Asleep at the wheel

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Driver fatigue is a common cause of road accidents. A new system warns drowsy drivers before it's too late. At the Vehicle Interaction Lab, researchers are studying in a virtual environment how best to design the electronic monitoring system by focusing on the human element.

It's 4:00 a.m. and the over-tired driver has already been on the highway for hours. Every so often, his eyelids droop. But before he totally falls asleep, a warning tone catches his attention. Simultaneously the seat belt vibrates, a warning triangle begins to blink in the rear-view mirror and a computer voice announces: "Drowsiness warning! Please stop at the next possibility for your own safety and take a rest!" Suddenly the lights come on and the projector stops.

This scene is being played out in the Vehicle Interaction Lab where

researchers from the Fraunhofer Institute for Industrial Engineering IAO and the University of Stuttgart are testing a new hypo-vigilance warning system being developed as part of the EU project AWAKE. It aims to create a driver assistance system through collaboration with automobile manufacturers.

The system is built around various sensors that deliver data to a central processor regarding the condition of the driver, his or her driving behavior and the surrounding car environment. An alarm is activated when the system recognizes situations such as lane drifting, drooping eyelids or if the driver is failing to maintain a safe distance to the vehicle in front.

But how do drivers react to the warnings? Will they comprehend them at all? The researchers have examined these and other questions by monitoring volunteers in an immersive driving simulator. The driver is placed behind the wheel of a real automobile. From behind the vehicle, virtual road scenes are projected onto several screens, giving the test participant the feeling of driving in actual road conditions. Clear, sunny skies can quickly be replaced by thick fog or other adverse weather conditions. Electromechanical elements installed in the car's suspension help to simulate the effects of leaning into curves and driving over bumps in the road. Finally, vibrating seats and chassis create a life-like sensation of driving.

How best to design the new assistance systems to make them easy to use and operate for drivers? "These are key points that must be addressed at the earliest possible stage of development," emphasizes Dr. Manfred Dangelmaier, head of the IAO Virtual Environments Competence Center. "Right from the start, we develop the man-machine interfaces in parallel with the other system components. Neglecting this area can bring about costly design mistakes." Only by tailoring the new electronic systems to the needs of the user can help drivers avoid mishaps.