Docket #: S16-370

Anticipatory Steering Wheel Movement for Automated Vehicles

Researchers at Stanford have advanced the concept of an "Anticipatory Control Interface" that informs the driver of a partially automated vehicle of its lateral trajectory plan. Partially automated vehicles that require supervision by a driver – and intervention in case of a failure – require the driver to be aware of the current action and, ideally, the future plans of the automated driving system. The researchers' innovation involves moving the steering wheel (or indicating such movement via visual pattern, e.g., a set of LEDs) in advance of the road wheels to inform the driver about the future plan of the automated driving system. Providing future steering information on the steering wheel in this way could empower the driver to recognize a mistake by automation and react to it faster, improving vehicle safety. Moreover, this approach may impose less visual processing on the part of the driver compared to other proposed systems requiring interpretation of visual information on a screen. Such a system may also improve driver trust in the vehicle, as vehicle steering actions are pre-cued and less likely to surprise. Many algorithms for road vehicle path planning allow calculation of the trajectory and the desired steering angle at a given (short) time in the future, assuming there is no sudden change in the environment, and are thus compatible with this invention.

Related Technology
Stanford docket 16-385 - describing an interface for controlling a vehicle during semi-autonomous driving by using the steering wheel to direct the vehicle under certain conditions, e.g., to make lane changes.

Stage of Development
The researchers report an evaluation of the Anticipatory Control Interface prototypes based on their ability to support driver recognition and response to automation failures, compared to a control condition. Results show faster disengagement of automation and subsequently better takeover quality on failure with the physical anticipatory interface compared to the control.

Applications

- Automated road vehicles classified as SAE level 3 ("conditional automation") or higher

Advantages

- Enables the automated system to communicate its plan to the operator, potentially giving them more time to react if a vehicle steering error is recognized

Publications

- Johns, M. et al. "Looking ahead: Anticipatory interfaces for driver-automation collaboration," *2017 IEEE 20th International Conference on Intelligent Transportation Systems (ITSC)*, 2017, pp. 1-7, doi: 10.1109/ITSC.2017.8317762

Patents

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Innovators

- Mishel Johns
- Wendy Ju
- Walter Talamonti

Licensing Contact

Evan Elder

Senior Licensing Associate

Email