Interval Comprehensive Evaluation Model for Traffic Safety of the Expressway Based On the closeness coefficient

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Abstract

On the basis of setting up the evaluation standard of safety levels, it adopts the membership function and gets the quantized evaluation index of traffic safety of the expressway. In this paper, the rating of each alternative is described by interval numbers. According to the concept of the TOPSIS, a closeness coefficient is defined to determine the ranking order of all alternatives by calculating the distances to both the interval ideal solution and interval anti-ideal solution. The comprehensive evaluation model of traffic safety of the expressway is set up by using TOPSIS. The new model is proposed to calculate the distance between interval numbers and membership function. And it carries a comprehensive evaluation on the existing expressway safety for four provinces in China. Finally, it was applied to the practical evaluation and some positive results were obtained. Applied results indicate that the method is feasible.

1. Introduction

The assessment to traffic safety is a valuable job for the development of the expressway. Presently, study on traffic safety of the expressway with qualitative analysis can't meet the actual demand. But setting up quantitative evaluating model with quantitative evaluation indices has already become the main study subject. There are about five methods to evaluate traffic safety of the expressway. Synthetic evaluation has the fuzzy-judgement method [1],...
gray-related method [2], matter element analysis method [3], artificial nervous network method [4], and analytic
hierarchy process method [5]. But there are lots of factors influencing traffic safety of the expressway, it is very
difficult to quantify the evaluating indices with specific function and evaluating traffic safety of the expressway with
a certain qualitative model. So the evaluation indices and evaluating models of the expressway need further study in
the article.

The evaluation problem about traffic safety of the expressway is a multi-index problem. So the TOPSIS model-
based interval number to evaluating traffic safety of the expressway is put forward. It avoids the shortage of
hereinbefore method. The process of this method is explained by actually surveyed data. The evaluated result is
compared with that of the multi-specialist evaluation to test and verify its feasibility, reasonability and reliability.In
order to develop the TOPSIS method, the paper is organized as follows. Next section introduces the basic definitions
and notations of the interval number. Section 3 presents the evaluation index of traffic safety of the expressway and
the calculation process. And then, the proposed method is illustrated with an example. Finally, some conclusions are
pointed out in the end of this paper.

2. Methodology

Interval comprehensive evaluation is to change the problem which to determine the weight into the evaluation
problem for attribute importance by interval number. The method is simple. In this paper, we further extended the
concept of TOPSIS to develop a methodology for solving multiple index evaluation problems of urban traffic safety.
We can convert the decision matrix into an interval decision matrix once the decision-makers interval rating has
been pooled. According to the concept of TOPSIS, we define the interval positive ideal solution and the interval
positive anti-ideal solution. Then, a vertex method is proposed in this paper to calculate the distance between two
positive interval number ratings about urban traffic safety. Finally, a closeness coefficient of each alternative is
defined to determine the ranking order of all alternatives about urban traffic safety.

2.1 Basic knowledge of interval number

These basic definitions and notations below will be used throughout the paper. Interval number \( [A] = [\bar{a}, \bar{a}] \) is an
ordered pair, and defines an interval number
\[
[A] = [\bar{a}, \bar{a}] = \{ x \mid \bar{a} \leq x \leq \bar{a}, x \in R \}.
\]

Where \( \bar{a} \) is the left limit and \( \bar{a} \) is the right limit, \( R \) is the set of all real numbers.

**Definition 1:** Let interval numbers \( [A] = [\bar{a}, \bar{a}] \) and \( [B] = [\bar{b}, \bar{b}] \), some operations of interval numbers can be
expressed as follows:

1. \( [A] \pm [B] = [\bar{a} + \bar{b}, \bar{a} + \bar{b}] \)
2. \( k \times [A] = k \times [\bar{a}, \bar{a}] = \begin{cases} [k\bar{a}, k\bar{a}], & \text{fork} \geq 0 \\ [k\bar{a}, k\bar{a}], & \text{fork} < 0 \end{cases} \)
   Where \( k \) is a real number.
3. \( [A_i], = ([\bar{a}_i, \bar{a}_i], [\bar{a}_2, \bar{a}_2], \cdots, [\bar{a}_n, \bar{a}_n]) = ([A_1], [A_2], \cdots, [A_n]) \)

**Definition 2:** Let \( [A] = [\bar{a}, \bar{a}] \) and \( [B] = [\bar{b}, \bar{b}] \) be two interval numbers, then the distance is defined
as 

\[
 d[(A), (B)] = \left( \frac{1}{2} \left( (a - b)^2 + (\bar{a} - \bar{b})^2 \right) \right)^{1/2}.
\]

A systematic approach to extend the TOPSIS to the uncertainty environment is proposed. This method is very suitable for solving the evaluation problems of urban traffic safety. In this paper, a multi-index evaluation problem based on interval number, which can be concisely expressed in matrix format as

\[
 A_{ij} \begin{bmatrix}
 A_{i1} & A_{i2} & \ldots & A_{in} \\
 \vdots & \vdots & \ddots & \vdots \\
 A_{i1} & A_{i2} & \ldots & A_{in}
\end{bmatrix}
\]

Where \( A_{ij} \) are possible alternatives; \( I_1, I_2, \ldots, I_m \) are the evaluation index with which alternative performance are measured; \( \{ a_{ij}, a_{ij}^\prime \} \) is the measure value of alternative \( A_i \) with respect to the evaluation index \( I_j \); \( w_j \) is the weight of the evaluation index \( I_j \).

### 2.2. The comprehensive evaluation model

In classical methods, the rating and the weights of the index are known precisely. It bases on the concept that the chosen alternative should have the shortest distance from the positive ideal solution and the farthest from the negative ideal solution. To avoid the complicated normalization formula used in classical TOPSIS, the liner scale transformation is used here to transform the various attribute scales into a comparable scale. In sum, an algorithm of the multi-attribute evaluation problems with interval number approach is given in the following.

**Step1.** Determining interval number rating \( [A_{ij}] = [a_{ij}, a_{ij}^\prime] \) of alternative \( A_i \) under index \( I_j \), and construct the interval evaluation matrix \( [A_{ij}]_{m\times n} \).

**Step2.** Construct the normalized interval evaluation matrix \( [R_{ij}]_{m\times n} \).

We assume that \( I^+ \) is the set of benefit attribute and \( I^- \) is the set of cost attribute. Then

\[
 \begin{align*}
 (1) [R_{ij}] &= [L_{ij}, R_{ij}] = \left[ \frac{a_{ij}}{a_{ij}^\prime}, \frac{a_{ij}^\prime}{a_{ij}} \right], \text{ Where, } a_j^+ = \max_{i \in I^+} \{ a_{ij} \}, I_j \in I^+ \\
 (2) [R_{ij}] &= [L_{ij}, R_{ij}] = \left[ \frac{a_{ij}^\prime}{a_{ij}}, \frac{a_{ij}}{a_{ij}^\prime} \right], \text{ Where, } a_j^- = \min_{i \in I^-} \{ a_{ij} \}, I_j \in I^-
\end{align*}
\]

Therefore, we can obtain the normalized interval evaluation matrix \( [R_{ij}]_{m\times n} \). Then, \( [\hat{R}]_n \) is defined in the following equation.

\[
 [\hat{R}]_n = ([L_{11}, R_{11}], [L_{12}, R_{12}], \ldots, [L_{1n}, R_{1n}], \ldots, [L_{m1}, R_{m1}], [L_{m2}, R_{m2}], \ldots, [L_{mn}, R_{mn}])
\]  

(1)

**Step3.** Construct the weight normalized interval evaluation matrix.

The normalization method mentioned above is to preserve the property that the ranges of normalized interval a number belong to \([0,1]\). Then, \( [\hat{B}]_n \) is defined in the following equation.
Then \( [B_{ij}]_{max} = \left[ \begin{bmatrix} b_{ij}, \bar{b}_{ij} \end{bmatrix} \right]_{max} = [w_j[R_j]]_{max} \)  

(2)

\[
[R^+]_n = \left[ \begin{bmatrix} \max \bar{r}_{i1}, \max \bar{r}_{i1} \end{bmatrix}, \max \bar{r}_{i2}, \max \bar{r}_{i2}, \cdots, \max \bar{r}_{in}, \max \bar{r}_{in} \end{bmatrix} \right] = \left( [R^+_1], [R^+_2], \cdots, [R^+_n] \right)
\]

(3)

**Step 4.** Calculate the distance of each alternative from \([R^+]_n\) and \([R^-]_n\), respectively.

According to the weight normalized interval evaluation matrix, we know that the elements \( [B_{ij}] = [\hat{b}_{ij}, \hat{b}_{ij}] \) are normalized positive interval numbers and their ranges belong to the closed interval \([0,1]\). Then, we can define the interval positive ideal solution \([R^+]_n\) and the interval positive anti-ideal solution \([R^-]_n\) as

\[
[R^+]_n = \left( [\min \bar{r}_{i1}, \min \bar{r}_{i1}], [\min \bar{r}_{i2}, \min \bar{r}_{i2}], \cdots, [\min \bar{r}_{in}, \min \bar{r}_{in}] \right) = \left( [R^-_1], [R^-_2], \cdots, [R^-_n] \right)
\]

The distance of each alternative from \([R^+]_n\) and \([R^-]_n\) can be currently calculated as

\[
V(A_i) = 0.2556
\]

(4)

\[
d_i(A) = d \left( [R_j]_n, [R_j]_n \right) = \sum_{j=1}^{n} d \left( w_j[B_j], w_j[R_j] \right),
\]

(5)

Where \( i = 1,2,\cdots,m \).

**Step 5.** Calculate the weight coefficient of each alternative.

In order to increase the objectivity of the decision-making process, this paper adopts fuzzy distance method to determine the weight coefficient of the measurement index. If \( w_j \) is the weighting coefficient of the measurement index \( I_j \), then

\[
w_j = \frac{1}{m} \sum_{m=1}^{m} r_j - \frac{1}{m} \sum_{m=1}^{m} r_j \left[ \sum_{m=1}^{m} \frac{1}{m} \sum_{m=1}^{m} r_j - \frac{1}{m} \sum_{m=1}^{m} r_j \right]^{-1}
\]

(6)

Where \( r_j = \frac{1}{2} \left( \bar{r}_{ij} - \bar{r}_{ij} \right), j = 1,2,\cdots,n \).

**Step 6.** Calculate the closeness coefficient of each alternative.

A closeness coefficient is defined to determine the ranking order of all alternatives, once the \( d^+(A_i) (i = 1,2,\cdots,m) \) and \( d^-(A_i) (i = 1,2,\cdots,m) \) of each alternative \( A_i (i = 1,2,\cdots,m) \) has been calculated. The closeness coefficient of each alternative is calculated as

\[
V(A_i) = \left[ 1 + \frac{d^+(A_i)}{d^-(A_i)} \right]^{-1}
\]

(7)
According to the closeness coefficient, the ranking order of all alternatives can be determined.

Obviously, an alternative \( A_i \) is closer to the interval positive ideal solution \( [R^{-}_n, R^{+}_n] \) and farther from the interval positive anti-ideal solution \( [R^{-}_n, R^{+}_n] \) as \( V(A_i) \) approaches to 0. Therefore, according to the closeness coefficient, we can determine the ranking order of all alternatives and select the best one from among a set of feasible alternatives.

3. The evaluation index of traffic safety of the expressway

The evaluation problem about traffic safety of the expressway involves in multi-field, multi-subject and so on. But the evaluation index selection should achieve two standards: on the one hand, the indices enable the evaluation for the target system in figure 1. Moreover, according to the results of the expert survey [6,7,8,11,12], the evaluation criteria through generalized analysis of the expressway of traffic safety system, we obtain the expressway safe evaluation the evaluation index system is most simple and minimum. In order to be convenient for the analysis computation, and maximal membership principle to set up quantitative evaluation model without subjective factor, the level standards of the evaluation index for traffic safety of the expressway are set up in Table 1.

Table 1. The level standards of the evaluating indexes

<table>
<thead>
<tr>
<th>The indicator</th>
<th>Serial number</th>
<th>Safety level</th>
<th>Level I</th>
<th>Level II</th>
<th>Level III</th>
<th>Level IV</th>
<th>Level V</th>
<th>Very safe</th>
<th>Safe</th>
<th>General</th>
<th>Unsafe</th>
<th>Very unsafe</th>
</tr>
</thead>
<tbody>
<tr>
<td>The connectivity of the road network</td>
<td>11</td>
<td></td>
<td>0.0~0.2</td>
<td>0.2~0.4</td>
<td>0.4~0.6</td>
<td>0.6~0.8</td>
<td>0.8~1.0</td>
<td>Very safe</td>
<td>Safe</td>
<td>General</td>
<td>Unsafe</td>
<td>Very unsafe</td>
</tr>
<tr>
<td>the density of road network</td>
<td>12</td>
<td></td>
<td>0.0~0.2</td>
<td>0.2~0.4</td>
<td>0.4~0.6</td>
<td>0.6~0.8</td>
<td>0.8~1.0</td>
<td>Very safe</td>
<td>Safe</td>
<td>General</td>
<td>Unsafe</td>
<td>Very unsafe</td>
</tr>
<tr>
<td>chuckles level of joint</td>
<td>13</td>
<td></td>
<td>0.0~0.2</td>
<td>0.2~0.4</td>
<td>0.4~0.6</td>
<td>0.6~0.8</td>
<td>0.8~1.0</td>
<td>Very safe</td>
<td>Safe</td>
<td>General</td>
<td>Unsafe</td>
<td>Very unsafe</td>
</tr>
<tr>
<td>the speed of road network</td>
<td>14</td>
<td></td>
<td>0.0~0.2</td>
<td>0.2~0.4</td>
<td>0.4~0.6</td>
<td>0.6~0.8</td>
<td>0.8~1.0</td>
<td>Very safe</td>
<td>Safe</td>
<td>General</td>
<td>Unsafe</td>
<td>Very unsafe</td>
</tr>
<tr>
<td>the volume of road network</td>
<td>15</td>
<td></td>
<td>0.0~0.2</td>
<td>0.2~0.4</td>
<td>0.4~0.6</td>
<td>0.6~0.8</td>
<td>0.8~1.0</td>
<td>Very safe</td>
<td>Safe</td>
<td>General</td>
<td>Unsafe</td>
<td>Very unsafe</td>
</tr>
<tr>
<td>apparent distance</td>
<td>16</td>
<td>0.8~1.0</td>
<td>0.6~0.8</td>
<td>0.4~0.6</td>
<td>0.2~0.4</td>
<td>0.0~0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>traffic segregation</td>
<td>17</td>
<td>0.8~1.0</td>
<td>0.6~0.8</td>
<td>0.4~0.6</td>
<td>0.2~0.4</td>
<td>0.0~0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>protection facilities</td>
<td>18</td>
<td>0.8~1.0</td>
<td>0.6~0.8</td>
<td>0.4~0.6</td>
<td>0.2~0.4</td>
<td>0.0~0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lighting facilities</td>
<td>19</td>
<td>0.8~1.0</td>
<td>0.6~0.8</td>
<td>0.4~0.6</td>
<td>0.2~0.4</td>
<td>0.0~0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tunnel facilities</td>
<td>110</td>
<td>0.8~1.0</td>
<td>0.2~0.4</td>
<td>0.4~0.6</td>
<td>0.2~0.4</td>
<td>0.0~0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>monitoring facilities</td>
<td>111</td>
<td>0.0~0.2</td>
<td>0.2~0.4</td>
<td>0.4~0.6</td>
<td>0.6~0.8</td>
<td>0.8~1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>guide facilities</td>
<td>112</td>
<td>0.0~0.2</td>
<td>0.2~0.4</td>
<td>0.4~0.6</td>
<td>0.6~0.8</td>
<td>0.8~1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>information system</td>
<td>113</td>
<td>0.0~0.2</td>
<td>0.2~0.4</td>
<td>0.4~0.6</td>
<td>0.6~0.8</td>
<td>0.8~1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>weather forecast information facilities</td>
<td>114</td>
<td>0.8~1.0</td>
<td>0.6~0.8</td>
<td>0.4~0.6</td>
<td>0.2~0.4</td>
<td>0.0~0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>road alignment</td>
<td>115</td>
<td>0.8~1.0</td>
<td>0.6~0.8</td>
<td>0.4~0.6</td>
<td>0.2~0.4</td>
<td>0.0~0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pavement behavior</td>
<td>116</td>
<td>0.8~1.0</td>
<td>0.6~0.8</td>
<td>0.4~0.6</td>
<td>0.2~0.4</td>
<td>0.0~0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>traffic accident rate</td>
<td>117</td>
<td>0.8~1.0</td>
<td>0.6~0.8</td>
<td>0.4~0.6</td>
<td>0.2~0.4</td>
<td>0.0~0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>landscape along the line</td>
<td>118</td>
<td>0.8~1.0</td>
<td>0.6~0.8</td>
<td>0.4~0.6</td>
<td>0.2~0.4</td>
<td>0.0~0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mileage saturation rate</td>
<td>119</td>
<td>0.8~1.0</td>
<td>0.6~0.8</td>
<td>0.4~0.6</td>
<td>0.2~0.4</td>
<td>0.0~0.2</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>traffic congestion level</td>
<td>120</td>
<td>0.8~1.0</td>
<td>0.6~0.8</td>
<td>0.4~0.6</td>
<td>0.2~0.4</td>
<td>0.0~0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>smooth-riding quality</td>
<td>121</td>
<td>0.8~1.0</td>
<td>0.6~0.8</td>
<td>0.4~0.6</td>
<td>0.2~0.4</td>
<td>0.0~0.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Evaluation set is a set which we may get evaluation conclusion for evaluation target. We can get traffic safety comprehensive evaluation grade in evaluation set \( V \) and give it relevant grade number. Evaluation set \( V = \{ \text{Level I (Very safe), Level II (Safe), Level III (General), Level IV (Unsafe), Level V (Very unsafe)} \} \). According to the quality, the evaluation index divides the quantitative index and the qualitative index. Each index has different meanings, and the value of the evaluation index is different too. For the purpose of each evaluation index has common degree, we have to carry standardized processing on the indices. So the evaluation value of the indicator is divided into five levels. It is showed in Table 1.
4. Application analyses

In order to carry on rational evaluation to traffic safety of the expressway in four provinces in China, we surveyed the expressway on-the-spot from June to July in 2013, and got a lot of effective data about traffic safety that could quantitatively evaluate this province’s expressway safety comprehensively. The observe values are showed in Table 2. There are four provinces (serial number: Province1, Province2, Province3, Province4) in China are showed in Figure.2.

Fig 1. The expressway in four provinces in China

(1) Determined interval evaluation matrix \( A_{ij} \) and normalized interval evaluation matrix \( R_{ij} \). As are showed in Table 2.

(2) According to formulas (6), the weight of the evaluated index can be calculated

\[
w = [0.033, 0.047, 0.037, 0.053, 0.046, 0.021, 0.052, 0.049, 0.029, 0.043, 0.048, 0.058, 0.049, 0.046, 0.034, 0.048, 0.053, 0.049, 0.051, 0.068, 0.052].
\]

(3) According to formulas (3), we calculated the weight normalized interval evaluation matrix \( B_{ij} \).

(4) According to the interval positive ideal solution and the interval positive anti-ideal solution, we calculated the distance of each alternative from \( R^+ \) and \( R^- \).
According to the closeness coefficient, the ranking order of all alternatives can be determined. The closeness coefficient about Province1 is \( V(A_1) = 0.2371 \); The closeness coefficient about Province2 is \( V(A_2) = 0.2209 \); The closeness coefficient about Province3 is \( V(A_3) = 0.2556 \); The closeness coefficient about Province4 is \( V(A_4) = 0.2102 \). So, the ranking as the follow: Province3 > Province1 > Province2 > Province4.

According to the value of to the closeness coefficient \( V(A_i) \) of the comprehensive measurement, the ranking about Province1, Province2, Province3, Province4 as it is shown in Figure 2. So, the author thinks that traffic safety of the expressway is basically rational, and is basically sustainable development in one province. But we should raise sustainable development level for traffic safety of the expressway in one province, and accelerate intelligence and information for traffic safety system of the expressway, and promote coordinated development in entire area in future plan.

### Table 2. The inspection values of the evaluation indexes

<table>
<thead>
<tr>
<th>The evaluating index</th>
<th>Inspection value</th>
<th>Province1</th>
<th>Province2</th>
<th>Province3</th>
<th>Province4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Safety level</td>
<td>normalized interval value</td>
<td>Safety level</td>
<td>normalized interval value</td>
<td>Safety level</td>
</tr>
<tr>
<td>H1</td>
<td>Level II</td>
<td>[0.124,0.131]</td>
<td>Level III</td>
<td>[0.129,0.132]</td>
<td>Level III</td>
</tr>
<tr>
<td>I2</td>
<td>Level I</td>
<td>[0.113,0.117]</td>
<td>Level II</td>
<td>[0.119,0.123]</td>
<td>Level I</td>
</tr>
<tr>
<td>I3</td>
<td>Level III</td>
<td>[0.217,0.231]</td>
<td>Level III</td>
<td>[0.209,0.211]</td>
<td>Level V</td>
</tr>
<tr>
<td>I4</td>
<td>Level V</td>
<td>[0.102,0.216]</td>
<td>Level IV</td>
<td>[0.108,0.116]</td>
<td>Level IV</td>
</tr>
<tr>
<td>I5</td>
<td>Level IV</td>
<td>[0.202,0.216]</td>
<td>Level II</td>
<td>[0.212,0.219]</td>
<td>Level IV</td>
</tr>
<tr>
<td>I6</td>
<td>Level III</td>
<td>[0.301,0.311]</td>
<td>Level III</td>
<td>[0.311,0.321]</td>
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</tr>
<tr>
<td>I7</td>
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<td>[0.112,0.116]</td>
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<td>[0.117,0.121]</td>
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</tr>
<tr>
<td>I8</td>
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<td>[0.402,0.413]</td>
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</tr>
<tr>
<td>I9</td>
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<td>[0.211,0.226]</td>
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<tr>
<td>I10</td>
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<td>[0.218,0.231]</td>
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<td>[0.207,0.211]</td>
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</tr>
<tr>
<td>I11</td>
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<tr>
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<td>[0.219,0.225]</td>
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<td>[0.337,0.341]</td>
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<td>[0.327,0.334]</td>
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<td>I19</td>
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<td>[0.147,0.152]</td>
<td>Level IV</td>
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<td>I21</td>
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</table>

![Fig. 2. The ranking result about measure provinces’ traffic safety](image-url)

In order to the best level for traffic safety of the expressway, we must take some measures to carry out it. The author thinks that it is important to manage the expressway for traffic safety. It is necessary to solve the problem of...
traffic safety level of the expressway by using comprehensive management from all sides. The following issues are key parts: teaching the expressway users especially expressway drivers to pay attention to the safety in order to enhance their consciousness to traffic safety code; increasing the vehicle safety performance to ensure the safety of driving; heightening the level of expressway’s traffic guidance and service, strengthening the management, and improving the facilities for road safety and driving condition. In the light of features of traffic safety level of expressway, the author’s suggestions are as follows:

① to perfect the management system of traffic safety of the expressway. The issue of traffic safety level of the expressway is a difficult management problem in the whole social system. It requires that people in all professions and trades to obey the laws and regulations involved traffic safety. Unified management system, perfect traffic control code and reinforced operation management are demanded. In accordance with the characteristics of the operation management of the expressway, in order to up-grade the level of expressway guidance, an integrated management structure should be founded which includes the management for charges, maintenance, road, efficiency, safety and service [13].

② to improve the supervision and control measures of traffic safety. Expressway has installed advanced and modernized facilities, among which traffic control system is the key approach of expressway traffic management. The traffic control system meets the needs of traffic patrol, monitoring, accessibility and communication. Under the circumstances of bad weather and traffic jam, the system can direct drivers to drive safely and make the expressway unimpeded by means of the information provided by guidance signal of traffic supervision and control system [13-15].

③ to adopt vigorous measures to develop intelligent traffic. Intelligent transportation system is the front topic in the field of traffic transportation all over the world; it comes into being against the background of the full development of science and technology. Intelligent traffic can improve the traffic capacity and the safety of existing network of communication lines on a large scale. It represents the development orientation of traffic science, and can solve the traffic’s technical problems fundamentally. Then the traffic science and technology would have great breakthrough and development, at the same time intelligent traffic can decrease traffic congestion and traffic accident, heighten the labor productivity, intensify the international competition and increase new industry in future [16-18].

5. Conclusions and Discussions

In this paper, the evaluated index weight was determined by the variation coefficient of evaluated index value. It avoids the subjective and partial opinion of experts in giving evaluated index weight, and it objectively reflects the evaluated index of the relative important degree in traffic safety of the expressway assessment. Moreover, the evaluated result is coherent to that of the multi-specialist evaluation. So this new model is feasible for the synthetically evaluate traffic safety of the expressway, and it provides a science basis for the policy decision of expressway construction. Meanwhile, it provides a train of new thought for the evaluated method in this field.

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