Emphasizing the auto in automobile—a unified approach for automated vehicles

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The idea of driverless cars continues to make headlines across the world, including the recent revelation that researchers drive around wearing car seat costumes to observe how the public interacts with cars that appear driverless. Despite the apparent absurdity of such research techniques, driverless cars are approaching the on-ramp to reality. A team of researchers have proposed an integrated framework to help self-driving cars interact without human intervention.

The collaborative team includes researchers from Cranfield University, UK, Tsinghua University, Beijing Institute of Technology, Xi'an Jiaotong University, China. They have published their approach in *IEEE/CAA Journal of Automatica Sinica (JAS)*, a joint publication of the IEEE and Chinese Association of Automation.

"One of the main challenges associated with connected and automated driving is the lack of a systematic approach to integrate both vehicle connectivity and vehicle automation attributes for maximizing the performance benefits," said Dongpu Cao, a senior lecturer at the Advanced Vehicle Engineering Center at Cranfield University in the United Kingdom, and an author on the paper.

Cao and his team developed a framework that combines cyber, physical and social systems, with the understanding that vehicles operate at different levels of automation and such levels can change with regard to the vehicle operator as well as external considerations. A person may switch from full automation to take over steering and braking operations

when encountering a traffic jam, for example. Another person may prefer full control when driving through a residential area, but allows for full automation while zipping down the highway.

How can separate driving approaches, with different levels of automation, come together for smooth and safe vehicle interactions? The researchers propose the use of parallel learning theory. Using a machine-based learning system, computer networks can analyze information regarding the physical vehicle, the human driver, and the information related to the action of driving. These three spaces can be assessed and processed in parallel through a cloud-based learning network.

"The parallel driving framework is a groundbreaking approach in both short and long term, whose full realization in the long term requires systematic collaborative efforts from multidisciplinary sectors," Cao said.

Cao noted that a simplified version of this cloud-based understanding and communication could be achieved in the short term with relative ease.

"The demonstration system of parallel driving is being developed, which is expected to demonstrate the functions and performance potentials in the real-world driving environment in January 2018," Cao said.

More information: Fei-Yue Wang et al, Parallel driving in CPSS: a unified approach for transport automation and vehicle intelligence, *IEEE/CAA Journal of Automatica Sinica* (2017). DOI: 10.1109/JAS.2017.7510598

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