Introduction
This is an assist system for a driver to realize smooth steering behavior by supplying tiny torque to the steering wheel to follow the desired trajectory. Its performance is examined through experiments using a driving simulator.

Haptic guidance controller
The haptic controller is designed to reduce the lateral error and the yaw error between the vehicle’s position and the target trajectory. The assist torque $u$ is obtained as

$$u = a_1 e_y + a_2 e_y + a_3 e_{\theta} + a_4 e_{\theta}.$$

$e_{\theta}$ : Yaw error
$e_y$ : Lateral error
Target trajectory

Driving simulator, DS
The haptic guidance control is achieved on the driving simulator, where an electric power steering, eps, system is installed. The system simulates the assist torque in addition to reaction torque produced by a typical eps.

Improvement of steering behavior in right and left turns
The DS simulates the haptic guidance control in right and left turns in the experiment with 10 subjects. The deviations of the trajectories are reduced particularly when the additional task, PASAT, oral calculation task, is imposed on the subjects.

Application to lane change assist
The haptic guidance control can be used to navigate drivers. The experiments to induce the lane change with the assistant torque were carried out. Three types of torque, weak, middle, and strong are applied. The results show the drivers change the lanes more speedily when the assist torque is supplied and the larger assist torque is not always more effective.

Publications