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Research on Avoidance Operations in Emergency Situations (Second report)

- In the Case of Small Overlap Rate -

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In Japan, the Advanced Emergency Braking System (AEBS) has become mandatory for all new domestic passenger cars manufactured after November 2021. And it is expected that the percentage of vehicles equipped with AEBS will increase. However, it is difficult to avoid all collisions through only collision avoidance support by AEBS, and it is also necessary to investigate Autonomous Emergency Steering systems (AES) as well. For effective support using AES, it is necessary to reflect driver operation characteristics and tendencies. In this study, we performed experiments using a driving simulator with the aim of grasping the operational characteristics of drivers in emergency avoidance scenarios.

In the first report, we examined driver avoidance maneuvers in emergency situations with large overlap rates (the rate of the relative overlap in the horizontal direction in relation to the obstacle in front of one's own vehicle compared to the width of one's own vehicle). As a result, it was found that many drivers avoid collision by steering in high speed situation, and the avoidance direction is on the driver's side. Moreover, we proposed that Emergency Steering Function (ESF) operation timing that less interfere with driver's steering maneuver.

In this report, we examined driver avoidance maneuvers in emergency situations with a small overlap rate. Because, with a small overlap ratio, the amount of lateral movement required for maneuver avoidance becomes smaller, and avoidance by steering is considered to be easier than in the case of a large overlap rate. The relationship between TTC and relative speed with the other vehicle at the time when the driver starts steering avoidance (or braking in the case of braking avoidance) is shown in the figure. From the data, the cases that did not result in collision avoidance can be classified into three types of patterns. In the first case, a collision occurred even though the driver started steering at a timing earlier than the steering avoidance limit. In this pattern, the system may be able to assist collision avoidance by ESF that the system begins assisting after the driver's avoidance maneuver. In the second case, the driver only braked at a timing that was below the braking avoidance limit and earlier than the steering avoidance limit, resulting in a collision. In the third case, the system performed steering at a timing below the braking avoidance limit and below the steering avoidance limit, resulting in a collision. In the second and third case, accidents may be avoided by AES that automatically begins assisting.

As a result, it was found that most drivers avoid collisions with steering in small overlap situations compared to large overlap situations. Moreover, we found that some drivers may be able to be assisted in avoidance by ESF and AES.

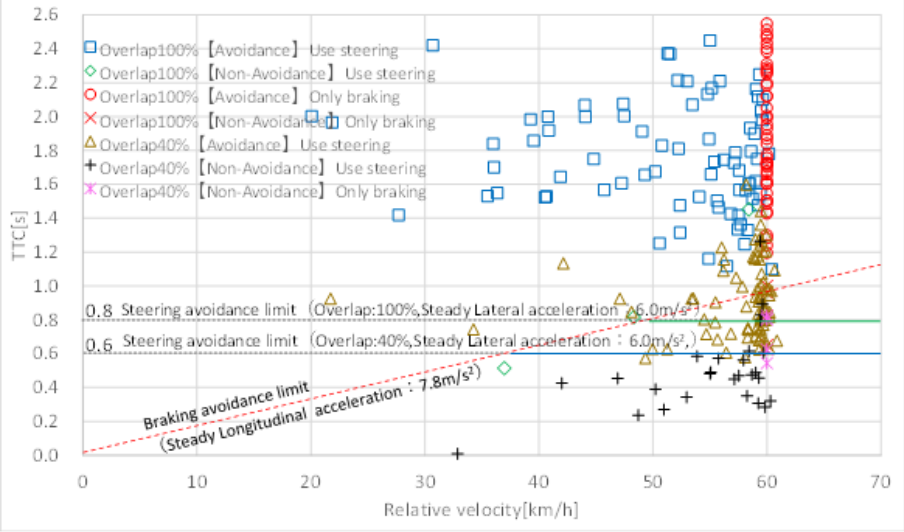

Fig. Relationship between TTC and relative velocity