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LEVEL OF SERVICE OF SAFETY GRADED QUANTITATIVE RESEARCH FOR LOW-GRADE HIGHWAY SECTIONS

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ABSTRACT
Level of Service of Safety is a new concept in the field of traffic safety in China and developed countries, it is a quality indicator which is used to describe the road traffic safety situation and roads providing service of traffic safety for traffic participants. Introducing the study status of the Level of Service of Safety in China and developed countries, the definition of the concept, applications and content. In order to objectively evaluate traffic safety performance at low-grade roads, the concept of the level of service of safety for low-grade roads is brought forward, the factors influencing the sections of level of service of safety are analyzed , then linear, the risk of the roadside, traffic volume, the proportion of trucks and 85% speed difference between cars and large vehicles are selected as the evaluations, level of service of safety for the basic sections of low-grade highway is divided into four levels, the grey class whitening function is established to determine the appropriate threshold, Grey Clustering Method is used to evaluate the level of service of safety for low-grade highway sections, and reasonability of the method is validated. The Grey Clustering Method is applied to evaluate traffic safety of actual low-grade highway section, the result shows that the proposed method is reasonable and feasible.

KEY WORDS
Low-grade Highway Section ; Level of Service of Safety ; Grey Clustering Method

1 INTRODUCTION
Contrast to the design specifications from the engineering technical standards (2003) find that the choice of service level, shoulder width, the width of roadbed, stopping sight distance, the sub-grade design flood frequency, bridge and culvert design flood level, vehicle load level and other indexes freeway ,first class highway, second class highway and under second class highway are obvious difference, therefore, low-grade roads is the distribution function of secondary roads and under second grade highway. In this paper, according to the characteristics of the traffic network in Beijing, selects second class roads and under second

grade highway for the low-grade roads, and the low level and rural roads hereinafter collectively are referred as low-grade roads.

Level of Service of Safety (LOSS) can be used to describe the road traffic safety situation and roads providing service of traffic safety for traffic participants, since used as a measure of the quality of service, it will inevitably require such a service which can be quantified, so the traffic level of service of safety can be defined as a quality indicator which can describe the road traffic safety situation and road traffic safety services to transport participants [8].

When implementing the improvement project for the safety issues of the sections, the engineering and technical personnel and decision-makers will face a series of thorny issues, such as how to identify the alternative point segment which needs to improve the safety, how to determine the implementation priority of these alternative point segment, how to determine the focus of the funds arrangements, and how to obtain greater security income with limited funds. A simple idea to answer these questions is to be able to grade the safety conditions of the different sections, and to distinguish the level of service of safety for sections through the different grades.

At home and abroad level of service of safety for freeway and highway intersection have been studied: in 2003, Jake Kononov and Bryan Allery proposed the level of service of safety of traffic and analysis framework of level of service of safety based on safe performance model (SPF), used the accident rate (per year per mile incidents frequency) and annual average daily traffic volume as a hierarchy of indicators, established a generalized linear regression accident prediction model of two-way six-lane highway in U.S. cities [5]; in 2007 the researcher of Southeast University proposed the basic concepts of level of service of safety for intersection traffic, level of service of safety for intersection traffic refers to the intersection of the user from the intersection geometry linear, road traffic conditions, traffic environment, traffic control and other aspects may be the quality of service of traffic safety, which is the intersection itself can provide the degree of traffic safety services, by the analysis of the intersection traffic safety influencing factors the report selected the main factors and sub-influencing factors, and respectively established master model and correction model to come to the intersection traffic of level of service of safety model. According to the model to calculate the value of "danger degree of intersection", and traffic level of service of safety was divided into A, B, C, D, E, F six level, and for a different level of safety proposed the qualitative description [6].

Traffic level of service of safety can be used to measure road traffic safety situation and its quality of service of traffic safety for the driver and passengers, and it also can be used to describe the potential to improve traffic safety. Abroad the research of traffic level of service of safety is still at the starting stage, at domestic there is simply introduction or application of foreign research in this area, and not make a detailed and in-depth research.

From 2005 to 2009, all traffic accidents (including fatal F, serious injury SI, minor injury MI and property damage PD) of the Huairou District in Beijing, low-grade roads accounts for 95.23 percent, thus, reducing traffic accidents and traffic casualty rate of low-grade roads to enhance the level of road traffic safety and improve our current severe traffic safety situation has important significance.

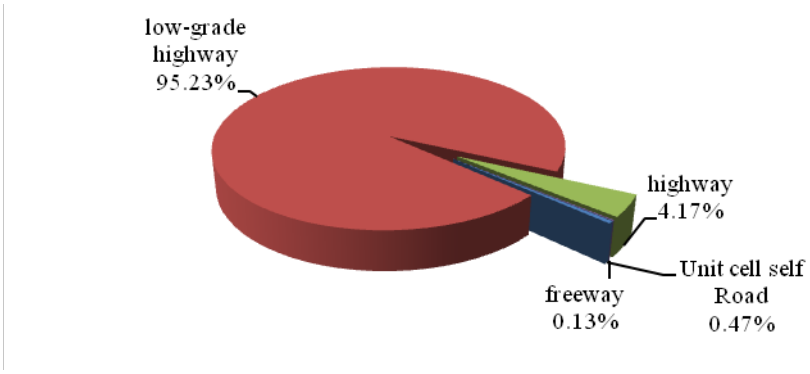

Fig.1 The distribution of road traffic accidents of Huairou District in each grade highway in 2005-2009

The research object of this paper is low-grade highway sections, based on the data from the survey of low-grade highway sections in Beijing assess the level of service of safety for low-grade highway sections.

2 THE SELECTION OF EVALUTION INDICATOR

In order to objectively evaluate the level of service of safety for low-grade highway, and consider the ability to obtain data required for evaluation, this paper is not from unsafe manifestations or results of low-grade roads, but from unsafe reasons of low-grade roads, by analyzing each factors affecting the safety of low-grade highway transportation system, this paper establishes a low-grade Highway Traffic Safety pre-evaluation methods - level of service of safety for low-grade road sections .

The road infrastructure involves in many parts, including roadbed, bridges, tunnels, and the drainage system which ensure the road normal function, safety facilities and so on. These components in different degree have impact on traffic safety, but studies have shown that one of the most important and critical factor is the road alignment. The driver most concerns about the information of linear in the driving process, which directly determines the driving behavior of the driver taken, while the linear trend combined with the surrounding terrain also determines the highway body and ancillary works, and therefore can be said for the road sector, "Traffic safety starts from the linear design. "

Traffic accident and its severity depend on the relative velocity between vehicles and knocked objects, thus, the discreteness of operating speed is considered to be more direct indicators to study the speed impact on accidents. Studies have shown that the greater the difference between the vehicle speed and average speed, speed distribution more discrete, the higher the accident rate will be.

Due to the difference of the vehicle type and its dynamic performance, resulting in cars and trucks in the process of moving exhibit significantly different characteristics, there is a large difference in the velocity distribution, the range of acceleration and deceleration, and driving behavior between cars and large vehicles. Large vehicles mixed necessarily impact on the entire traffic flow, between cars and large vehicles produce mutual interference, resulting in a difference in speed and then increase the probability of accident.

From the research at home and abroad, traffic is an important factor affecting accident, usually thinks that with the increase in the volume of traffic, an increase in the number of

accidents, when the volume of traffic increases to a certain downward trend, the number of accidents is decreasing tendency. By analyzing the correlation between the number of accidents and impact factors, the average daily traffic volume is positively correlated with the number of accidents, and the correlation coefficient is maximal.

Simply speaking, roadside accident is the accident of running off the road. According to incomplete surveys and statistics: roadside traffic accidents in road traffic accidents account for about 30%; in a death toll of more than three people serious accident, the vehicle which runs off the road, crashed roadside cliffs or high bridge accidents accounting for about half of the fatal traffic accidents, and even more. So enhancing the environment of roadside safety has a significant role in reducing the probability vehicle running off the roadside and the severity of roadside accident.

Level of service of safety for sections evaluation index system is composed by road properties and transport property, each category contains a number of indicators under an indicator. Generally think, road alignment and traffic factors is related to the probability or frequency of vehicles running off the road; roadside characteristics factors affect the severity of the accident; the truck proportion and speed difference between cars and large vehicles not only affect the traffic accident rate, but also affect the traffic accident seriously. According to the above analysis and summary, the level of service of safety graded evaluation index system for Low-grade highway sections is shown in Figure 2.

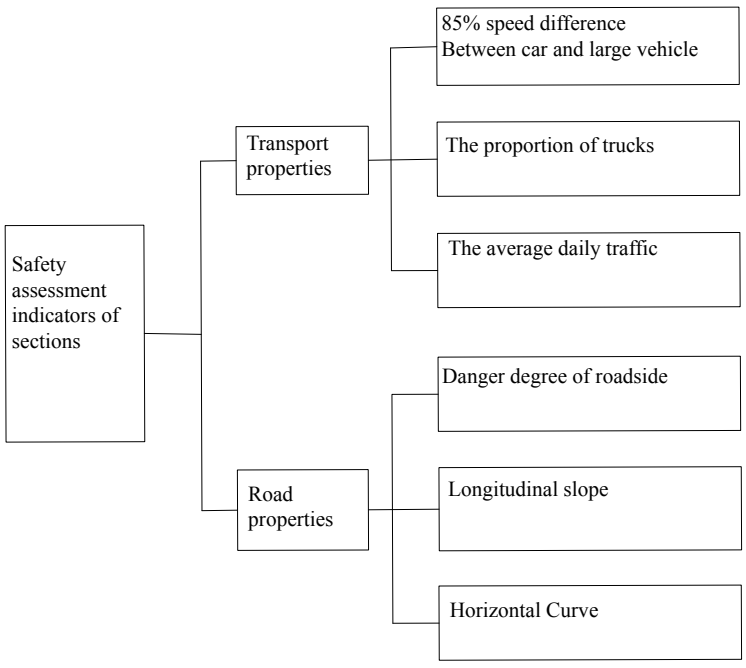

Fig. 2 Level of service of safety graded evaluation index system for Low-grade highway sections

Definition and calculation method of indicator variables are shown as follows [1]:

(1) Horizontal curve variables X_1

X_1 is aggregate variable, represents the deflection average one hundred meters length evaluation sections, and is calculated according to formula (1).

$X_1 = \sum_i (WH_i \times DEG_i)$ (Formula 1)

Formula:

l_i - The length of the round curve i in evaluation sections;

L - The length of the Evaluation section;

R_i - The radius of round curve i;

WH_i - The proportion of round curve i in the evaluation sections $WH_i = \frac{l_i}{L}$;

DEG_i - Deflection angle of curve per 100m length of the round curve i $DEG_i = \frac{18000}{\pi \times R_i}$;

(the line segment DEG_i is zero in the evaluation section) $\sum_i WH_i = 1$.

(2) Longitudinal slope variable X_2

X_2 is aggregate variable, represents weighted average longitudinal slope value of the evaluation sections, and is calculated according to formula (2).

$$X_2 = \frac{\sum (G_i \times l_i)}{L}$$ (Formula 2)

Formula:

G_i - The longitudinal slope value of slope segment i in evaluation sections;

l_i -The length of slope segment i;

L - The length of the evaluation road section;

(3) Danger degree of roadside X_3

In order to guide engineering practice, China's researchers put forward danger degree of roadside four division method based on foreign roadside safety level classification, namely: Class I, Class II, Class III, Class IV, the higher the level, the lower level of roadside safety, which can see 《Guideline for Implementation of Highway Safety Enhancement Project》 issued by the Ministry of Transportation in 2004.

①Roadside Safety Level = I level

There is sufficient clear-zone on the roadside, the width of the clear-zone is generally more than 4m, the clear-zone is basically no hazardous obstacles, the slope angle is smaller than 1:3, motorists who encroach on the recoverable slopes can generally stop their vehicles or slow them enough to return to the roadway safely, the likelihood of a collision and rollover accident is small.

②Roadside Safety Level = II level

The width of clear roadside is small, the width of the clear-zone is usually no more than 3 meters. There is scattered obstacles on the roadside ,such as trees, warning pile, flag poles, within closer distance of the outer edge of the carriageway there may also exist ditches, retaining wall ,rock wall and continuous hazardous obstacles , the slope angle is steeper than 1:3,and from which most vehicles will be unable to return to the roadway , vehicles which run off the road generally can be effectively controlled, there is less likely to collide with an obstacle, the probability of a rollover accident is not large.

③Roadside Safety Level = III level

The width of clear roadside is smaller, the width of the clear-zone is usually no more than 1.5 meters. The deep of roadside is more than three meters, or within closer distance of the

outer edge of the carriageway there may also exist clemency ditch, housing, hard rock face and so on, vehicles which run off the road can result in injury or death.

④Roadside Safety Level= IV level

The width of the clear roadside is usually no more than 1 meters. The roadside terrain conditions mostly is cliffs, deep groove , fill slope greater than 4 meters in height or the shoulder retaining wall, or within closer distance of the outer edge of the carriageway there may also exist rivers, lakes, railway lines and so on, vehicles which run off the roadway easily lead to serious and catastrophic accidents.

Actually danger degree of roadside on both sides of the road is relatively large difference. On this basis, there proposes the concept of the integration danger degree z of roadside. Integration danger degree of roadside indicators can characterize the overall level of danger degree of the sample on both sides of the roadside $z = \frac{l_1 + l_2}{2}$

In the formula,

l_1 - the danger degree of left roadside of the main road;

l_2 -the danger degree of right roadside of the main road;

(4) The average daily traffic X_4

Due to the equivalent of the current traffic department traffic statistical reports are based on mid-sized car converter for the standard models, therefore, the average daily traffic volume in the evaluation method converted into equivalent standard car traffic volume according to the conversion factor of the various models.

(5)The proportion of trucks X_5

The proportion of trucks is calculated according to formula (3)

$$X_5 = \frac{\sum_i Truck_i}{ADT} \times 100\% \quad \text{(Formula 3)}$$

Formula:

$Truck_i$ -The equivalent number of the mid-sized car in Class i truck; ADT - The equivalent number of mid-sized car in average daily traffic volume. According to record information of the existing traffic observation stations, and trucks include a small truck, medium truck, large truck, trailer, small tractors and medium-sized tractor six types.

(6) 85% speed difference between cars and large vehicles X_6

Here the speed difference is calculated based on the difference between the speed of car and large vehicle before and after in traffic flow.

3 THE USE OF GREY CLUSTERING METHOD IN THE EVALUTION PROCESS OF LEVEL OF SERVICE OF SAFETY

Grey Clustering Method is a multi-index comprehensive evaluation method in grey system theory, which can follow the comprehensive evaluation of a number of different indicators on the evaluation object, and to determine the category of the evaluation object. Grey clustering evaluation method is used in level of service of safety for low-grade roads sections, can combine the evaluation indictors of level of service of safety previously selected and evaluation of ideas to form an organic whole.

The grey clustering is based on a method in the grey number whitening weight function, its essence is adequate and reasonable use of known information instead of unknown and non ascertain information ,and based on the essential attribute of the grey system classification recognition gives objective and reliable quantitative analysis. The Grey Clustering is to clustering objects which have different clustering index whitening number, inducting in accordance with a few grey type, thereby determining the clustering object to belong to which category. The principle of Grey clustering analysis is composed by determining a grey whiting function, calibrating the clustering weight and calculating the clustering coefficient.[4]

Grey clustering evaluation modeling includes five parts [3]:

Grey classes $G = \{G_1, G_2, ..., G_m\}$;

Grey whitening value $\lambda = \{\lambda_1, \lambda_2, ..., \lambda_m\}$;

Whitening weight function $f(x) = \{f_1(x), f_2(x), ..., f_m(x)\}$;

Clustering weights $\eta_{jt} = \{\eta_{j1}, \eta_{j2}, ..., \eta_{jm}\}$;

The value of clustering evaluation $\sigma_{it} = \{\sigma_{i1}, \sigma_{i2}, ..., \sigma_{im}\}$.

3.1 Grey level value of the indicator variable

Based on the study of the selected evaluation indexes in China and abroad and the research results of Road Safety Technology , this paper sets down grading values of evaluation indexes for low-grade road sections as follows.[7]

Tab.1 Classification of evaluation index variable

variable	$x_j(1)$	$x_j(2)$	$x_j(3)$	$x_j(4)$
Horizontal curve variables X_1	15	30	50	100
Longitudinal slope variable X_2	1	3	5	7
Danger degree of roadside X_3	1	2	3	4
Average daily traffic X_4	100	750	1500	6000
The proportion of trucks X_5	10%	30%	50%	70%
85% speed difference between cars and large vehicles X_6	5	10	15	20

The dimensions of the above indicators are not identical, according to the properties of the indicator ,involved in analysis of the original data is to make dimension and the quantization processing, each of the data is compressed in between [0,1], the result of the processing is shown in the table as follows.

Tab.2 Dimensionless index value and grading standards

variable	$x_j(1)$	$x_j(2)$	$x_j(3)$	$x_j(4)$
Horizontal curve variables X_1	0.15	0.3	0.5	1
Longitudinal slope variable X_2	0.14	0.43	0.71	1
Danger degree of roadside X_3	0.25	0.5	0.75	1
Average daily traffic X_4	0.02	0.13	0.25	1
The proportion of trucks X_5	0.14	0.43	0.71	1

variable	$x_j(1)$	$x_j(2)$	$x_j(3)$	$x_j(4)$
85% speed difference between cars and large vehicles x_6	0.25	0.5	0.75	1

3.2 Determination of the indicator variable weights

Weight of evaluation factors is essential, and it reflects the position and role of the various factors in the evaluation process, and directly influences the results of the comprehensive evaluation. The weight coefficient is proposed in line with relative importance of the evaluation index, the determining pathway can be divided into two categories, namely objective way and subjective approach. The weight of the variable in the grey clustering evaluation method used in this paper is determined according to the following formula (4), the weight value of each index is shown in Table 3.

$$\eta_{jt} = \lambda_{jt} / \sum_{j=1}^{m} \lambda_{jt} \qquad \text{Formula (4)}$$

Formula:

η_{jt} ——Cluster weights ;

t ——the grey-grade of evaluation, and $t \in \{1,2,...,k\}, k = 4$ is kinds of grey-grade evaluation;

m ——the number of evaluation indicators, $m = 6$;

λ_{jt} ——whitening value of the indicator j belongs to the t-species of grey.

Tab.3 Weight values of indicator variables for low-grade road sections

Variable	safety	Less Safe	Criticality safety	Unsafe
Horizontal curve variables η_1	0.158	0.131	0.136	0.167
Longitudinal slope variable η_2	0.149	0.189	0.194	0.167
Danger degree of roadside η_3	0.262	0.218	0.204	0.166
Average daily traffic η_4	0.018	0.055	0.068	0.166
The proportion of trucks η_5	0.150	0.188	0.194	0.167
85% speed difference between cars and large vehicles η_6	0.263	0.219	0.204	0.167
$\sum$	1	1	1	1

3.3 The form of grey class whitening weight function

When establishing whitening weight function a value in the turning point of each function is given in Table 1. After determined the form of whitening weight function and the value of the turning point, the numeric expression of whitening weight function is determined and can be used for the grey clustering assessment specific calculation procedure.

(1) Level of service of safety for road section is Class I, with a lower limit of whitening weight function

$$f_j^{\,1}(x)=\begin{cases}0 & x>x_j(2)\\ \dfrac{x_j(2)-x}{x_j(2)-x_j(1)} & x\in[x_j(1),x_j(2)]\\ 1 & x<x_j(1)\end{cases} \quad \text{(Formula 5)}$$

(2) Level of service of safety for road section is Class II, with a moderate measure whitening weight function

$$f_j^{\,2}(x)=\begin{cases}0-x\notin[x_j(1),x_j(3)]\\ \dfrac{x-x_j(1)}{\lambda_j^{\,2}-x_j(1)}\ x\in[x_j(1),\lambda_j^{\,2}]\ \ \lambda_j^{\,2}=\dfrac{1}{2}\times[x_j(1)+x_j(3)]\\ \dfrac{x_j(3)-x}{x_j(3)-\lambda_j^{\,2}}\ x\in[\lambda_j^{\,2},x_j(3)]\end{cases} \quad \text{(Formula 6)}$$

(3) Level of service of safety for road section is Class III, with a moderate measure whitening weight function

$$f_j^{\,3}(x)=\begin{cases}0-x\notin[x_j(2),x_j(4)]\\ \dfrac{x-x_j(2)}{\lambda_j^{\,3}-x_j(2)}\ x\in[x_j(2),\lambda_j^{\,3}] \quad \lambda_j^{\,3}=\dfrac{1}{2}\times[x_j(2)+x_j(4)]\\ \dfrac{x_j(4)-x}{x_j(4)-\lambda_j^{\,3}}\ x\in[\lambda_j^{\,3},x_j(4)]\end{cases} \quad \text{(Formula 7)}$$

(4) Level of service of safety for road section is Class IV, with the upper limit of the whitening weight function

$$f_j^{\,4}(x)=\begin{cases}0 & x<x_j(3)\\ \dfrac{x_j(4)-x}{x_j(4)-x_j(3)} & x\in[x_j(3),x_j(4)]\\ 1 & x>x_j(4)\end{cases} \quad \text{(Formula 8)}$$

4 THE APPLICATION OF LEVEL OF SERVICE OF SAFETY RATING METHOD

4.1 Division of evaluation section units

Grade evaluation of a road section usually needs to be divided into several small sections, these small sections are called evaluation sections unit. Division of section units should follow the following principles:

(1)The length of 1000 meters is appropriate, in addition to special conditions, the maximum length should not exceed 2 km;

(2) The start and end points of road section should fall on a straight line segment

(3) The same horizontal curve should not be assigned to two sections.

(4) The same tunnel should not be divided into two sections.

(5) The same road sections should be approximately same width of the unilateral clear-zone

4.2 Application steps of the assessment methods

Level of service of safety for low-grade road section evaluation may proceed as follows:
(1) Collect road alignment, danger degree of roadside, traffic attribute;
(2)The evaluated sections are divided into n evaluation section units;
(3)Calculate the variable value of evaluation section unit i $X_{ij}, j=1,2,...,6$;
(4)Calculate the value of 4 level whitening weight function of evaluation section unit i $f_j^{\,k}(X_{ij}), k=1,2,3,4$;

(5)Calculate grey clustering coefficient of evaluation section unit i $\sigma_i^k, \sigma_i^k = \sum_{j=1}^{m} f_j^{\,k}(X_{ij}) * \eta_j$;

(6)Determine the grade level of security service for evaluation section unit i, if $\sigma_i^k = \max_{1\le k\le s}\{\sigma_i^k\}$: the grade level of security service for section unit i is k^*;
(7) Repeat steps (3) to (6), until the level of service of safety for all evaluation section units is determined.

4.3 Application example of the assessment method

(1) The data situation
The research of the Huoma county road of Tongzhou is dual-lane two-way highway, width of roadbed is 9 meters, width of pavement is 7 meters, width of the clear roadside is about 1 meter, the deep of roadside is about one meter ,traffic volume is 4240 (after converted) ,proportion of freight car is 34%, and the length of evaluation sections is about 700 meters, according to the calculating formula of each index and the index value of this section, the horizontal curve is 18.2, longitudinal slope variable value is 2.24, danger degree of roadside is Class III.
(2) The calculation process
Values of each indicator variable and the calculation process of corresponding whitening weight function value at all levels is omitted, the formula can be found in second section of this paper. The following table lists the final results of each step.

Tab.4 Calculation results of level of service of safety for Huoma road

Indicator variables	Value	$f_j^{\,1}(x_j)*\eta_{jk}$	$f_j^{\,2}(x_j)*\eta_{jk}$	$f_j^{\,3}(x_j)*\eta_{jk}$	$f_j^{\,4}(x_j)*\eta_{jk}$
X_1	18.2	0.124	0.024	0	0
X_2	2.24	0.057	0.117	0	0
X_3	3	0	0	0.204	0
X_4	4240	0	0	0.046	0.065
X_5	34%	0	0.150	0.039	0
X_6	12	0	0.131	0.082	0
$\sigma_i^k = \sum_{j=1}^{m} f_j^{\,k}(X_{ij})*\eta_{jk}$	-	0.181	0.423	0.371	0.065

From $\sigma_i^k = \max_{1\le k\le s}\{\sigma_i^k\} = \max_{1\le k\le 4}\{0.181,0.423,0.371,0.065\}$,We can see that the level of service of safety rating for this road section belongs to Class II, alignment indicators of this road section is better, but due to a higher proportion of trucks and 85% speed difference between cars and large vehicles, which have a certain influence on road safety. So we can consider setting speed limit signs at turning of the front horizontal curve to reduce speed difference between cars and large vehicles, to further improve the safety of the road section

4.4 The verification of level of service of safety for low grade road section

In order to verify the reasonableness of the quantitative classification of the level of service of safety, collecting a total of 14 road sections data of Tongzhou and Shunyi District in Beijing, including linear, roadside features, traffic volume, vehicle types and speed. According to the collected road and transport properties, the application of grey clustering method to get the security grade of the various sections. The paper collects the accident data in 2005-2009, based on the number of accidents to determine the security grade of the various sections. The calculation results based on grey clustering method is shown in table 5.

In this paper the average annual number of accidents is used to verify safety level of the road sections, the average annual number of accidents is calculated based on nearly five years accident numbers of the evaluation section unit. Based on the existing research results and 《Road Safety Technology》 " Eleventh Five-Year "National Key Books Western Transportation Construction of the Ministry of Transportation and Communications Technology Project Support, the center value of safety evaluation grade is given based on the average annual number of accidents: {safety, less safe, criticality safety, unsafe} = {0,1,2,4}, and then obtain the boundary value of safety grade {0.5,1.5,3}, so the safety evaluation grade value based on the average annual number of accidents is: {safety, less safe, criticality safety, unsafe} = {0 to 0.5,0.5 to 1.5,1.5 to 3,> 3}. The safety grades based on the evaluation method of historical accident are shown in table 5 as follows.

Tab.5 Contrast the results of two different assessment methods

Link number	The assessed value of the grey class					Evaluation method based on historical accident	
	safety	Less safe	Criticality safety	unsafe	safety level	annual average accident number	safety level
1	0.004	0.446	0.496	0.044	III	3.2	IV
2	0.156	0.340	0.409	0.022	III	2	III
3	0.247	0.664	0.009	0.014	II	1	II
4	0.281	0.425	0.281	0.075	II	1.2	II
5	0.326	0.329	0.317	0.040	II	0.8	II
6	0.498	0.511	0	0.166	II	1.0	II
7	0.151	0.379	0.391	0.129	III	2.6	III
8	0.448	0.494	0.056	0.122	II	0.8	II
9	0.891	0.114	0.065	0.101	I	0.4	I
10	0.356	0.559	0.056	0.087	II	1.2	II

Link number	The assessed value of the grey class					Evaluation method based on historical accident	
	safety	Less safe	Criticality safety	unsafe	safety level	annual average accident number	safety level
11	0.175	0.333	0.422	0.166	III	2	III
12	0.327	0.625	0	0.166	II	1.4	II
13	0.469	0.507	0.046	0.134	II	0.6	II
14	0.553	0.412	0.061	0.095	I	0.2	I

Comparing the calculation results according to the above table shows that the level of service of safety based on grey clustering method assessment and based on evaluation method of historical accident have a good consistency, the probability is 92.85%, so the application of grey-clustering method to evaluate the level of service of safety for low-grade highway sections is reasonably and feasibility.

5 CONCLUSION

Level of Service of Safety as a new method for quantitative evaluation of traffic safety, not only can be used to describe the extent of the potential to improve traffic safety, and can be used as reference of traffic safety renovation project implementation object, its construction of theoretical framework and classification standard can provide more practical and scientific analysis basis for the evaluation of traffic safety. In order to objectively evaluate traffic safety situation of the low-grade roads, the basic concepts of level of service of safety for the section is proposed, the factors influencing the level of service of safety for sections are analyzed, the level of service of safety for low-grade highway sections is evaluated by using the grey clustering evaluation method, and with the measured data of 14 sections of Tongzhou and Shunyi District in Beijing as example rates and verifies its level of service of safety, the results show that the article proposed method is reasonable and feasible. As the level of service of safety for sections is a new concept, there may be ill-considered, and therefore needs to be further studied.

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