Effect of Signal Light Periodic Time on Traffic Capacity

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1. Motivation

Following the rapid urbanization, more and more cities in the world have urban traffic congestions in current traffic system. Simultaneously, intelligent transportation systems are designed to provide real-time control and play an important role in traffic network system. In order to improve traffic capacity, it is necessary to have a brief understanding of traffic control system function. The motivation of this report is to calculate space occupancy rate and estimate the capacity of all intersections in central area of Tsukuba under actuated control.

2. Introduction

Traffic signals are used to manage conflicting requirements for use of road space – often at road junctions – by allocation right way to different sets of mutually compatible traffic movements during distinct time intervals. Because of under the signal light control traffic flow is changing in periodic cycle. According the entire space occupancy rate distributed in 29 intersections, analysis the reason of this condition and evaluates the traffic capacity in central area of Tsukuba.

3. Methodology

In order to calculate the space occupancy rate for 29 intersections, change the dynamic state to static state on the traffic condition is a good choice for evaluate. At first, during the fieldwork time, every morning in 7:00-8:00 one hour period to recode the number of vehicles for waiting signal light in red color. Second, using road data and network analysis tool to calculate the distance between the two intersections. Third, count space occupancy rate in one-way traffic lane and calculate average value above all traffic lane in one intersection.

At last, compare with the entire space occupancy rate in study area, analysis the relationship between location and traffic capacity.

4. Results and Discussion

The graph in Fig.1 shows the number of vehicles is waiting in the different intersection. Fig.2 shows that distribution of waiting vehicles is dispersing. Fig.3 shows that in each intersection the waiting vehicles in four or three directions. From the rate graph, the rate is not stable in different intersections. According to other papers or materials, the space occupancy rate under a perfect traffic capacity will be float from top to bottom in a permanent range. Because of lack time and instrument, all the data in the morning peak and the sample is too small to cover all the traffic condition. Under these circumstances, the result is valuable. The biggest space occupancy rate is smaller than 60%, can not cause the traffic jam in one signal periodic time. The signal periodic time plays a significance role for traffic capacity in central area of Tsukuba.

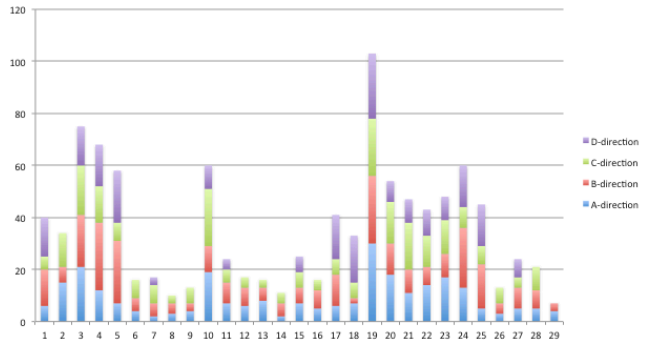

Fig.1 Number of waiting vehicles

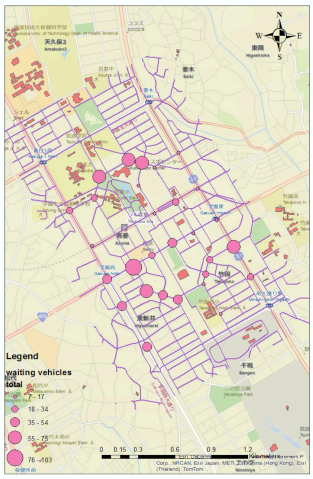

Fig.2 Distribution of waiting vehicles (left image)

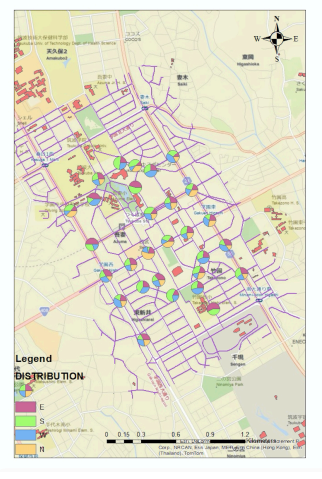

Fig.3 Distribution in different directions (right image)

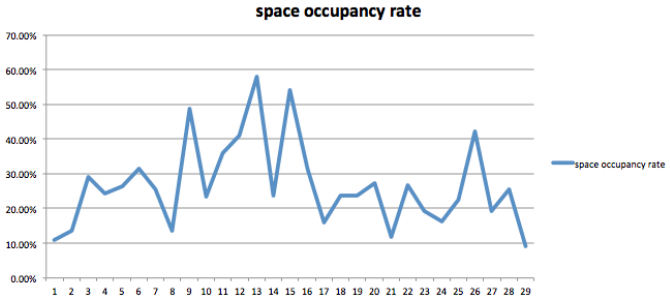

Fig.4 Space occupancy rate in study area