STUDY OF ACTIVATION TIMING OF AUTOMATIC BRAKING FOR VEHICLE-INFRASTRUCTURE COOPERATIVE DRIVING SUPPORT SYSTEM

1Hirose, Toshiya*, 1Tanaka, Nobuhisa, 1Kojima, Touru, 1Hatano, Tadashi, 1Taniguchi, Tetsuo, 2Sawada, Toichi  
1National Traffic Safety and Environment Laboratory, Japan,  
2Shibaura Institute of Technology, Japan


ABSTRACT -
In this study, the timing of the warning or the automatic braking with the vehicle-infrastructure cooperative driving support system in case of cross traffic intersection accidents at blind intersections was investigated. The aim of this study is to investigate the suitable timing which the system would not interfere with the driver’s normal operation. The experiment was carried out with actual vehicles and the driving simulator. This study was targeting the countermeasure of cross traffic intersection accidents which the system warned to the driver at first stage, and the system activated the automatic braking at second stage.

The situation of cross traffic intersection accidents is that two vehicles collide at blind intersections. One vehicle (that is driven by subjects) has to stop at blind intersections, but the vehicle’s driver does not operate the braking. Another vehicle is traveling on the priority road. The experimental situation is the collision of these vehicles. First, when the vehicle travels into the intersection, the timing which the driver’s braking control starts is measured and analyzed in the experiment with actual vehicles. Second, the range of the timing of the warning and the automatic braking which do not intervene in the driver’s operation is decided. Third, the deceleration of automatic braking is decided in each range. Finally, the system was evaluated with the driving simulator. The vehicle-infrastructure cooperative driving support system was constructed in the driving simulator, and traffic accidents were reproduced in the virtual world. The driver controls the vehicle equipped the system, and then the system evaluates the effect to avoid traffic accidents and the driver’s acceptability to the system.

As a result,
1) Warnings should not be activated earlier than 3.5 seconds at the time of vehicles’ traveling into the intersection. And this timing is effective for the warning.
2) Automotive braking should not be activated earlier than 2.3 seconds at the time of vehicles’ traveling into the intersection. When vehicles travel into the intersection with the low velocity range, it is possible for vehicles to stop without crossing the stopping line and without intervening in the driver’s operation.

In this study, the effective activation timing of the warning and the automatic braking can be examined and the study is confirmed to provide efficient data for building of the system in the future.