keep in their lane, already exist. Publicity campaigns like those in Australia and the USA also work by reminding drivers and their passengers to think about breaks. Legislation and enforcement measurements for truckers and bus drivers, for example, already prevent long and risky stints at the wheel through the log-book system.

Technology — in the form of in-vehicle systems that can eventually warn drivers when they are becoming fatigued — is a natural next step in the battle against drowsy driving. HARKEN has focused on the sensing material systems and how they can work in typical seatbelt and seat designs. Automakers are now in a position to integrate this groundbreaking R&D in downstream applications. For example, the sensors could trigger an alarm, a dashboard or 'heads-up' warning message, or even send a small pulse through the seat to jolt or remind the driver to take a break.

Since the project ended in May 2014, former partners have continued developing HARKEN's results with the aim of getting closer to market: 'We are nearly ready to hit the road. We've had tremendous interest from manufacturers in Scandinavia already. As soon as we have submitted our European patent application we will be able to show everything off,' Gameiro explains.

Several of the project's SMEs have already incorporated HARKEN's research into product upgrades of their own. Gameiro is confident about the future for the technology: 'There is the possibility of selling over 100 000 units of the product in the first five years. This could be worth around EUR 14 million for the project SMEs and help to prevent thousands of fatalities and injuries every year. We certainly won't be falling asleep at the wheel as we steer this work towards commercial success.'

HARKEN

★ Coordinated by Borgstena Group in Portugal.
★ Funded under FP7-SME.
★ http://ec.europa.eu/research/infocentre/article_en.cfm?artid=33938
★ Project website: http://harken.ibv.org/
★ http://bit.ly/1HPvSvE

INTERVIEW

FIRST-HAND INSIGHT INTO DRIVERS' NATURAL BEHAVIOUR

Naturalistic Driving is a relatively new approach to driver behaviour monitoring, where information from a volunteer's everyday trips is recorded and gathered in an unobtrusive manner, devoid of experimental control. The UDRIVE project is gathering such data with a view to helping make European roads safer and more sustainable.

Whilst the number of road fatalities in Europe has already decreased by 22 % since 2010, the disappointing performance recorded in 2014 is a clear sign that innovative solutions to increase safety on our roads are desperately needed. So far, measures have been taken based on the likes of simulations, surveys, analyses of relevant statistics, prevention campaigns, speed cameras or reinforced police controls. But do we really know what's actually happening behind the wheel, and how to best prevent it?

For the UDRIVE (eUropean naturalistic Driving and Riding for Infrastructure & Vehicle safety and Environment) team, the answer is no. Current insights into driver behaviour are often altered by the nature of collected data, which fails to reflect the natural driving behaviour of European citizens.

Since 2012, the 19-strong consortium — which includes universities, transport research institutes, the FIA and car manufacturer Volvo — has been handling the first large-scale Naturalistic Driving experiment ever conducted in Europe. Volunteer car, truck and motorcycle drivers from seven countries have agreed to have their cars equipped with cameras and data transmitters. These devices will ultimately allow researchers to quantify the risk of safety-critical behaviours, monitor user behaviour in relation to emissions levels, fuel consumption and environmental factors, and identify new measures to make the European traffic system safer and more sustainable.

Dr Nicole van Nes, project leader safe automation of roads and vehicles at SWOV and coordinator of UDRIVE, details the project objectives, benefits and achievements so far.

★ **The project aims to contribute to reducing the number of road accidents in Europe. How?**

Dr Nicole van Nes: The UDRIVE project aims to gain insight into daily driving behaviours on European roads, in a real-life context. CAN data, kinematic data, images from five to eight camera views and information from a smart camera are continuously collected from cars, trucks and scooters, which provides us with a good overview of what is happening inside and outside these vehicles. Taking statistics into account, it is likely that a number of crashes and near-crash situations will be recorded, and this data provides us with concrete information about the causes of accidents.


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DR NICOLE VAN NES

★ What kind of data do you focus on and how do you use it?

With our recordings, we can identify risk factors and analyse the consequences of behaviours such as texting. Other key focuses include distraction and inattention, interaction with pedestrians and cyclists, and scooter driver behaviour.

This data is really as close as we can get to a look over the driver's shoulder in real traffic conditions. We can monitor the use of in-vehicle systems or mobile phones in terms of frequency, duration and traffic situation. The impact of such distractions can also be revealed by looking at related changes in terms of speed, lane position and eye position, which are key to safe driving. And as the camera data also provides a good overview of what is happening around the vehicle, it allows us to study how drivers interact with pedestrians and cyclists: When are they recognised and how does the driver respond in terms of speed?

Finally, besides road safety, the data is also used to study eco-driving and could potentially be exploited in other areas such as traffic management and infrastructure-related questions.

★ What were the main criteria for selecting your operation sites?

The seven sites were selected so as to have a good representation of Europe: North, South, East and West. Additionally, the selected countries vary in their level of road safety: countries with relatively high, medium and low road safety records.

★ Was it easy to find volunteers?

Yes and no. There are many volunteers interested in participating in the study, so in that sense it is not difficult to find volunteers. However, the study design puts very specific requirements on the participants, such as the brand and model of their car. Only a limited number of people meet the selection criteria, which makes it harder to find relevant volunteers.

★ What would you say are the main advantages of NDS?

Traditionally, traffic safety research has been using driving simulators, instrumented vehicles, self-reports, analyses of crash statistics and, increasingly, in-depth crash investigation. These methods have greatly contributed to the understanding of road user behaviour.

However, each method has its limitations. Results from driving simulator studies may not always be easily transferred to real traffic situations, especially in simpler and static simulators. In instrumented vehicle studies, on the other hand, subjects drive in real traffic environments but in a special, highly equipped vehicle, usually with an experimenter on-board. This makes subjects aware of the fact that they are participating in an experiment which, as a result, may affect their driving behaviour. In both cases, it will be difficult to observe real crashes or near crashes. The results of self-reports may be biased by socially-desirable responses as well as by perceptual and memory limitations. Crash data is objective but generally insufficient when it comes to giving proper explanations. Finally, in-depth crash analyses provide valuable additional information about how and why a crash occurred, but it is only based on information collected after the crash, with post-hoc self and witness reports.

With Naturalistic Driving observations, drivers are observed in real traffic conditions, continuously, and they are not asked to do anything specific. It is about understanding normal traffic behaviour in normal everyday traffic situations. There is no observer or experimental intervention, but we can still observe conflicts, near crashes or possibly even actual crashes without potential biases of post-hoc reports. It is much more accurate.

★ The participants still know they are being monitored. Don't you fear this will change their behaviour on the road?

From our previous experience with this method on a smaller scale in Europe and on a larger scale in the US, we know that people forget that they are being observed after about a week. This is visible from their behaviour: they do things someone who knows he or she is being observed would normally not do, like nose picking for example. Also, we asked our participants in a previous study about this, and they indicated that they forgot about the equipment really quickly and started behaving normally.

★ What have you learned from your research so far?

We are just starting the data collection, so it is still too soon to tell.

★ What are the next steps in the project, and after its end?

Before summer, all vehicles should be on the road collecting data. The next step will be to prepare for the analyses. Tools are being developed to access the data, to make relevant selections and to annotate the video data. Different partners will perform analyses on key topics: crash causation factors and associated risks, distraction and inattention, vulnerable road users, and eco-driving. Additionally, we will endeavour to apply our findings in four specific areas, notably the identification of new and promising countermeasures, the potential of simple DAS for monitoring performance indicators over time, the improvement of driver behaviour models for road transport simulation, and the possibilities of commercial applications of ND data.

The project doesn't allow much time and budget for data analyses, but it will still hold much potential after the project ends. One of our objectives is to make this data available for further analyses, subject to legal and ethical constraints.

UDRIVE

★ Coordinated by SWOV in the Netherlands.
★ Funded under FP7-TRANSPORT.
★ http://cordis.europa.eu/project/rcn/105406_en.html
★ Project website: http://www.udrive.eu/

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