Dr. Karl-Heinz Glander
Regional Director of Advanced
Safety Europe at Aptiv in Wuppertal
(Germany)

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Enhanced Safety When Combining Interior and Exterior Sensors

Nowadays, Advanced Driver Assistance Systems (ADAS) make use of fusion of data inputs from two or more external sensors in order to get a better read on what obstacles of interest might be around the vehicle. Inputs from several sensors are combined, for example, to extend the respective fields of view or to combine different sensor technologies to make best use of their advantages and to mitigate their weaknesses.

Recently, we are observing the emergence of interior sensors, often in form of a camera inside the cabin, and they can make many safety-related determinations, such as whether drivers have their eyes on the road or whether passengers are wearing their seatbelts. Combining the information from the sensors about what is going on outside the vehicle with the information about the driver's state inside the vehicle becomes more and more important. Using interior and exterior sensor fusion, we can proactively warn about a dangerous situation well before an intervention is required, which is helpful in situations when drivers are drowsy, distracted or concentrating on other aspects of current traffic situation.

Let's take as an example a scenario where a driver stops at an intersection waiting to make a right-hand turn. He looks short to his right and from then on to the left, watching for a gap in the traffic so to quickly make the right turn. Meanwhile, a pedestrian starts to cross in front from the right. The interior sensor sees where the driver is looking, but one of the exterior radars "sees" the pedestrian. The system knows the driver has not looked over to see the pedestrian, so it warns him that the person is there — before an accident even happens.

Predictive support is gaining importance: With interior sensing, the vehicle can see that the driver's eyes are looking down at the radio or navigation system instead of out at the road. At the same time, the exterior sensors see traffic situations changing. When, for example, a vehicle is cutting into the driver's lane with risk of collisions, we can immediately trigger a warning that something is going on outside the vehicle that requires attention. We direct him with visual and audio cues to where it is taking place, before a classic ADAS would even start to intervene: This prevents from an emergency braking because of late intervention.