

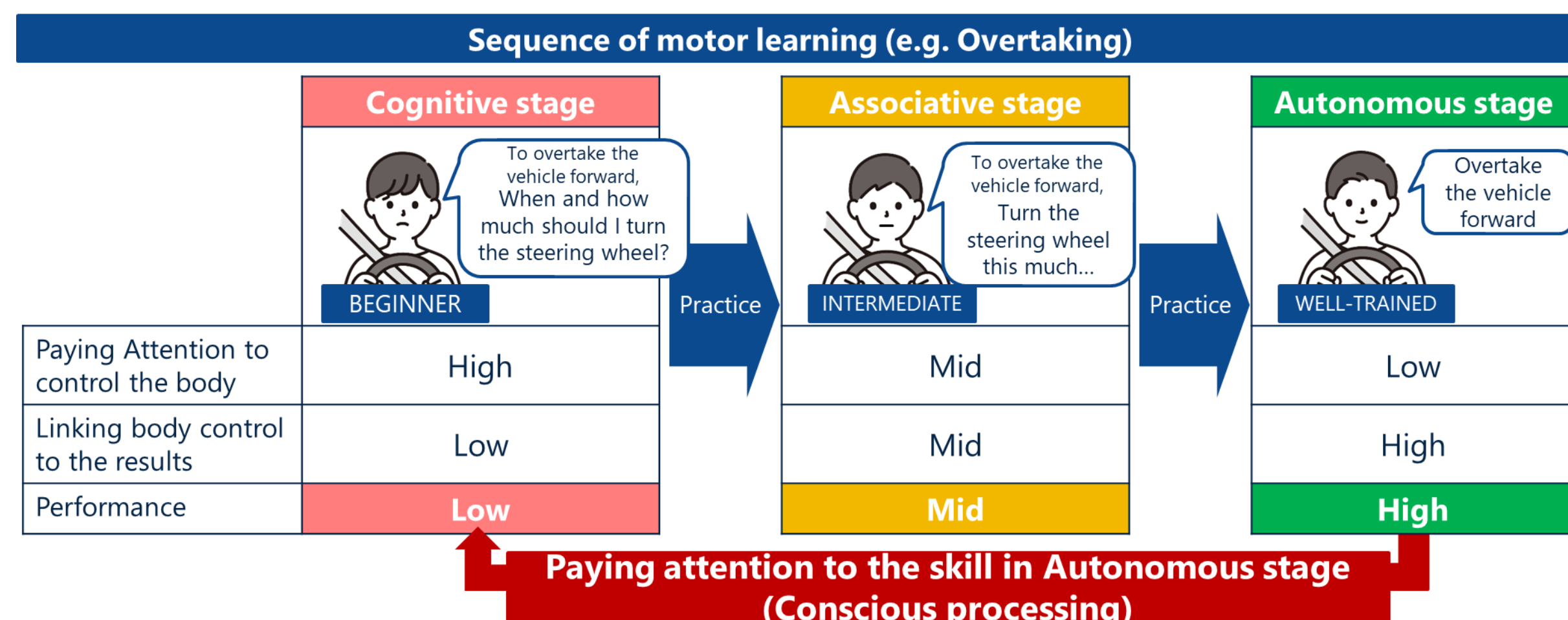
Research on interface to improve safe driving based on human's conscious processing

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Introduction

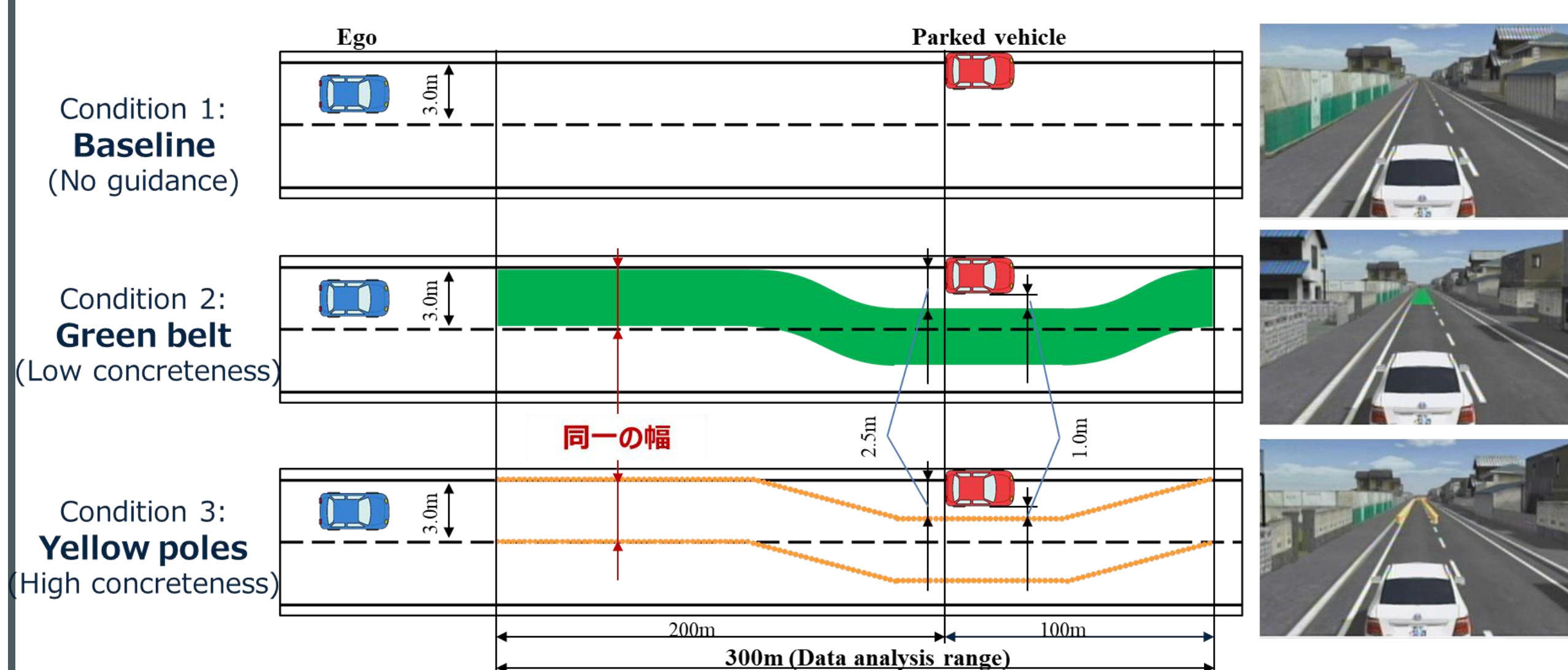
When humans pay attention to the components of a task that can be performed without conscious control, the performance decreases. This phenomenon is called conscious processing theory. If this theory is applied to driving assistance system, presenting inappropriate assistance information may induce conscious processing and reduces safe driving performance. However, little systematic knowledge is useful for designing driving assistance systems that prevent conscious processing. In this study, we apply conscious processing theory to overtaking scene, which has a high traffic fatality rate, and examine the effects of presenting information with different characteristics on drivers' processing and safe driving performance.

Motor-skill learning and conscious processing in driving



To improve safe driving performance, driving assistance information should be maintain driving skill in Autonomous stage.

Influence of concrete visual information on driving behavior

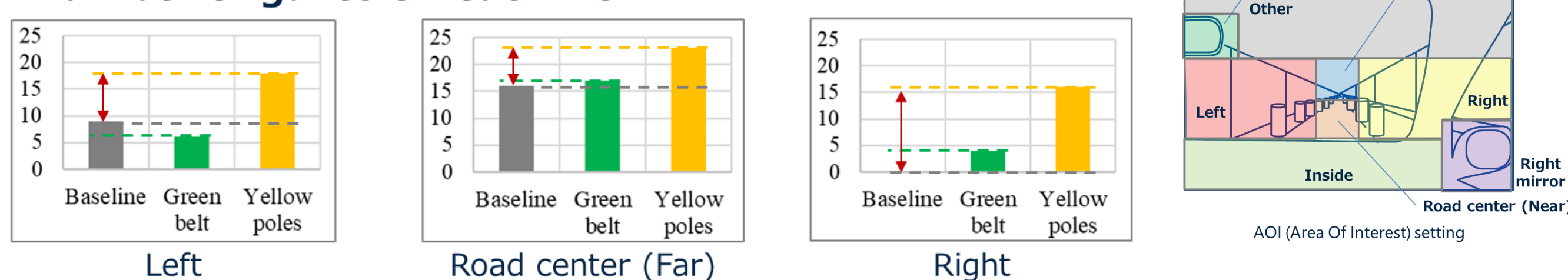


To investigate correlation of concreteness of visual information (accuracy of tracing specified route) for overtaking assistance and safe driving performance, we conducted a driving simulator experiment.

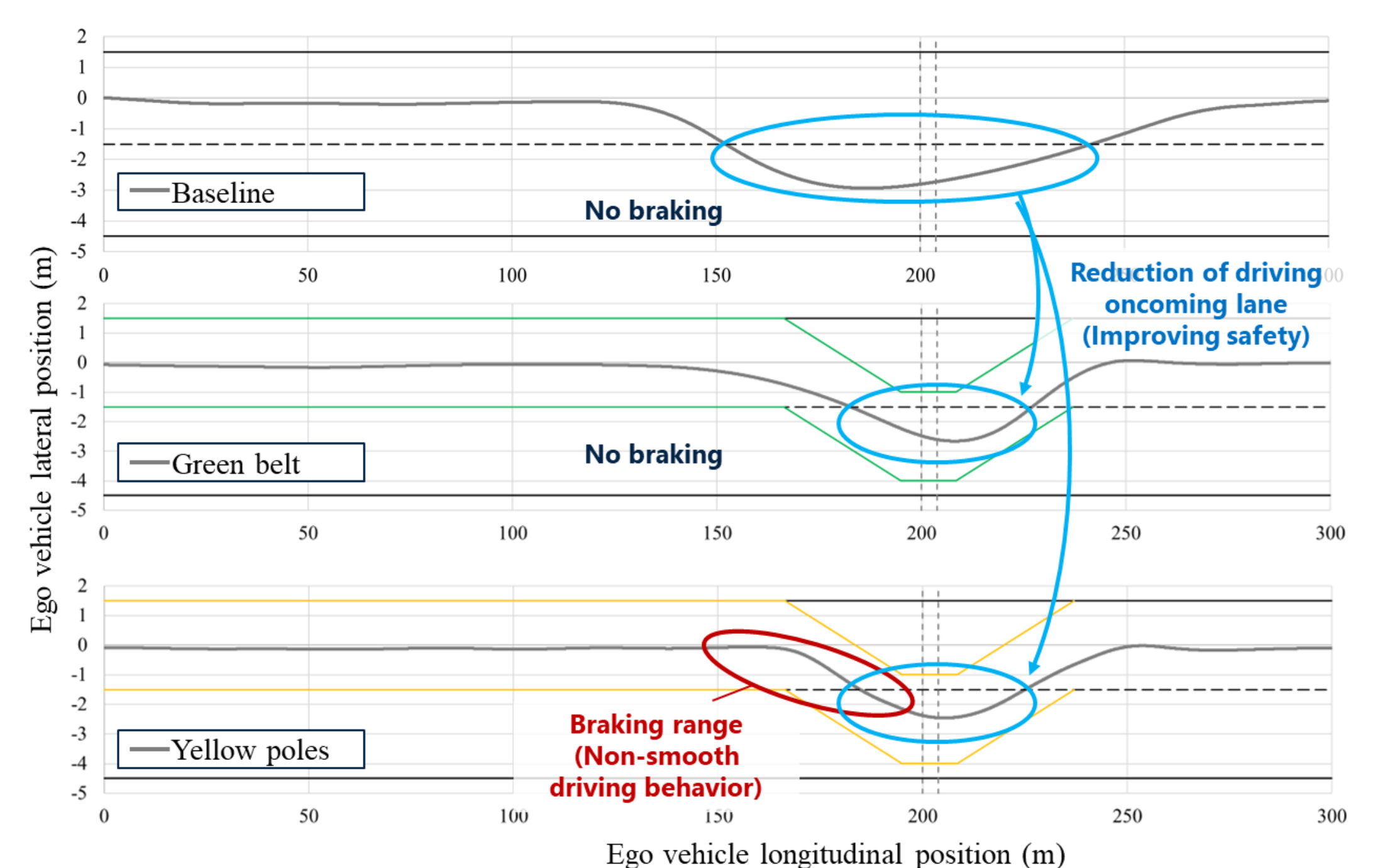
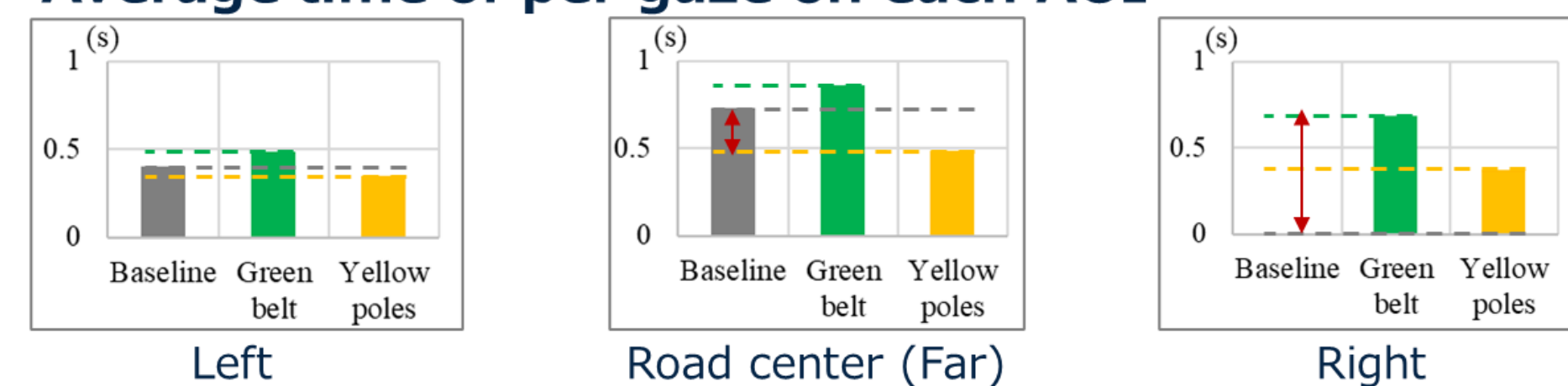
- Experimental scenario: Overtaking a parked vehicle at 40km/h
- In Green belt, driver could deviate from the specified route since the route was specified in plane.
- In Yellow poles, driver should have traced the specified route with high accuracy since the route was specified in three-dimensional objects.

Analysis on vehicle behavior and gaze behavior

Number of gazes on each AOI



Average time of per gaze on each AOI



- In Green belt, the driver's gaze behavior was similar to baseline, but the vehicle behavior was safer and smoother.
 - It was suggested that Green belt improves safe driving performance since it maintained driver's skill in autonomous stage.
- In Yellow poles, the driver's gaze behavior was different from baseline there was a trend to decelerate sharply before overtaking.
 - It was suggested that the poles decreased safe driving performance since it induced driver's conscious processing.

Publications

Hasegawa R., Nakamura H., Abe G., Kitajima S. and Nakano, K., Analysis of concrete guidance's influence on human drivers' overtaking performance, The 17th International Conference on Motion and Vibration, August 2024, Tokyo, Japan.

Hasegawa R., Nakamura H., Abe G., Kitajima S. and Nakano, K., Analysis of the influence of concrete information on human driver's overtaking performance, Dynamics and Design Conference 2024, September 2024, Kanagawa, Japan (in Japanese).