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Development of "Pairdriver", a human centered automated steering control system*Harmony between human and system. Contribution to safe and comfortable driving*

JTEKT has developed an automated steering control system, named **Pairdriver**, that realises safe driving by sharing the steering of the vehicle between driver and automation, in order to respond to the future expansion of the automated driving market.

Pairdriver makes possible seamless and continuous steering collaboration between automation and driver through control technology while ensuring safe automated lane tracing.

Market status and demand for automated driving

Automated driving is classified in levels starting from "0" (no driving automation) to "5" (full driving automation). The use case of mobility are diverse, such as logistics, personal use, and fun to drive. There is a demand for the development of automated driving technology that is suitable for each use case. Therefore, a versatile technology that is compatible to all types of application and all levels of automation is required.

Introduction of Pairdriver

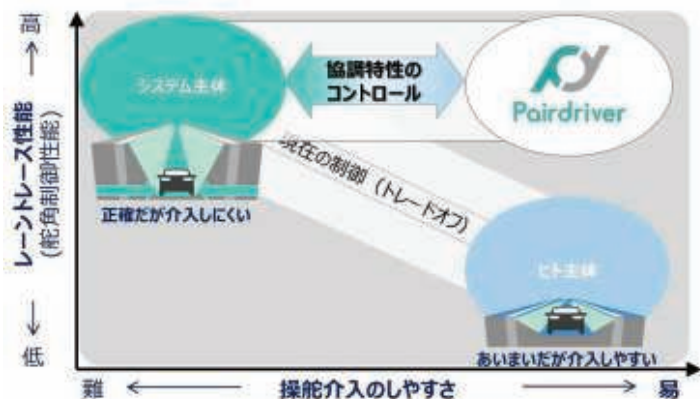
It is a system that connects the "intention" of the driver to the automation through the electric steering system (EPS) interface. Based on information such as driver operation as well as road and traffic conditions (detected by the vehicle sensors), a steering reaction torque or vibrations is computed to inform the driver. Steering assistance based on this "intuitive communication between human and automation" realises an unprecedented sense of trust, comfort and safety.

When the system detects a manual intervention during automated driving, it smoothly reflects the driver intention by steering the vehicle while synchronising the automation with that intention.

Advanced sensing and control technology enables seamless intervention and coexistence between automated and manual steering without the need to interrupt the automation.

**Development background**

Steering harmony between human and automation is important at all levels of automation, from level 0 (no driving automation) to level 4 (high driving automation). High performance automated lane tracing together with the capability of smooth manual steering are required to avoid discomfort and misunderstanding. These give a sense of trust, comfort and safety to the driver while operating an automated driving vehicle.



JTEKT has applied EPS sensing and control technologies to develop a system that harmonizes the automated steering with the intention of the driver.

Since the start of the development in 2017, we have continued to improve the level of confidence that enables the announcement of **Pairdriver**.

Naming & logo concept

Pairdriver means "two drivers in an equal relationship".

Rather than relying solely on the automation for automated steering, the name conveys the idea of driving collaboration between human and automation



Targets of SDGs that can contribute through this new product



- **[3.6]** By 2030, halve the number of global deaths and injuries from road traffic accidents
- **[11.2]** By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

Prospect

We will propose this product to customers together with our steering system. **Pairdriver** system is highly compatible with integrated control systems of automobile manufacturers and mega suppliers.

JTEKT will take advantage of this feature to respond flexibly and quickly to diverse needs in automated driving region, while contributing to driver trust, comfort and safety.