Method of Using Probe Data to Specify Congestion Occurrence Locations and Range of their Impact

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1. Introduction

Congestion is a major challenge facing road traffic in Japan. To effectively take congestion countermeasures, we have to specify locations for priority countermeasures by specifying where intersections that cause congestion are located, and clarify the range of the impact of this congestion. This report introduces a method of using probe data to specify congestion occurrence locations and the range of their impact.

2. Method of specifying congestion occurrence locations and the range of their impact

Specifying congestion occurrence locations and the range of their impact is done using the bottleneck index that indexes combinations of congestion and non-congestion between adjoining road sections (Fig. 1).

First, probe data is used to compute the average speed in a section in a particular 1-hour period, then with 20km/h as the threshold value, judging whether congestion has or has not occurred. Next, when the section to be analyzed is "congested", computing the bottleneck index by giving a +1 point if the downstream side section is non-congested and giving a－1 point if the downstream section is congested, then dividing the resulting score by the number of days data is received. If the absolute value of the (+) bottleneck index is large, there is a high possibility that the section analyzed is the start of congestion, and if the absolute value of the (-) bottleneck index is large, there is a high possibility that it is influenced by congestion in the downstream section.

3. Confirming effectiveness of the specification method

The effectiveness of this method was confirmed near the Taisho intersection on National Highway No. 2, that is a major congestion location in Hiroshima Prefecture (Fig. 2). The analysis was done between 7:00 and 8:00 in the morning on 247 weekdays during 2011 and the percentage of days of congestion out of all 247 days (congestion rate) and the bottleneck indexes were computed for each section on a digital road map. Data was obtained for more than 90% of the days for almost all sections. In section 2, "congestion" occurred at a percentage of 0.8 or more between 7:00 and 8:00 a.m. and the absolute value of the bottleneck index (+) was large at 0.7 or higher, so it was judged to be highly probable that the Taisho Intersection is a congestion occurrence location. In sections 3 and 4, the absolute value of the bottleneck index (-) was high at above 0.6, so it was determined that there is a high probability of these sections being influenced by downstream section congestion.

4. In conclusion

In the future, more verifications of the method will be done, confirming its effectiveness, and the specification method will be improved.

Figure 1. Concept of bottleneck index computation

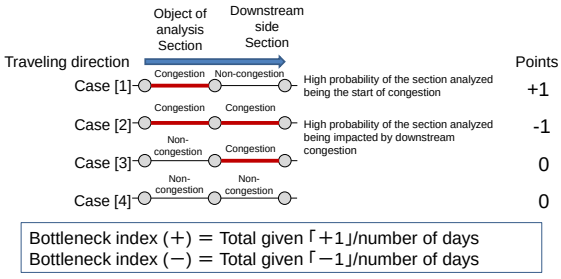
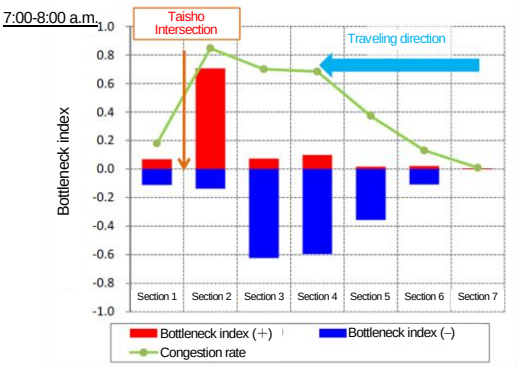


Figure 2. Bottleneck index near the Taisho Intersection (7:00 - 8:00 a.m.)



※ Congestion rate = days of congestion (average speed under 20km/h)/total days