Field Operational Tests to Examine the Driving Practice for Congestion Mitigation at Sag Sections

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1. Introduction

About 60 percent of the traffic congestion on highways occurs at an upslope of sag sections. It easily causes a change on the inter-vehicle spacing by involuntary speed reduction at sag sections which gently changes the grade of the road from down to up. It is also considered that an unstable traffic flow due to the excessively long or short following time gap is a factor of traffic congestion.

Therefore, information providing services have been developed: (a) information providing service for drivers to recommend the driving practice which leads smooth traffic flow before traffic congestion occurs via ITS Spots compatible car navigations and/or other devices, and (b) services integrated with ACC (Adaptive Cruise Control) vehicle which is able to maintain a certain vehicle speed and/or following time gap that has been commercially available in recent years as a vehicle advanced technology, in order for preliminary detection of traffic congestion by road side sensors[1]. This article reports a summary of the field operational test (FOT) for (a) that was conducted on the public road to carry on a basic study to find possibility of the service actualization and drivers' acceptance and effects on traffic flow.

2. Driving practice for traffic congestion mitigation at sag sections

This service expects traffic congestion mitigation in terms of realizing smooth traffic flow by adjusting excessively long or short inter-vehicle spacing by requesting drivers to maintain a certain inter-vehicle spacing at traffic congestion-prone point such as sag sections described on Figure 1. For actual drive practice to keep a certain following time gap, the drivers' ease of acting is considered while remaining smoothness and safety, thus it was targeted to maintain as fixed for the following time gap (time interval from the passing of front vehicle to the driver's vehicle at a certain spot) as 2 seconds.

3. Summary of driving test on public road

The driving test was conducted at Yamato sag section Tomei highways (20.0kp~23.0kp) and was conducted in the early morning on Saturdays and national holidays at which traffic demand excess in November and January 2012. To conduct the experiment at a higher traffic volume before occurrence of traffic congestion on the passing lane to confirm the effects of a certain control of inter-vehicle spacing time, it was chosen at 120 vehicles or more / 5 minutes as a condition of the experiment start.
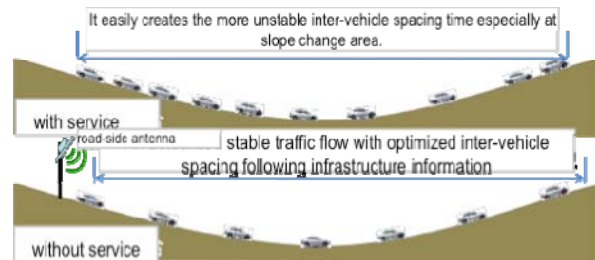

Fig. 1   The inter-vehicle spacing optimization service by road vehicle coordination.

It was prepared 8 passenger vehicles as experiment vehicles.

At the FOT to maintain the following time gap 2 seconds, subject drivers (collected from general drivers) were asked to count the following time gap by verbally counting"0102(zero, ichi, zero, ni, pronunciation of zero, one, zero two in Japanese)"[2] while driving, in order to confirm possibility of actualization and acceptance to maintain a certain following time gap. Also, to analyze the change of the traffic flow rate, change of each following time gap by putting vehicles that maintain a certain inter-vehicle spacing, occurrence and propagation status of deceleration shockwave, driving behavior data such as the vehicle location of latitude and longitude, speed, acceleration and deceleration speed were acquired by GPS logger mounted on the test vehicles in addition to video image of the roadside cameras.

4. Conclusion

Utilizing the data collected from this driving test, the traffic congestion mitigation effects by mixing ratio of vehicles that maintain a certain following time gap will be identified by the traffic simulation and the more effective information service method for drivers will be studied.

【Reference】
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Traffic congestion mitigation program integrated with road information and vehicle control technology
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