Steering Controller Design of Automated Driving Bus

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Introduction
There are high expectations for the development of automated buses and driverless bus operation in developed countries due to the aging population and the labour shortage. However, some technical challenges still remain, such as robust localization in severe conditions, vehicle stability at high speed, redundancy needed for sensor failure and precision docking for elderly or disabled people.

Localization
Localization plays an important role in lateral control for automated driving systems. Considering accuracy, availability, and redundancy, four types of sensors are used for localization.

Steering control
The transfer lag from the steering input to the front wheel angle is measured and modelled as the second-order system. A novel six-state feedback control with gain scheduling is proposed to obtain the optimal damping.

Pilot tests
Automated driving bus has travelled over 10,000 km successfully within suburban/urban environments in Japan. The standard deviation of lateral error in precision docking was 1.2 cm, which is slightly under the criterion threshold. Experimental results show GMPS is much robust since it provides high accuracy even in severe conditions.

Publications