Analysis of the Impact of Plateau Mountain Environment on Vehicle Use

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Abstract: In this study, firstly, the impact index of plateau mountain environment on vehicle use is classified, and the establishment idea of index system is studied, this paper puts forward the method of establishing the index system. On the basis of establishing the index system, it studies and puts forward the feasibility study model of using the plateau mountain vehicles based on the time task. At last, the paper explores the method of determining the index weight, and highlights two more used methods of determining the weight.

1. Introduction

The environmental factors affecting the use of vehicles in the environment mainly include: temperature, road traffic, altitude, dust, radiation and other factors. The research evaluates whether the environment is suitable for vehicle use by analyzing the above indicators [1].

2. Research Ideas of Index Classification

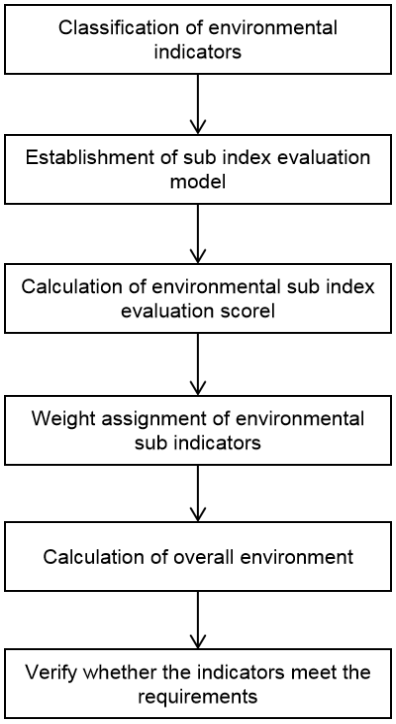

Figure 1 Environmental assessment ideas

Firstly, the index system is classified, and the evaluation method of index value is found out by classification. Then according to the index information of temperature, road traffic, altitude, sand and dust, radiation impact, such as Wendy, road traffic, etc., including a large number of random information, altitude belongs to cost index, etc., for the uncertain information, research and establish the corresponding evaluation model according to the characteristics of environmental indicators, including fuzzy comprehensive model, grey clustering evaluation model, etc; The weights of the sub indicators included in each indicator are assigned, mainly using expert weight assignment combined with AHP [2], and then the scores of each indicator are calculated, and finally

the total scores are verified to meet the needs. The specific ideas are as follows:

Step 1: index classification.

The second step is to establish the evaluation model of environmental indicators.

Step 3: calculate the evaluation score of each sub index.

The fourth step: environment sub index weight assignment.

Step 5: overall score of environment.

Step 6: verify whether the total score of indicators meets the requirements.

The specific idea is shown in the figure 1.

3. Time Task Based Feasibility Study Model for the Use of Mountain Vehicles on the Plateau

According to the time and task window of task driving, the study of vehicle use analyzes whether the area is suitable for vehicle driving based on the temperature, road traffic, altitude, dust, radiation, temperature difference and other conditions. The idea of root analysis is as follows:

Step 1: analyze the temperature, road traffic, altitude, dust, radiation, temperature difference and other conditions under the environment.

Step 2: judge whether the temperature meets the requirements of vehicle use.

Step 3: judge whether the local dust meets the requirements of vehicle use.

Step 4: carry out comprehensive analysis on altitude, radiation, temperature difference, etc., and analyze whether the time window used by the vehicle meets the driving requirements.

Step 5: carry out comprehensive analysis on altitude, radiation, temperature difference, etc., and analyze whether the time window used by the vehicle meets the driving requirements.

Step 6: establish vehicle use time model to judge the feasibility of vehicle use.

Step 7: carry out vehicle use analysis.

The train of thought for use analysis of vehicles in plateau mountain environment is shown in the figure 2 below:

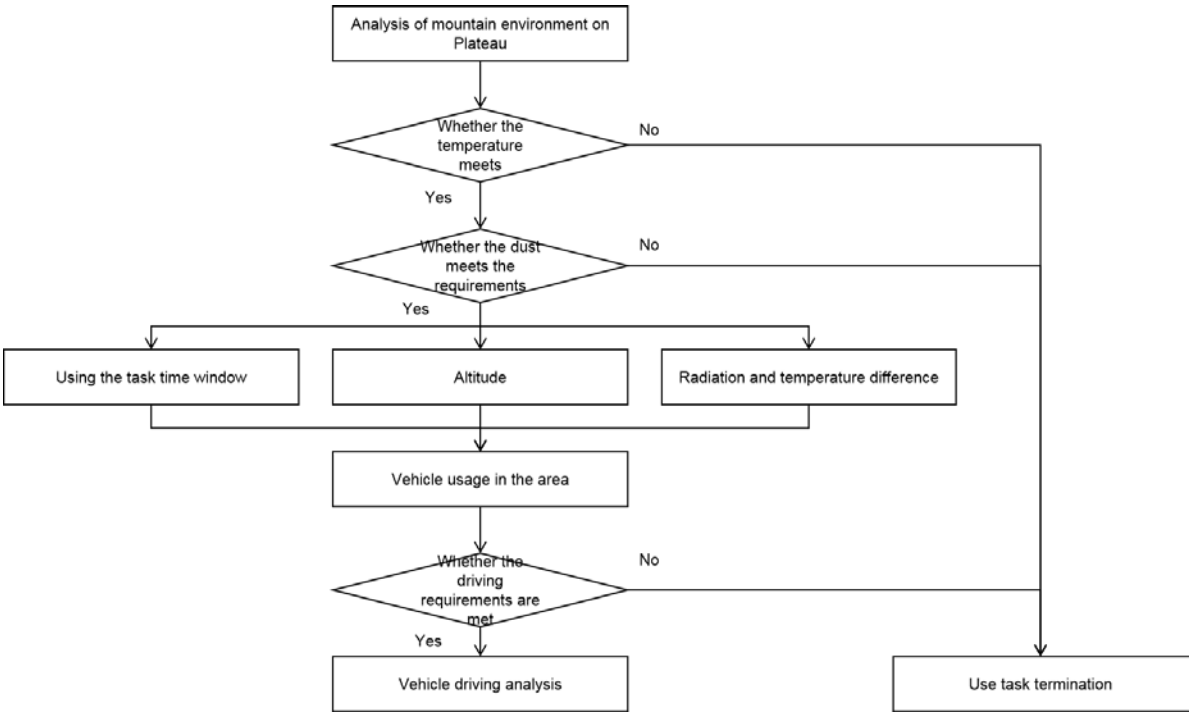

Figure 2 vehicle usage model based on time task

4. Commonly Used Weight Judgment Methods for Vehicle Use Impact Judgment

4.1 Group Decision Method

Suppose expert z 's opinion is that the relative importance of factor m to factor n is

$\beta_{mn}^{a},(a=1,2,\cdots p)$, Take the following methods to synthesize the opinions of experts:

(1) When $m>n$, take the average number of experts' self statements [3]

$$\overline{\beta}_{mn}=\sum_{a=1}^{p}\beta_{mn}^{a}\bullet\lambda_{a} \tag{1}$$

(2) When $m<n$, take the average number of experts' self statements

$$\overline{\beta}_{nm}=1/\overline{\beta}_{mn}=1\Big/\sum_{a=1}^{p}\beta_{mn}^{a}\bullet\lambda_{a} \tag{2}$$

That is, $\overline{\beta}_{mn}$ is the harmonic mean of β_{mn}^{a}.Where $\lambda_{a}(a=1,2,\cdots p)$ is the weight of expert z.

Take $A=(\overline{\beta}_{mn})$ as the judgment matrix of the expert group. As a result of synthesizing the opinions of many experts, the influence of individual experts' judgment errors on the correctness of the results is greatly reduced [4].

4.2 Simple Analytic Hierarchy Process to Determine Index Weight

(1). Construction of comparison judgment matrix

(2). A comparison judgment matrix is constructed, which assumes that the expert group is composed of K experts. The expert group is required to provide the comparison tendency judgment matrix $A_{1}(\beta_{mn}^{1}),A_{2}(\beta_{mn}^{2}),\cdots A_{k}(\beta_{mn}^{k})$ under a certain criterion for the research objects at the same level. The weight coefficients of experts are $\lambda,\lambda_{2},\cdots,\lambda_{k},$ and $\sum_{m=1}^{k}\lambda_{m}=1$ respectively. Then, $A(\beta_{mn})$ is a comprehensive judgment matrix constructed by processing the judgment matrix of expert group, in which $\beta_{mn}=(\beta_{mn}^{1})^{\lambda_{1}}(\beta_{mn}^{2})^{\lambda_{2}}\cdots(\beta_{mn}^{k})^{\lambda_{k}},m,n=1,2,\cdots,q$ [5].

β_{mn} indicates that the relative importance of index i to index j is considered from the perspective of judgment criteria [6], and

$\beta_{mn}=1/\beta_{nm}\left(m,n=1,2,\cdots,q\right)$.

The judgment scale is $\sqrt{3}$-scale, and $1,3^{1/4},3^{1/2},3,9$ is specified that the m-index is equally important, more important, important, very important and extremely important for the n-index. Calculate the normalized weight vector [7].

Calculate the relative importance with the square root method, and use the formula [8]

$$\omega_{m}^{h}=\left(\prod_{n=1}^{a}\beta_{mn}\right)^{\frac{1}{q}} \tag{3}$$

Calculate each component of the eigenvector; then use the formula

$$\omega_{n}^{h}=\omega_{m}^{h}\Big/\sum\omega_{m}^{h} \tag{4}$$

5. Conclusion

In this paper, the modeling method of the impact of plateau mountain environment on vehicle use is studied, and the vehicle use model based on time task is preliminarily combed on the basis of determining the index classification, in the model, temperature, road traffic, altitude, dust, radiation and other factors are added. Finally, the method to determine the weight of each index is explored. Relevant theories show that the method is simple and effective.

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