whenever accident rate is more than crisis rate, the justified safety explanatory analysis)

6-4-3- equivalent damage property only

The index (EPDO), proportionating one weight to each accident that is a follower of the level of a damage level which is tolerated by each of the accident sacrifices, devoting more emphasis on the accidents severity subject and driving events. Therefore, an accident causing local injuries to two persons and a harsh event to the third person, is ranked as a severe accident. Also, an accident that bring about a severe injury to three people is placed in the same ranking. For this purpose, artificial weigh- giving factors have been suggested [5].

For accidents of damage property only (PDO): 1

For accidents with local injuries: 3/5

For accidents with severe injuries or death: 9/5

Estimation stages

1. Position of all reported accidents should be identified within the analysis period
2. Various data communities should be defined
3. Weight-giving factors should be selected for every accident severity
4. For any data population

EPDO index and its average should be estimated in each area.

$$EPDO_j = \sum w_i \times F_{ij}$$

(6,3)

In which:

Fn= number of accidents type I in the area j

$$EPDO_i = \frac{EPDo_j}{F_j}$$

(7-3)

In which:

FJ= sum of accident number in the area j

Average of EPDO in data population is estimated by the following relation:

$$EPDo = \frac{\sum\sum w_i \times F_{ij}}{\sum F_j}$$

(8-3)

- Intensity method- accident rate

This approach combining the severity of accidents and accident rate and has been regarded as the most meaningful method. In this method the numerical amount of financial damages is calculated equals (EPDO) and then by dividing it on the million

entering vehicles to a knot (MWV)7 or million entering vehicle on the basis of km (MEK) one rate of financial damage would be obtained for each spot(24). For any data population the following relation is calculated:

$$SR_j = \frac{EPDO_j \times 10^6}{365 \times 25 \times PL_j Q_j} \quad (9\text{-}3)$$

in which:
Rj= rate of accident severity per spot j (number of accident on million entering vehicle -kilometer)
EPDO= index of financial damage equally per spot j
P= analysis period (year based)
Lj= length of area level j (klm)
Qj= annual average of daily traffic of the area j (AADT)
Then the average rate of accident severity be estimated for the sample data:

$$R_{rp} = \frac{\sum EPDO_j \times 10^6}{365 \times 25 \times P \sum L_j \times Q_w} \quad (10\text{-}3)$$

In which:
SR= the average rate of accident severity (accident on million vehicle- kilometer)
Q= annual weigh average of daily traffic (AADT)

severity method- accident

This method while combining the accident severity and accident rate, has been regarded as the most meaningful methods. In this method, the amount of numerical equal financial damage is estimated and then by dividing it on million entering vehicle to a knot (MWV)10 or million vehicle- kilometer (MEK)11 one equal rate of financial damage for each spot would be obtained (24). For each sample data the following relation is estimated:

$$SR_j = \frac{EPDO_j \times 10^6}{365 \times 25 \times PL_j Q_j} \quad (11\text{-}3)$$

Where:
R_j= the accident severity rate in area j (number of accident on million vehicles/ kilometers)
$EPDO_j$= Indicator of compensation equivalent in area
P= analysis duration (in a year)
L_j= the cross-section length of area j (kilometer)
Q_j= Annual mean of daily traffic in area j (AADT)
Then the mean of accident severity rate is accounted for statistical population:

$$R_{rp} = \frac{\sum EPDO_j \times 10^6}{365 \times 25 \times P \sum L_j \times Q_w} \quad (12\text{-}3)$$

Where:
SR_{rp}= the mean of accident severity rate (accident on million vehicles/ kilometers)
Q_w= The annual weighted average of daily traffic (AADT)

The method based on accident prediction model

In previous methods, the approach of defining places needed to analyze details has been based on comparing the safety level in total statistic population. In practice, when there is not enough places with similar features, computing f_{rp} is not possible. In such cases, accident prediction method can meet this problem.
This model predicts the number of accidents based on independent variables function [5]:

(3-13) the number of accidents (fn) = (independent variables function)
That one of these most common models (the general figure of equivalent0 is:
(3-14) the number of accidents = $a\ (trafic\ function)^b$

In this relation, the amount of b is assumed from 0.8 to 1.2. it I must be noted that addition to traffic variables, the geometry plays a significant role in accidents. It is implemented through different reference community and extending model for each society. For example, we can make some separately models for suburban cross and T-shape intersection.

If according to accident prediction model, we want to compute improvement potential of area j, and then the relationship of improvement potential based on the frequency of accident equals to:
(3-15) $P.I_j = f_j\text{-}f_{rp}$
P, I_j, the improvement potential of area j^{th}
f_2, the frequency of accident in area j^{th}
f_{rp}, the accident mean frequency in reference community
is transformed following as:
(16-3) $P.I_j = f_j\text{-}f_{pj}$

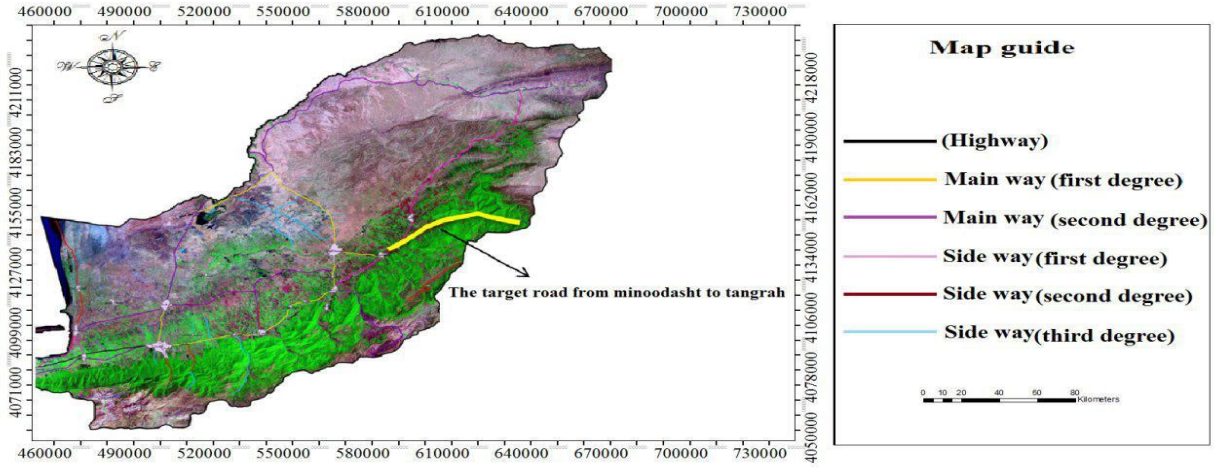
That fpj is the frequency of the predicted accidents in the j place is obtained through relation (13-3).

In order to determine whether an area is accident-prone or not (black spots), prediction model can also be used. Thus, the accident- prone number is achieved by applying the proposed conditions in the definitions. Therefore, the areas with the accident – prone number above the numbers achieved are identified as accident – prone areas. (Accident – prone number is the same proposed priority index of P.I.).
The whole procedure of this method is as follows:

1. Locating all reported accidents within the analysis period
2. Determining different reference communities
3. Calculating frequency and traffic size for each area
4. Development of prediction model of accident for each reference community

Review of the case study

Minoodasht- axis which is a bottleneck to the length of around 65.3 kilometers and known as Golestan jungle read is one of the most important connecting roads of Golestan province to the northeast of the country. It starts from Minoodasht police station and its end is the boundary between the Golestan province and the north Khorasan province (bottleneck to the jungle tunnel). Most of the route is composed of two-way roads to the width of 5-7 meters that it is mainly without enough dirt track edge and many of its providing safety factors especially its geometrical plan is not proportional to the size and type of road's traffic. Most of the tourism travels of people living in Golestan, Mazandaran and Tehran provinces to the holy city of Mashhad are through this road that makes a very special traffic conditions periodically in this route and increases the intensity of traffic interruptions in this area. The mentioned axis is one of the most accident – prone axis in the country that is always with many life and financial losses. Therefore, conducting reforms for increasing the regarded axis would be necessary. Figure (1) shows the geographical situation of the mentioned road in GS system and its segmentation. Some criteria considered in the route segmentation can be referred to as the number of lanes, route expansion, access density, residential areas, route separation, and route direction from the horizontal and vertical arc perspective, and route improvement condition.



(a)

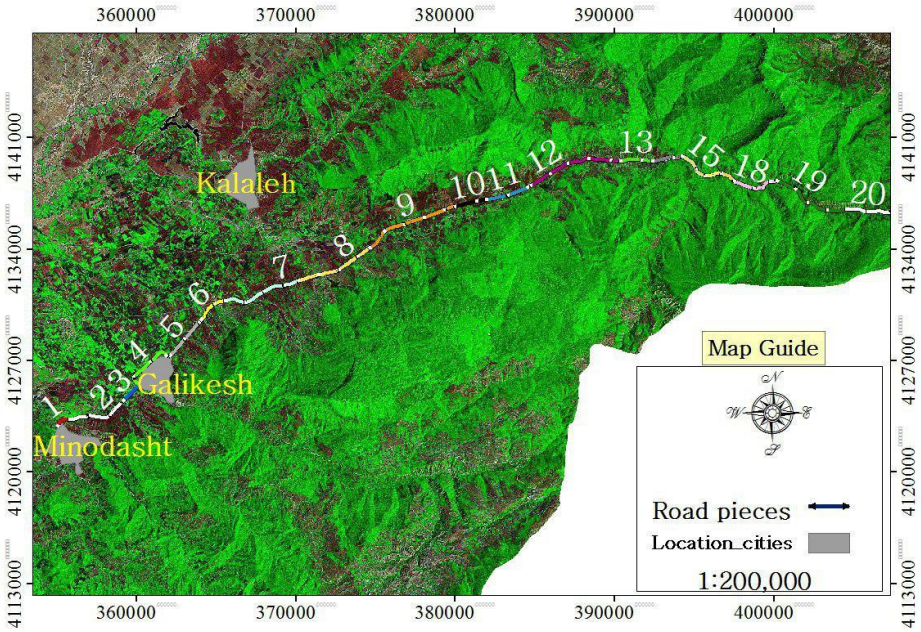


Figure 1. (a) road geographical position Minidasht-Tangrah and (b) its segmentation in the east of Golestan province in grouping of Golestan province ways.

This road has several hairpins and horizontal and orthogonal arcs because of passing from upstand downs of Alborz mountains margin. Being a mountainous –jungle road and environmental factors increasesafety reduction in this road. This axis with 65.3 kilometers length In Golestan state is studied in this investigation.

1-4-way segmentations features

According to this, as it is said, the studying zone is field studied carefully.

According to plan map and longitudinal and latitudinal profile of the way and in necessary conditions, and the way has divided into suitable segments. After that the in formations a bout road parameters like the number of bands, the way separation condition, the overtake lines condition, the way constructions included in each segment.

Table 1 is showing the ways segmentation and its information.

Table 1. The ways segmentation in studying zone and each segments features.

zone	Type of road	Exies	Police zone Minodasht-Galikesh
Google bend	Main	Minodusht to Galikesh	Minodasht-Galikesh
Perse so bend	Main	Minodusht to Galikesh	Minodasht-Galikesh
Dozin Intersection	Main	Minodusht to Galikesh	Minodasht-Galikesh
Tanfagh Intersection main axis	Main	Minodusht to Galikesh	Minodasht-Galikesh
Mahmood Abad village	main	Galikesh to kalaleh dilemma	Minodasht-Galikesh
karimabad village	main	Galikesh to kalaleh dilemma	Minodasht-Galikesh
Pasang	Main	Kalaleh crossroad to tangrah	Tangrah
Parabad village	Main	Kalaleh crossroad to tangrah	Tangrah
AghGhamish	main	Kalaleh crossroad to tangrah	Tangrah
Love Intersection	main	Kalaleh crossroad to tangrah	Tangrah
Sadegh Abad cillage	Main	Kalaleh crossroad to tangrah	Tangrah
Besh oily	Main	Kalaleh crossroad to tangrah	Tangrah
Tarangoli village	main	Kalaleh crossroad to tangrah	Tangrah
Tarangoli village	main	Kalaleh crossroad to tangrah	Tangrah
Tangrah village	main	Kalaleh crossroad to tangrah	Tangrah
Mouzeh turn	main	Tangrah to Golestan Jungle tunnel	Tangrah
FirsT parking	main	Tangrah to Golestan Jungle tunnel	Tangrah
GolTange Intersection	main	Golestan jungle	Tangrah
Stony wall(Divarsangi)	main	Tangrah to Golestan Jungle tunnel	
Abshar turn	main	Golestan jungle	
14 meters bridge	main	Kalaleh crossroad to tangrah	
Sayyeh turn	main	Tangrah to Golestan Jungle Tunnel	

2-4-Types of accidents and the ways traffic

After collecting the most important information from cam forms, and road police station, all the segments for 92, 93 and 94 year is included and classified separately, the number of each segments accidents and their total number according to strength of accident is obtained. Also with reference to transportation organization data bank of Golestanstate, going back and forth statics in studying axis is received during these three years with year and month separation has been calculated.

Table 2 show number and intensity of accidents and traffic rate base on transportation and police reports of target limitation.

Table 2. Number of accidents and traffic rate if92, 93, 94 base on transportation and police reports

sum	death	injury	damaged	ADT	Legal speed	Band no	Ending km	Starting km	Part length	P.no
10	5	5	0	9860.11	60	2	1+000	0+000	1.0	1
8	1	7	0	9860.11	60	2	4+800	1+000	3.8	2
18	7	11	0	9860.11	80	2	6+300	4+8000	1.5	3
8	1	7	0	9860.11	80	2	9+800	6+300	3.5	4
11	3	8	0	10153.67	60	2	12+800	9+800	3.0	5
16	3	13	0	10153.67	50	2	14+800	12+800	2.0	6
11	1	10	0	5051.08	90	2	19+800	14+800	5.0	7
6	1	5	0	5051.08	90	2	24+800	19+800	5.0	8
25	3	19	3	5051.08	60	2	29+800	24+800	5.0	9
8	0	8	0	5051.08	80	2	31+800	29+800	2.0	10
25	1	24	0	5051.08	80	2	34+800	31+800	3.0	11
8	0	8	0	5051.08	60	2	40+800	34+800	6.0	12
18	2	16	0	5051.08	80	2	42+800	40+800	2.00	13
18	1	17	0	5051.08	60	2	44+800	42+800	2.0	14
6	2	4	0	5051.08	60	2	46+800	44+800	2.0	15
14	5	9	0	5051.08	50	2	47+800	46+800	1.0	16
9	1	8	0	5051.08	60	2	48+800	47+800	1.0	17
7	4	3	0	5051.08	80	3	51+800	48+800	3.0	18
9	2	7	0	5051.08	50	2	56+800	51+800	5.0	19
5	2	3	0	5051.08	50	2	61+300	56+800	4.5	20
5	1	4	0	5051.08	40	2	65+300	61+300	4.0	*21*

3-4-choosing the best criteria strategy for identification of accidental points.

Base on evaluating identification criteria of accidental points by AHP and questionnaire of 50 experts and supervisor in transportation ,road safety and road survey domains about weighting criteria base on Experts choice software .weight of intensity rate (0.499, that is higher than other methods has been investigated base on identification of accidental points in Iran.

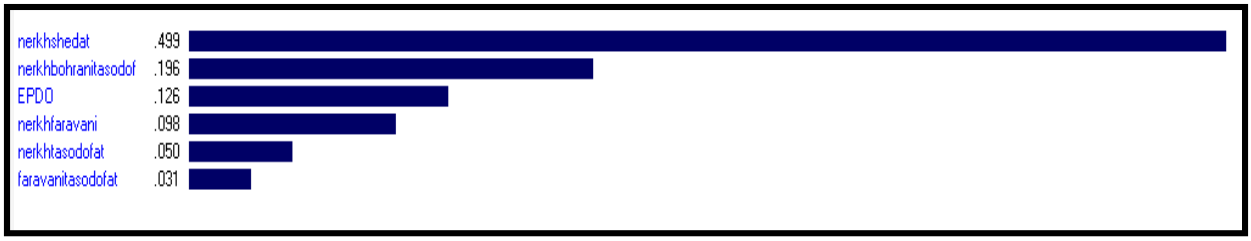


Figure 2. Weighting of identification of criteria in accidental points by AHP in Expert choice software.

As can be seen, weight of other criteria, critical rate of accident, EFDO, accident rate, and accident abundance are 0/196, 0/126, 0/098, 0/500, 0/032, respectively.

4-4-evaluating whole limitation in this study and prioritizing particles based on accident statistics.

Information accident for Minoodasht - Tangrah axis extracted from the database bottleneck- in part 1-4 and 2-4 and In the next steptheir values are calculated for each piece by assigning the number of accidents recorded and using methods of identifying accident-prone sections, also according to the allowed threshold values accident-prone sections and the need for reform that have priority will be identified.

Table 3. Calculation criteria to identify black spots for each piece.

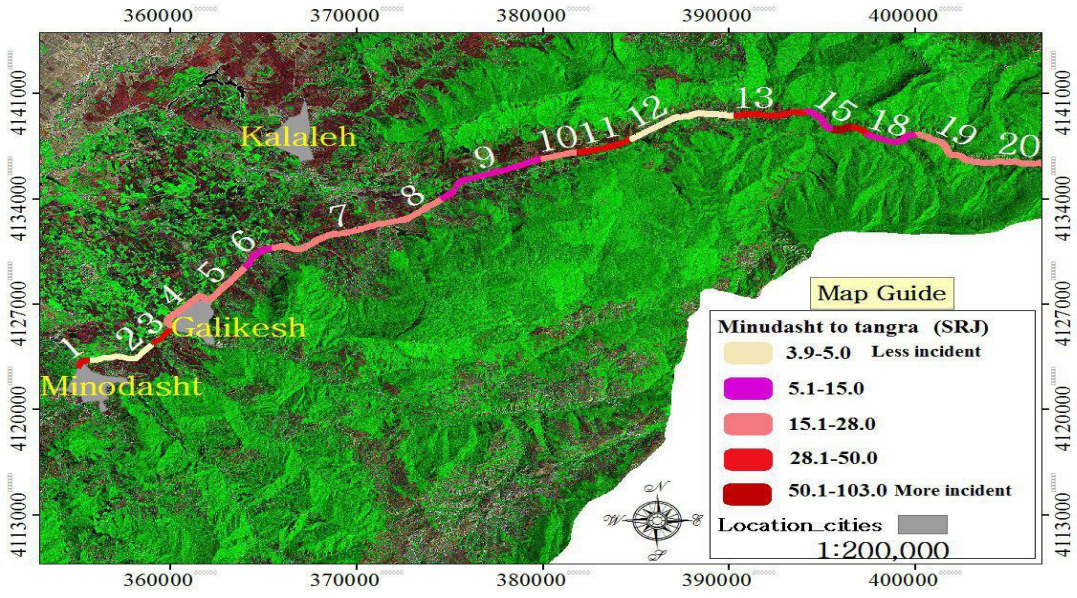
SRj	EPDO	Accident crises rate	Accident rate	frequency	ADT	Ending km	Starting km	Part length	no
46.7	50.5	1.3	0.9	10.0	9860.1	1+000	0+000	1.0	1.0
4.8	24.6	1.0	0.2	8.0	9860.1	4+800	1+000	3.8	2.0
47.6	42.8	1.2	1.1	18.0	9860.1	6+300	4+8000	1.5	3.0
5.2	24.6	1.0	0.2	8.0	9860.1	9+800	6+300	3.5	4.0
11.5	34.8	1.1	0.3	11.0	10153.7	12+800	9+800	3.0	5.0
20.8	28.9	1.1	0.7	16.0	10153.7	14+800	12+800	2.0	6.0
8.9	22.3	1.1	0.4	11.0	5051.1	19+800	14+800	5.0	7.0
6.0	27.5	1.1	0.2	6.0	5051.1	24+800	19+800	5.0	8.0
20.3	22.5	1.1	0.9	25.0	5051.1	29+800	24+800	5.0	9.0
11.6	16.0	1.3	0.7	8.0	5051.1	31+800	29+800	2.0	10.0
28.2	18.8	1.2	1.5	25.0	5051.1	34+800	31+800	3.0	11.0
3.9	16.0	1.1	0.2	8.0	5051.1	40+800	34+800	6.0	12.0
38.5	23.7	1.3	1.6	18.0	5051.1	42+800	40+800	2.0	13.0
32.3	19.8	1.3	1.6	18.0	5051.1	44+800	42+800	2.0	14.0
21.1	39.0	1.3	0.5	6.0	5051.1	46+800	44+800	2.0	15.0
102.8	40.6	1.6	2.5	14.0	5051.1	47+800	46+800	1.0	16.0
38.5	23.7	1.6	1.6	9.0	5051.1	48+800	47+800	1.0	17.0
23.4	55.4	1.2	0.4	7.0	5051.1	51+800	48+800	3.0	18.0
10.2	31.3	1.1	0.3	9.0	5051.1	56+800	51+800	5.0	19.0
8.8	43.6	1.1	0.2	5.0	5051.1	61+300	56+800	4.5	20.0
6.7	29.8	1.1	0.2	5.0	5051.1	65+300	61+300	4.0	*21.0*
15.98	*28.77*	-	*0.5555*	*11.66*	Index average for data sample				
27.17	*48.909*	-	*0.9444*	*19.83*	Legal threshold***				
17-16-14-13-11-3-1	*18-1*	*17-16-14-13-11*	*17-16-14-13-11-3*	*11-9*	Crises levels				

* Critical rate for a confidence level is considered 99%.
** Weighting coefficients for Fatal, injury or damage accident respectively is considered 85-16 and 1.
***Threshold in any criterion achieved from multiplying Demographic index in Factor 1.7.

Table 4. Compare different criteria based on threshold and Parts accident risk.

SRJ (the best criteria on the view of experts)	** EPDO	Accident crises rate	Accident rate	frequency	Results
1-3-11-13-14-16-17	1-18	11-13-14-16-17	3-11-13-14-16-17	9-11	Crises levels according to legal threshold

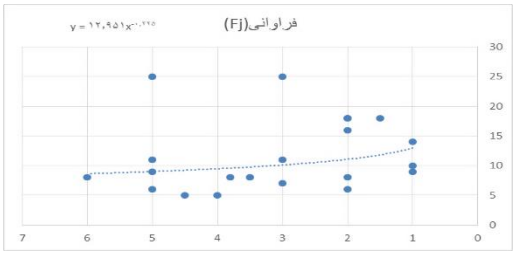
Also picture 3 shows location black spots map thattheir spatial database has been provided in GS systems with severity rate method and accident amount.



Checking accidents prediction model withimproved potential method:

Sections examine with using of accidents prediction models to determine which pieces have more accident occurrencepotential.The details of this method explained in part 3.It is worth nothing that the length of the piece are used as a

function of variable because of fixed average daily traffic for more parts.According to this the frequency of accidents prediction follow up the following model.



Scale of quality accident prone of parts in severity rate method.

Picture 5: calculation criteria of identificatd of accident _ prone spots for each piece with experimental method bayes and improvement potential.

Well-being power graph by analysis pieces:

Just as marked in upper graph and in list number 5 in addition to pieces be event by intensity rate method (color brown) piece 6 and 15 (color green) in beforehand events method to recognition as feasible piece. Therefore 9 feasible pieces with due attention to their priority. It means 16, 3,1,13,17,14,11 by intensity rate method 15,6 recognition by beforehand events method that in future must distinction by informal method to show solution for secure the beforehand events pieces.

Table 4. fitting design model of parts based on part's length

P.I. (model)	Fpj	(ADT) Q	Length ofpart	Kilometrage finish	start	No ofpart
2.81	12.951	9860.11	1.0	1+000	0+000	1
-0.93	9.21	9860.11	3.8	4+800	1+000	2
1.53	11.67	9860.11	1.5	6+300	4+8000	3
-0.73	9.41	98⁄60.11	3.5	9+800	6+300	4
-0.35	9.79	10153.67	3.0	12+800	9+800	5
0.71	10.857	10153.67	2.0	14+800	12+800	6
-1.55	8.59	5051.08	5.0	19+800	14+800	7
-1.5	8.6	5051.08	5.0	24+800	19+800	8
-1.5	8.6	5051.08	5.0	29+800	24+800	9
-0.7 /	10.85	5051.08	2.0	31+800	29+800	10
-0.36	9.78	5051.08	3.0	34+800	31+800	11
-194	8.2	5051.08	6.0	40+800	34+800	12
0.66	10.8	5051.08	2.00	42+800	40+800	13
0.66	10.8	5051.08	2.0	44+800	42+800	14
0.66	10.8	5051.08	2.0	46+800	44+800	15
2.81	12.95	5051.08	1.0	47+800	46+800	16
2.81	12.95	5051.08	1.0	48+800	47+800	17
-0.41	9.79	5051.08	3.0	51+800	48+800	18
-1.54	8.6	5051.08	5.0	56+800	51+800	19
-1.34	8.8	5051.08	4.5	61+300	56+800	20
-1.04	9.1	5051.08	4.0	65+300	61+300	21

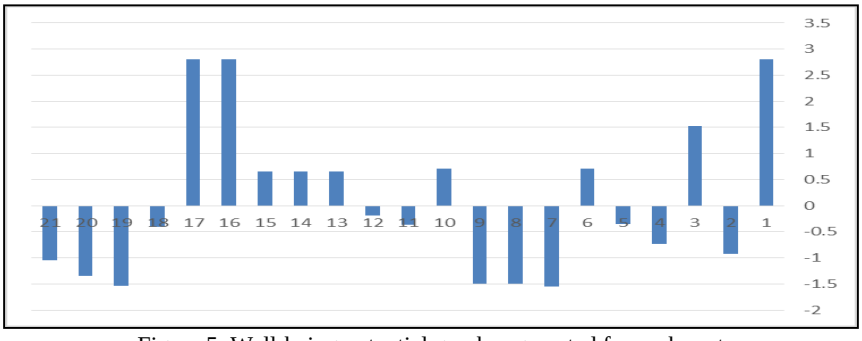


Figure 5. Well-being potential graph segmented for each part

Summary, conclusions, and recommendations:

In this essay after putting up the issue and the importance of the subject matter in recognition of the accidental road, checking the diagnostic of the criterion the dangerous points according to the global standard of the safe roads was pointed then conducting the research of the accidents data is one of crucial axis of Golestan county and just way out to the east of the country and Khorasan city, the related organizations for Minodasht axis bottleneck was done. In continuation of the subject with the help of the traditional methods the recognition of the accidental places were identified the severe rate got more weight on the AHP questionnaire from specialists as a final criteria in recognizing for accidental points as an anticipation model of the accidents were used, and the anticipation model was also used, in addition of the overall data is related to the accidents in parts in GS surrounding were collected and integrated.

According to this, with regards to the conducted primary research and main problems that solved the main problems could be named such as the lack of alarming signals and the middle line and the edge in the accidental section, the interference of the passer and mounted in residential areas and the villages and the danger of falling limit that study was conducted and the unauthorized construction and due to the lack of parking, non-standard radius and the lack of the drainage and proper safeguardon the bridges and dangers areas of falling could be named

Some proposals about continuing the research could be explained as a sample:

1. The recognition of the safe roads and presenting the technical strategies and standard for increasing safety and surveying the economic strategies with regards to the profit to the expense(B\C)
2. The recognition and prioritizing accidental points by using the new approach and by comparing it to the traditional approach.
3. Prioritizing the projects of the safety improvement in Minoodasht axis bottleneck based on the budget and by using the different methods in prioritizing (the first generation, second generation, third generation in the necessary level.
4. The comparison of the audit results in safety roads and accidental data and the rate of influencing each factors in out breaking an accident with the artistically model.
5. The use of the multilevel models (multi- level modeling) for identifying accidental points with regards to the accidents factors related to the human being, road and vehicles that have both environmental and

behavioral.

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