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Creating a New "Driving Ecology" for Enhanced Auto Safety

Project:	Human Centered Intelligent Driver Support Systems
PI:	Mohan Trivedi, Prof, Jacobs School; UCSD Leader, Cal-(IT)^2 Intelligent Transportation and Telematics layer
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Division:	UCSD
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A steering wheel that begins vibrating if you're drowsy or take your eyes too often off the road? That may sound far-fetched, but it is one of many innovations under investigation as part of a wide-ranging, $3-million project to improve auto safety by using state-of-the-art technologies to reduce driver distraction.

Every year, more than one million Americans are injured and more than 8,000 die on American roads – either directly or indirectly – due to crashes resulting from driver distraction. Trivedi and his colleagues in the newly created Laboratory for Intelligent and Safe Automobiles (LISA) have already instrumented an Infiniti Q45 sedan with an array of cameras and sensors, and actuators for the steering wheel and pedals to test sending vibrational signals to the driver. The prototype driver-support system under development provides information about events that show signs of potential interference with a driver's intentions through sensory channels capable of processing information even if the driver's visual and verbal attention is overloaded. Primary focus is initially directed to the tactile channels, but other modalities will be explored in the quest to create a new "driving ecology" that manages drivers' attention rather than controlling it.

"The driving wheel could begin vibrating to signal that the driver isn't paying attention, and the strength of the vibration would escalate to indicate the problem is getting worse. We will also explore other modalities for intelligent driver-vehicle interfaces. Our quest is to create what we call a new 'driving ecology' that manages a driver's attention rather than controls it."
– Mohan Trivedi, Director, UCSD Computer Vision and Robotics Research (CVRR) Lab

With the advent of in-car "telematic" devices, this project aims to design a system to support a driver in attention management, perception, decision-making and control – and to do so, without shifting too much of the burden of monitoring conditions to the car, thereby making the driver feel he or she can pay even less attention. According to Trivedi, the goal of the three-year project is to develop a "human-centered" system that allows the vehicle to act as an extension of the driver's cognition and that is aware of the driver's inherent attention limitations. The system would also evaluate the state of the environment and the driver in a manner consistent with the driver's perception of criticality and performance.

To carry out the research, Trivedi put together a multidisciplinary team of Cal-(IT)^2 academic participants, including Psychology's Harold Pashler and Cognitive Sciences' Jim Hollan, as well as the Jacobs School's Bhaskar Rao. Also contributing to the research: Erwin Boer, a technical consultant and liaison between the academic team and Nissan. The researchers are focusing on ways to assess when there's a problem and how best to make the driver aware of it. Initially, they will explore sensory channels capable of processing information even if the driver's visual and verbal attention is overloaded (such as touch).

Contact: Mohan Trivedi, (858) 822-0075, trivedi@ece.ucsd.edu