European researchers driving road safety

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Safety while driving is paramount, and Europeans are making efforts to ensure our well-being in vehicles - whether we are behind the steering wheel or in a passenger seat. The project partners have pushed the envelope by developing an inexpensive optical sensor system for the windshields of small and medium-sized cars.

This driver-assistance system will help reduce the number of accidents on the roads. ADOSE ('Reliable application specific detection of road users with vehicle on-board sensors') is funded under the 'Information and communication technologies' (ICT) Theme of the EU's Seventh Framework Programme (FP7) to the tune of EUR 6.1 million.

Having the capacity to differentiate between fog and darkness, this latest

system gives cars the 'intelligence' they need to respond to their surroundings. Led by the Centro Ricerche Fiat Societa Consortile per Azioni in Italy, the ADOSE consortium comprises research and industry experts from Austria, Belgium, Finland, Germany, Italy, Norway and Sweden.

The project partners point out that the number of traffic fatalities in Germany, for instance, has dropped in recent years. Based on data obtained in various studies, novel driver-assistance systems are increasingly reacting more quickly to critical situations than humans can. These systems not only have the capacity to identify risks, but they can also warn drivers of dangers and help them deal with critical situations. A case in point is radar sensors that scan surrounding traffic conditions, monitoring the car's blind spot or maintaining a safe distance from the car up ahead. Infrared detectors give night vision a boost, while fatigue sensors sound an alarm if a driver becomes drowsy. The downside of these systems is that they are available only for high-priced vehicles. This is where the ADOSE system comes in.

'Our multifunctional system consists of an entire camera, two sensors equipped with Fresnel lenses to detect light signals, and an infrared LED (light-emitting diode),' explains Dr Henning Schroeder, ADOSE partner and group manager of Fraunhofer Assembly and Packaging Technologies for Microsystems (IZM) in Germany. 'Because fog and darkness can exhibit optically identical spectra, it is difficult to distinguish between these two light phenomena. That's why the infrared LED emits light waves that are scattered back in fog, but not in conditions of darkness. It's particularly difficult to capture the light signal from a broad aperture angle, to bundle the signal and pass it along the circuit board to the four corners of the camera chip. Because the middle of the chip is reserved for recording the camera image.'

The researchers developed lightpipes in a hot stamping procedure to

make this possible, they say. The lightpipes are hollow, mirrored tubes capable of deflecting a light signal by as much as 90°. While optical fibres were used to transmit these signals up to this point, they are vulnerable to snapping at even low bending radii. They are also costly and must be mounted in place manually and with great care.

'With the lightpipes, we have succeeded in making the optical signal transmission more efficient, making the entire system smaller and reducing costs as a result,' the Fraunhofer IZM researcher says.

A number of optical channels are produced in a single pass during the hot stamping method. This process effectively makes the assembly much easier to perform. A prototype of the sensor module is now available, and Centro Ricerche Fiat is already performing initial tests in the field.

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