

Accident reduction effect analysis of driving load reduction system based on market data

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Traffic accidents in Japan are decreasing due to trinity activities such as safe car manufacturing, driver enlightenment, and transportation infrastructure development. The spread of advanced driver assistance systems (ADAS) is also cited as one of the factors of the traffic accidents decreasing. Regarding driving load reduction systems such as Adaptive Cruise Control (ACC), the results of investigations on accidents have been reported. The report suggests that the difference in the ratio of road types when the system is in use and when it is not in use affects the estimation of the accident reduction effect of the system. And further investigation is required to calculate the accident reduction effect of the driving load reduction system. Therefore, the authors analyzed the accident reduction effect of the driving load reduction system by investigating the accident occurrence frequency for each road type depending on whether or not driving load reduction system was used, using market data of Japan.

In this survey, we first investigated accidents while using ACC (A1) and accidents while not using ACC (A2) from the event data DB for each road type. Next, using a DB that constantly records driving data, we estimated the mileage when using ACC (B1) and the mileage when not using ACC (B2) for each road type. Finally, the accident frequency A1 / B1 while using ACC and the accident frequency A2 / B2 while not using ACC were compared for each road type, and the forward collision reduction effect of ACC was analyzed. Table 1 shows the estimation results of the forward collision frequency per million kilometers obtained as a result of the survey.

When the road type is not taken into consideration, the frequency of forward collisions while using ACC is 1 / 8.2 of not using it. Considering the road type, it is 1 / 2.1 for highway and 1 / 4.3 for main road. On city roads, there were 1.85 cases per 1million km when ACC was not used, but there was no forward collision while using ACC. The value of 1 / 4.3, which is the result of the main road, is considered to be an excessive result for the accident reduction effect by using ACC. This is because we believe that the utilization rate of ACC is decreasing in a complicated environment where accidents are likely to occur.

Next, considering the highway, there is a complicated road environment such as the Metropolitan Expressway, but the proportion of the entire highway is small. Therefore, the analysis result that the frequency of forward collision when ACC was used was 1 / 2.1 of not used is considered to be largely due to the accident reduction effect of ACC.

However, other factors with and without ACC use, such as the possibility of different driver characteristics and different weather conditions, may also affect the forward crash frequency. In addition, the results of this survey were based on the use or non-use of ACC, but not based on the use or non-use of other driving load reduction systems such as lane keeping assist systems. Therefore, it will be necessary to investigate individual accidents that occurred while using the system, and to investigate / verify the effects of the system, including other factors. We also believe that it is important to work to ensure that customers who use new systems understand and use them correctly, to develop systems that are easy to understand, and to continuously investigate/verify the effectiveness of these efforts in the future.

Table 1 Estimated Frequency of forward collisions

Use of ACC	Road type	Forward collision (Cases)	Mileage (Million km)	Frequency of forward collisions (Cases / Million km)
Use	Highway	7	62.9	0.11
	Main road	3	24.7	0.12
	City road	0	3.1	0
	Total	10	90.7	0.11
Not use	Highway	37	158.1	0.23
	Main road	209	403.0	0.52
	City road	501	270.7	1.85
	Total	747	831.8	0.90
Overall driving data		757	922.5	0.82