Research and Analysis of Transportation Engineering Planning and Transfer Traffic Volume Based on Cube

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Abstract. as an important factor affecting the national economy, transportation industry has been developing rapidly with the continuous development of China's economy. Therefore, the planning of transportation engineering is very important. Under the condition that people's requirements for transportation industry are constantly increasing, we need to make a comprehensive study on the factors such as transferring traffic volume and inducing traffic volume. For this purpose, this paper analyzes the planning of transportation engineering and the use of cube to transfer traffic volume, which is of great significance to the development of China's transportation industry.

Keywords: Transportation Project Planning, Transfer Traffic Volume, Thinking

1. Introduction
How to predict the traffic volume with scientific and reasonable methods and accurately grasp the trend of future traffic volume is very important for the planning and construction of highway network and feasibility study[1-2], and it is also an important reference for highway construction[3-4]. Therefore, the planning and construction of highway network transportation engineering is one of the key research topics at present[5-6].

According to the current transportation situation, the whole transportation system in the future is reasonably planned. The general ideas of the planning are as follows: first, the problems existing in the current transportation system are clarified, so as to reasonably plan out the specific objectives for improvement; second, according to these specific improvement objectives, systematic solutions are proposed and detailed plans are planned, so as to achieve the goal. Third, according to the actual situation of the local traffic, we should evaluate and analyze the plan to select a more reasonable plan. Fourth, we should modify the plan according to the change of the situation.

2. Reasonable planning of transportation engineering
After a comprehensive consideration of the construction characteristics of transportation engineering, the planning of transportation engineering can be divided into the following processes: first, the collection and analysis of traffic data, the primary task in the planning of transportation engineering is to analyze the current transportation situation, and to collect and analyze the current traffic road data is the transportation engineering Key points of project planning. The focus of data collection and
analysis is mainly related data and information in traffic planning engineering, including data analysis report and specific planning; second, analyze the current transportation situation and formulate reasonable policies. After collecting and analyzing the traffic data, we can find the problems in the transportation system in time, and make a reasonable comparison between the current transportation system and the future transportation requirements, so as to formulate the objectives and related policies of transportation engineering planning. Third, analysis of the system and financial expectations, reasonable analysis of the management system and financial expectations of the transportation planning project, but also the important factor to ensure the smooth implementation of the transportation project planning; fourth, providing services, analyzing the transportation engineering facilities and transportation tools, so as to analyze the service performance and level that they can bear; Fifthly, forecasting demand starts from the social, cultural and economic aspects, establishes the specific relationship model among the three to predict the future transportation demand; sixth, evaluates and analyzes the formulated scheme, comprehensively considers the existing problems in the current transportation engineering, and formulates 2 to 5 planning schemes for selection, and implements each scheme. The impact of construction is analyzed, so as to make appropriate adjustments to the traffic volume in each transportation line.

3. Scientific prediction of traffic volume based on cube

At present, highway transportation, railway transportation and low-grade highway transportation are widely used in China's transportation industry. In view of the traffic distribution of the three modes of transportation, we can use cube to effectively predict the traffic volume, and estimate the medium price vehicle ratio according to the specific assumptions in the traffic volume. It is assumed that the vehicle price to vehicle ratio in the base year and other characteristic years is a stable value. The vehicle price to vehicle ratio is calculated by using the relevant data in the basic year, and then the results are inversed by using the matrix, so as to find the induced traffic flow transfer problem in the future characteristic year. The combined logit model is used to calculate the traffic volume flow.

For large-scale commercial construction projects, the peak hours of weekdays and weekends should be investigated and analyzed respectively to determine the unit trip rate. Use Cube to allocate traffic volume and find the control sections of each circle that the traffic volume of the construction project must pass through. Divide the circle layers. First select all the control sections of the first layer, and the \( A, A_1, \cdots, A_n \) section is the first circle section. The section is the section between the first circle. The section of the second circle is \( B_1, B_2, B_3, \cdots, B_m \). All traffic entering the \( A, A_1, \cdots, A_n \) section must flow through the \( B_1, B_2, B_3, \cdots, B_m \) section. Then look for the \( C_1, C_2, \cdots, C_i, \cdots, C_q \) section entering the \( B_1, B_2, B_3, \cdots, B_m \) section, and extrapolate in turn.

Determine the weight of the traffic allocated for each road segment. The weight of the traffic allocated for each road segment in the same circle is determined by the weight allocation model. The calculation formula is as follows:

\[
W_i = \frac{C_i - V_i}{\sum_i (C_i - V_i)}
\]  

Where: \( C_i \) is the capacity of the i-th road section; \( V_i \) is the traffic volume of the i-th road section; \( C_i - V_i \) is the remaining capacity of the i-th road section; \( W_i \) is the weight of the traffic volume of the road section i.

The traffic volume of each road segment around the construction project is apportioned according to the weight. The calculation formula for the traffic volume of each road segment is as follows:

\[
\Delta V_i = P \times W_i
\]  

In the formula: \( \Delta V_i \) is the traffic allocated for the i-th section; P is the total traffic of the
construction project; $W_i$ is the weight of the i-section.

The application of traffic volume prediction method. According to the different function types of the project, travel forecast is carried out. In terms of the service characteristics of the development facilities of the project, there are mainly two functional types: retail and office, so travel forecast is carried out according to their two different function types.

Due to the continuous introduction of the proposed transportation projects, the traffic conditions in the project affected area have changed, making the time and distance of each traffic section gradually shortened, thus inducing the impact of the project on the traffic area. The induced traffic volume increases rapidly in the initial stage of traffic project establishment, but after a period of time, it will drop to a stable value under the influence of traffic facilities construction. Therefore, the cube can be used to predict the traffic volume effectively. According to the specific assumptions in the traffic volume, the vehicle ratio of medium price is estimated, and it is assumed that the vehicle price vehicle ratio in the basic year and other characteristic years is a stable value. The vehicle price vehicle ratio is calculated by using the relevant data in the basic year, and then the result is inversed by using the matrix, so as to calculate the induced traffic volume in the future characteristic year.

4. Deficiencies in traffic planning

4.1 Traffic signal control can not meet the requirements of the existing traffic volume

Through the collection and processing of traffic signals, the traffic volume can be well predicted. At present, the traffic signal control work mainly has the following problems: first, at present, the signal control work mainly depends on the single-chip microcomputer, because the single-chip control speed is slow, can not meet the current traffic signal control for real-time requirements; second, the cost of signal control is high, most of our traffic signal control system is from It is imported from abroad, but the control cost of this system is higher, and the cost of single traffic signal in the system is also higher. In addition, the smooth operation of the signal control system requires the installation of a large number of sensors on the road, but many traffic hubs in China do not have such conditions, which brings great difficulties to the installation work.

4.2 Traffic volume forecast cannot be separated from highway system

In the prediction of traffic volume, the transfer rate method is often used, which takes the highway system as the main consideration object. However, when determining the exchange volume, there will be a lack of corresponding control indicators, which leads to the lack of preciseness in traffic volume prediction. Because of the long-term forecast period of highway system project, the mode of transportation in the transportation system is also affected in different periods, resulting in the change of abnormal transfer traffic. Therefore, it is difficult to accurately describe the long-term and complex relationship by using the transfer rate method, which will eventually lead to the deviation of the prediction results.

5. Experiment and result analysis

At the end of 2009, the corresponding road traffic volume around the shopping center was investigated. Taking 15 minutes as a period, the manual calculation method was adopted. When the traffic volume was observed at the intersection, the parking line was taken as the observation section, and the number of motor vehicles turning left, going straight and turning right was counted. The traffic volume of each section at the end of 2009 was calculated and compared with the predicted traffic volume, as shown in Table 1.

It can be seen from Figure 1 that the predicted traffic volume is larger than the actual survey traffic volume, and the error between the two is not large. The main reasons for the above situation are: in the traffic impact analysis, the current road flow is based on one or two temporary traffic surveys, which is very accidental, It can not objectively reflect the real situation of road flow. Because China's economy and population are in a jumping high-speed growth stage, it is difficult to quantify its
The development trend and law with a certain formula, which makes the prediction of traffic volume difficult. The establishment of traffic volume prediction model provides a reliable basis for traffic volume prediction. However, the value of boundary conditions needs to be further optimized. The speed of socio-economic development is not consistent with the development speed planned by the planning department, and the economic planning index is often high, which leads to large traffic volume forecast.

Table 1. Comparison of survey traffic volume and forecast traffic volume at the end of 2009.

| Section | Survey traffic volume in 2009 / pcu·h⁻¹ | Forecast traffic volume in 2004 / pcu·h⁻¹ | Deviation rate /% |
|---------|----------------------------------------|-----------------------------------------|------------------|
| A1      | 1078                                   | 1140                                    | 5                |
| A2      | 1139                                   | 1257                                    | 9                |
| B1      | 486                                    | 521                                     | 7                |
| B2      | 503                                    | 539                                     | 7                |
| B3      | 1098                                   | 1203                                    | 9                |
| B4      | 1066                                   | 1133                                    | 6                |
| B5      | 1155                                   | 1241                                    | 7                |
| B6      | 1291                                   | 1394                                    | 7                |

Figure 1. Comparison diagram of deviation between forecast data and 2009 survey data.

In the process of traffic volume analysis and statistics, there are many human factors involved, which leads to the prediction error. The selection standard of prediction model is inconsistent, and the parameters are often selected in a large range, resulting in errors. The change of the surrounding road network structure layout is not considered, and the idea of looking at the local part from the whole is lacking. It is necessary to distinguish the building area of each purpose of the construction project. Through investigation, analogy and other methods to accurately determine the traffic attraction rate of buildings for each purpose of the project, so as to determine the traffic volume of each building and the total building. Formulate relevant specifications, formulate unified and standardized standards for data requirements, parameter determination, etc. the analysis of social and economic development is the basis of traffic volume prediction. When forecasting social and economic development, we should fully grasp the historical data, deeply study the regularity of economic development, and consider the macroeconomic development plan to make a more reasonable analysis on the future economic growth trend of the project scope.

6. Conclusion

To sum up, it is of great significance for the development of transportation engineering to make reasonable planning for transportation engineering and to predict the traffic volume with scientific methods. With the promotion of China's national economic development, the transportation industry has developed rapidly, but the current transportation engineering planning and the measurement model of traffic volume have not been developed, which makes the current transportation model planning unable to meet the needs of the development of the transportation industry. It is urgent to
make a reasonable planning and scientific prediction of the transportation engineering and traffic volume. Therefore, this requires us to study the problems existing in the current transportation industry planning, and improve these problems in the future transportation planning, so as to make the transportation industry of our country develop better.

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