

An Evaluation of the Acceptance of a Driver Assistance System That Alerts Drivers to the Presence of Bicycles

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KEY WORDS: Human Engineering, Active Safety, Driver behavior, ADAS, HMI (C2)

Car-to-bicycle crossing collisions frequently occur at intersections with poor visibility. While communication-based driver assistance systems that utilize smartphones are expected to help address this issue, a key challenge is that they do not frequently and accurately alert drivers to the presence of bicycles. Rather than using notifications that alert drivers to high-risk situations as they occur and prompt immediate decisions, we explored a more abstract notification method designed to raise awareness of the bicycle's presence in advance and encourage drivers to assess their surroundings. We also investigated the impact of this approach on drivers' readiness for safe driving.

The experiment involved driving on residential roads using a driving simulator. We provided notifications of the presence of bicycles near intersections where the test vehicle had the right of way and examined driving behavior as the vehicle passed through the intersections. The notification content consisted of abstract phrasing and a clear, simple voice message: "There is a bicycle nearby. Please be careful." The frequency of positive notifications was set at 20 %, considering smartphone ownership and usage rates, and the frequency of encounters with bicycles.

(1) Evaluation Results for Low-Frequency Notifications

For HMI notifications with a 20 % accuracy rate and a high level of abstraction, 80 % of users did not place excessive trust in them, and 72.5 % expressed a willingness to use them (Figures 1 and 2).

While excessive reliance on the assistance system is being curbed, approximately 20 % of users are concerned about overreliance; therefore, we believe it is necessary to encourage drivers to understand that the system is intended for supplementary use and to use it accordingly.

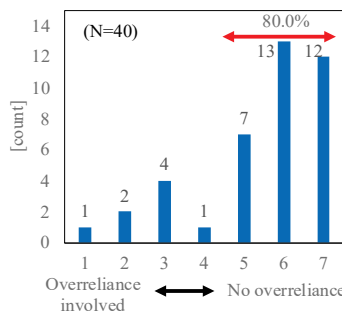


Fig.1 Intention to use the system

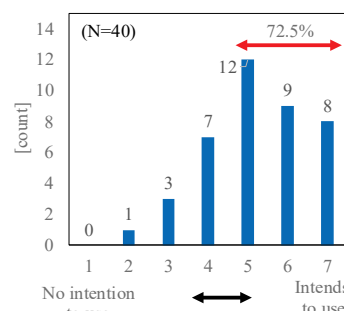


Fig.2 Overreliance in the system

(2) The Impact of Driver Assistance Systems on Maintaining Driving Vigilance

While driver assistance systems are generally recognized for their effectiveness in reducing accidents, there are concerns that overreliance on them may pose risks; however, we expect that low-frequency assistance will help curb such overreliance. Therefore, we evaluated safe driving readiness based on three driving behaviors—vehicle speed, use of the brakes, and proportion of fixation time approaching an intersection. Figure 3 shows a comparison of average vehicle speeds approaching intersections before and after gaining sufficient experience. Figure 4 shows the results of comparing the proportions of fixation time on the areas corresponding to the road ahead, the intersecting road to the right, and the intersecting road to the left while traversing three consecutive intersections. Based on these results, it was confirmed that low-frequency assistance system does not adversely affect the readiness for driving vigilance. These findings are based on a short-term experiment; we plan to investigate the effects of overreliance following daily use in the future.

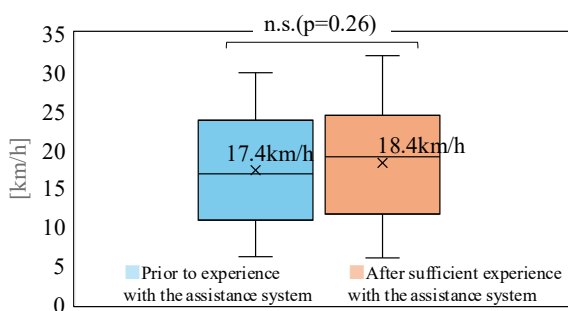


Fig.3 Comparison of speeds approaching an intersection (N=36)

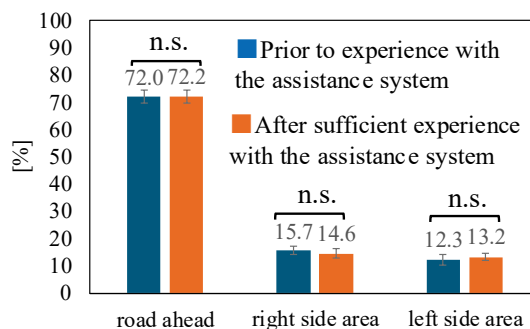


Fig.4 Proportion of fixation time(N=28)