

Effect of Residential Area Open to the Road Traffic

Yirong Yang

School of North China Electric Power University Baoding, Baoding 071000, China;

1241114834@qq.com

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Abstract. In order to evaluate the effect of residential area open to the road traffic, we select an initial evaluation indexes with domestic and international traffic management standards at first. Then, since the requirements of distinct cities are different, we choosing Shenzhen as the direct study target. AHP is used to do the further selection and obtain five indexes to build an evaluation structure.

1. Introduction

A dialectical discussion is caused when the State Council issued a number of opinions to promote the block system. Considering the current development situation of our country, although the existence of closed residential area has its rationality, but the closed area has also caused the lack of links between the internal and the external of the residential area and the residential and the city. It can be seen from the common structure of the closed residential area, the internal road system of the closed area presents the structure of the inward tree, which mostly has broken roads. The existence of such a road system not only increases the pressure on urban traffic, but also extends the time required for travelers to travel. In addition, the closed area also destroyed the link between the urban road networks, reducing the road network density, greatly reducing the accessibility between the roads 1. Based on this background, it is necessary to establish a mathematical model to evaluate the impact of community opening on the surrounding road traffic.

2. Index System

To establish an appropriate evaluation model, a proper index system must be build. Since the core of building an appropriate evaluation index system is to select proper evaluation indexes, we choose some common indexes in national standards at first and the aim of my paper is proposed an appropriate evaluation index system to display the impact of residential area open to the surrounding roads.

Road traffic is a complex part of urban road traffic, it is difficult to use a single index to evaluate the actual road traffic situation. Due to the residential area open will make the area surrounding road intersection and the load increased and the surrounding area traffic situation more complex.

In order to make the evaluation of the impacts more scientifically, the index based on the Highway Capacity Manual (HCM) abroad, queuing theory and travel time² and the domestic traditional city road traffic evaluation indexes is used to establish a comprehensive evaluation index system of the residential area surrounding the road capacity. As a result, we choose some initial indexes in the table below.

Table 1 Initial indicator source

Index source	HCM	queuing theory	Travel time	traditional city road traffic evaluation
Index name	V/C	Queue length	Travel time	Road traffic flow
	Average delay of intersection	Lane occupancy	Travel speed	Average speed
	service level		Delay time	Server quantity

Considering the consequences of residential area open, such as the area surrounding road intersection the road density will increase and the road load around the open-area will increase with the road density and so on, we will choose the indexes from three aspects, which contains the intersection indexes, road indexes and area indexes. To sum up, combined with the actual situation of traffic management and access to relevant literature, we can conclude that the evaluation of the impact of community opening on the surrounding road traffic can be obtained from 13 indicators, including the intersection traffic volume, saturation, average delay, signalized intersection second queuing, saturation, travel time, travel speed, total delay, relative delay rate, the ratio of congested road length to the length of the whole road segment, congestion travel volume, regional mobility index and reachability index.

To make the result more practical, the analytic hierarchy process (AHP) [3] is used to select the evaluation indexes which accord with the specific requirements of the city with the actual situation of different cities. The criteria to measure the relative importance of evaluation indexes of distinct cities can be summed up by policies and urban planning requirements of that city in recent years. After selecting the appropriate evaluation index, the evaluation index can be quantified according to the relative literatures, so as to get a suitable evaluation index system.

To give an example about how to choose some more important indexes, we select Shenzhen as the direct object of our research on the open policy. According to Shenzhen traffic management regulations and notifications in nearly five years, the criteria of measuring evaluation indexes of Shenzhen is operability, accuracy and sensitivity. Based on the above steps, the hierarchical structure of the evaluation index can be get as follows:

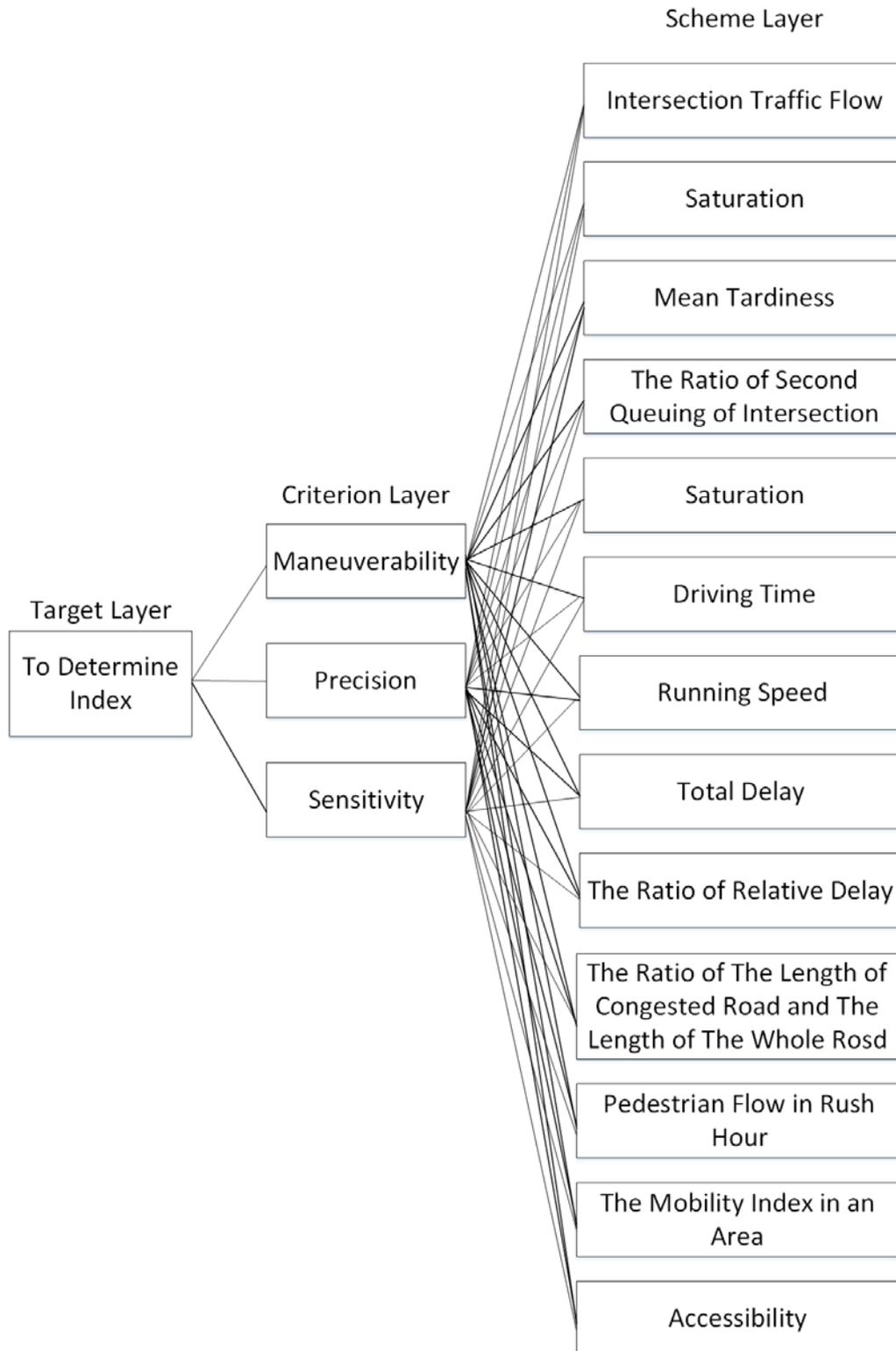


Fig.1 Hierarchical structure of evaluation index

The pairwise comparison matrix A for the sensitivity, operability and accuracy of the criteria layer is as follows.

$$A = \begin{bmatrix} 1 & \frac{1}{3} & \frac{1}{2} \\ 3 & 1 & 3 \\ 2 & \frac{1}{3} & 1 \end{bmatrix} \quad (1)$$

Finally the weights of all listed index scheme about the principle of rule layer sorting results:

intersection saturation, average intersection delay time, regional mobility and driving speed, length of road congestion and the length of whole section length ratio, intersection traffic volume, the intersection of two line rate, the main road, the main road total saturation the delay time, regional accessibility and regional congestion travel volume, main road, the main road relative delay time.

3. Summary

According to the results obtained by AHP, The five indexes, such as the intersection saturation, the average delay at the intersection, the driving speed, the length of the congested road section and the length of the whole road section, and the regional maneuverability length are chosen as the indexes of our evaluation index system.

4. References

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