Driver drowsiness detected by Eyetracker

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The Integrated Eyetracker developed by the Fraunhofer IDMT permits contact-free and completely calibration-free 3-D measurement of a person's line of vision. (© Fraunhofer IDMT)

Car drivers must be able to react quickly to hazards on the road at all times. Dashboard-mounted cameras help keep drivers alert. At the VISION trade fair in Stuttgart, Germany, researchers are presenting this system from November 9-11, 2010.

Those who do a lot of driving know how tiring long car trips and night driving can be. And a simple fraction of a second can decide the difference between life and death. According to the German Road Safety Council e.V. (DVR), one in four highway traffic fatalities is the result of momentary driver drowsiness. Researchers at the Fraunhofer Institute for Digital Media Technology IDMT in Ilmenau, Germany, have developed an assistant system that tracks a driver's eye movements

and issues a warning before the driver has an opportunity to nod off to sleep.

The special feature of the Eyetracker is that it can be installed in any model of car. There is no need for a complicated calibration of the cameras. "With conventional systems, every person whose line of vision is to be monitored has to complete more or less time-consuming preparations. Because every head, every face, every pair of eyes is different," notes Prof. Husar of the IDMT.

There is also another benefit: The system does not require a PC or a laptop. "What we have developed is a small modular system with its own hardware and programs on board, so that the line of vision is computed directly within the camera itself. Since the Eyetracker is fitted with at least two cameras that record images stereoscopically – meaning in three dimensions – the system can easily identify the spatial position of the pupil and the line of vision," according to Husar. The information is fed out through a standard interface The information is stored in a standard interface (USB, CAN). This way, the Eyetracker can be connected directly to the car's trip computer.

If the camera modules detect that the eye is closed for longer than a user-defined interval, it sounds an alarm. When used as a driver-assistance system, there can be four or even six cameras keeping watch over the driver's eyes. The cameras evaluate up to 200 images per second to identify the line of vision, even when a driver's head moves to the left or right. Yet the Eyetracker is only roughly half the size of a matchbox and practically undetected when mounted behind the sun visor and in the dashboard. The tiny lenses are just three to four millimeters in diameter.

There are a host of applications for the Eyetracker. In medicine, the camera system can assist with eye operations by registering a patient's every eye movement. With this technology, players of computer games

can also look around themselves, without requiring a joystick to change their viewing direction. It is also a valuable tool for marketing and advertising researchers with an interest in determining which parts of a poster or advertising spot receive longer attention from their viewers.

More information: Researchers will be on hand at the VISION trade fair in Stuttgart to show how eyetracking works in the field. From November 9 through 11.

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