Verification of Vehicles' Driving Route Monitoring Technologies on Actual Roads

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1. Introduction

In our country, rapid increases in repair costs and renovation expenses have become a significant problem due to the aging of the structures constructed on and after the period of high economic growth.

The Intelligent Transport Systems Division has been conducting the technical study of the systems to monitor heavy vehicles' driving routes and support their appropriate driving pursuant to the vehicle specifications with the aim of reducing their impact on the life span of road structures.

This report is to describe the outline of the results of the fundamental verification experiment on the technologies for monitoring driving routes using the ITS spot compatible on-board units and/or Tablet devices implemented on actual roads in the fiscal year 2012.

2. Experimental method

To verify the technology for monitoring vehicles' driving routes, we used the ITS spot compatible on-board unit with GPS (On-board unit with GPS) and two types of Tablet devices A and B as on-board units. Furthermore, we installed a high-performance GPS antenna capable of collecting GPS data at 0.1 second intervals in the test vehicle in order to verify how the accuracy is enhanced through map matching of the driving position data.

Shown in Table 1 are specifications of on-boards units and the items of data collected. The route (245km) on the Tomei expressway is shown in Fig. 1 is an example of a driving route.

Table 1 On-board units' specifications and the items of data collected

	On-board unit with GPS	Tablet device A	Tablet device B
GNSS type	GPS	GPS	GPS/GLONASS
Probe data accumulation interval	Every 200 m travel/ 45°turning angle	Every 1 minute	
Items of data collected	On-board unit ID, date, time stamp, geographic coordinates etc.	Date, time stamp, geographic coordinates	

Fig. 1 Running route

Fig. 2 Section with sound insulation walls

3. Experimental results

In the section with sound insulation walls (Outward and homeward 26km) on the driving route shown in Fig. 1, we have compared the GPS data obtained through the on-board unit with GPS and Tablet devices with the GPS data obtained through the high performance GPS antenna at the same time to verify the accuracy of the measurement data of the respective on-board unit on making the high-performance GPS data as the reference value. Table 2 shows the result. As there were found differences in the accuracy of the measurement data by on-board units, we find that position grasping accuracy of respective on-board unit differs by roadside conditions.

Table 2 The accuracy of measurement data of each on-board unit

Item	On-board unit with GPS	Tablet device A	Tablet device B
Distance from the reference value (average, (m))	8.0	12.9	11.8
Standard deviation (m)	2.89	7.29	7.82
Median (m)	7.75	12.89	7.82
Number of data	132	1231	1131

4. Future plan

We plan to verify also the accuracy of the measurement data under different roadside conditions or environments such as high-rise building streets and underneath elevated road structures. We also plan to investigate the judgment method of the route noncompliance by using the obtained driving route data. Hereafter, we will establish the verification testing system based on these results to study how to make the task on nationwide function verification and actual deployment clear.

【Reference】

・Research on Voice-output ITS SPOT-onboard units with GPS system, 10th ITS symposium 2011, Vol.10 ,67-72