

Press Release

Findings from the DEKRA Road Safety Report 2023

Many causes for disengagement from highly automated driving

- ▶ California: Many feel uncomfortable with automated maneuvers
- ▶ Disengagements more often triggered by humans
- ▶ Research gaps on takeover scenarios without prior warning

Today, highly automated driving functions are technically capable of controlling a vehicle independently. Under clearly defined and comparatively narrowly limited conditions, the driver can devote their attention to other activities. However, they must be “on standby” in order to be able to intervene manually in critical situations if necessary and thus disengage from the automation. The reasons for this are manifold and are being systematically monitored and analyzed in the U.S. state of California, for example. “The figures provide important indications of safety-threatening problem areas surrounding highly automated driving”, says DEKRA traffic psychologist Dr. Thomas Wagner, referring to the DEKRA Road Safety Report 2023 “Technology and People”, which – among other topics – deals in detail with the topic of disengagements.

The technological evolution from manual to automated driving is inevitably progressing. As the level of automation increases, so does the proportion of driving tasks that are taken over by the technical system. At the first three levels of the SAE level definition (Level 0 to Level 2), the assistance systems support or supplement the driver; at the higher levels (Level 3 and above), vehicle control is partially or completely and permanently delegated to the vehicle system. However, this then creates new, previously unknown risk potentials.

“Traffic situations that push the system to its limits and prompt the driver to take over manual control represent a particularly neuralgic point in vehicle control at Level 3 and 4”, says DEKRA expert Wagner. The frequency of such disengagement, i.e., disconnection from automation, is already being recorded in California. The Department of Motor Vehicles there has required all vehicle manufacturers to submit annual reports in which they must, among other things, provide information on disengagements that have occurred in highly automated (test) vehicles.

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Analysis of these reports for the years 2014 to 2019 shows that with increasing time or experience in terms of automated miles traveled, system-initiated disengagements on California's roadway network decreased. The researchers attribute this to improved system adaptation, even in complex traffic situations.

At the same time, however, a slight increase was observed in manual disengagements. "This suggests a stagnation or decline in confidence in the technology, but could also be due to the fact that drivers developed a better understanding of the system's limitations as they gained experience using it", explains Thomas Wagner.

No greater risk of accidents due to disengagement

Looking at the triggers and causes for disengagement, it is striking that more than 80 percent were initiated by drivers who either felt uncomfortable with the maneuvers of the automated vehicles or performed manual disengagements as a precaution due to insufficient confidence. Most disengagements could be attributed to system-related causes: About 75 percent were due to errors in perception, localization and control of the automated driving system. "Basically, the disengagements were more often triggered by the drivers than by the vehicle system", the DEKRA traffic psychologist continues.

In his view, the solution approaches of artificial intelligence to typical human idiosyncrasies in road traffic, such as acting intuitively, accommodating in partnership, dealing with conflict situations or gesture-based communication between road users, are still in their infancy. "This apparently disrupts the harmony of traffic flow and provokes human intervention in automated vehicle control."

In a separate paper, researchers at the University of Virginia in Charlottesville/USA evaluated the California report data sets along with available accident statistics and examined the relationship between disengagements and accidents. A total of 770 disengagements and 124 accidents were included in the analysis. The results showed that such maneuvers do not in themselves generally lead to an accident. However, according to the study, those aspects related to driver decision-making in particular increase the likelihood of a disengagement with an accident.

Insufficient situational awareness and still many research gaps

The problem of manual takeover from highly automated driving without prior warning apparently accounts for the vast majority of such situations in real-world road traffic. However, this is not reflected in current research – studies on situations with prior takeover warning dominate. The range of the required takeover time varies between

2.8 and about 40 seconds, depending on the task for the test subjects, the type of takeover warning, and the definition of what is understood by a safe takeover of control. An essential prerequisite for this is, for example, that the driver is able to “read” the traffic situation correctly – i.e., recognizes what is happening, or whether a danger is imminent and what should then be done.

With regard to situational awareness, various studies show a significant delay overall – especially when it comes to understanding the behavior of other road users. “The findings available to date are by no means sufficient for a comprehensive assessment of all adoption variants”, the DEKRA expert sums up. Especially against the background of current legislation in Germany, for example, which requires a takeover under circumstances that endanger traffic or in the event of faulty system conditions, more studies on takeovers without prior warning are urgently needed, he says. The number of real drives under experimental conditions also needs to be significantly increased, he added.

Further background information on this topic and on the area of conflict between technology and people can be found in the DEKRA Road Safety Report 2023, which is available at www.dekra-roadsafety.com.

Picture Caption

In the US state of California, systematic monitoring and analysis is carried out to determine how often and for what reasons automated vehicles switch to manual mode. The current DEKRA Road Safety Report 2023 also deals with the topic of these so-called “disengagements”.

Photo: guteksk7 – stock.adobe.com

About DEKRA

DEKRA was originally founded in 1925 to ensure road safety through vehicle inspection. With a much wider scope today, DEKRA is the world's largest independent non-listed expert organization in the testing, inspection, and certification sector. As a global provider of comprehensive services and solutions, we help our customers improve their safety, security, and sustainability outcomes. In 2022, DEKRA generated sales totaling nearly EUR 3.8 billion. The company currently employs almost 49,000 people who offer qualified and independent expert services in approximately 60 countries on five continents. With a platinum rating from EcoVadis, DEKRA is now in the top one percent of sustainable businesses ranked.