

Highly automated driving

Resolution of the DVR Board of 30th October 2015 prepared on the basis of a recommendation by the DVR Executive Committee for Vehicle Safety with the contribution of the Legal Advisory Group and the Executive Committee on Adult Road Users

Explanation

Foreword

"DVR welcomes the development towards automated driving, since hopefully it will become an improvement for road safety in the long term". (DVR Board Resolution from 23rd May 2014)

Starting point

Automated driving functions are gradually becoming reality in road traffic. Many current driving assistance systems have already proven to increase road safety. DVR therefore supports the further development and deployment of ADAS advanced driver assistance systems. In parallel, developing the level of automation of driving functions can have new possibilities for improving road safety with a view to Vision Zero.

Under this premise, DVR supports and accompanies the development of those automated driving functions which hold the potential for safety benefits.

This paper deals with the requirements for highly automated driving functions, which are currently focused on highway driving.

Guidance concerning highly automated driving is formulated by DVR at a time when on the one hand a number of technical concepts for automated driving have already been realised, but on the other hand practical experiences are lacking and further research is needed.

DVR will therefore monitor developments and will reflect new findings in respect to the various aspects of automated driving. The following recommendations or requirements are therefore subject to reconsideration and revision.

Subsequently, an overview of the levels of automation is given :

Definition of the levels of automation

(Source: BASt 2015)

Assisted Driving as a preliminary stage of the automated driving:

The driver performs either the transversal or the longitudinal guiding. The respective other task is performed within certain limits by the system. The driver must permanently monitor the system and must be ready at any time to regain proper control of the vehicle.

Automated driving:

- **Partly automated driving functions:** The system performs both the transverse and the longitudinal guidance of the vehicle for a certain period or in specific situations. The driver must permanently monitor the system and be always ready to control the vehicle. (...)
- **Highly automated driving functions:** The system performs the transverse and longitudinal guiding for a certain period or in specific situations. The driver is expected to be available for occasional control, but with sufficiently comfortable transition time. The system provides warnings to the driver.
- **Fully automated driving functions:** The system performs the transversal and longitudinal guidance under certain conditions. The driver is not expected to monitor the system. The system has always to ensure a minimum safe level of performance.
- **Autonomous ("driverless") driving as highest level of automation:** The system controls the vehicle for the entire trip; all persons inside the vehicle are considered as passengers.

Resolution

The Board of Directors of DVR holds the following view:

1. DVR stipulates that vehicles with highly automated driving functions should constantly reach a higher safety level for all road users than is typical with current vehicles.
2. For a continuous assessment of the safety of automated driving functions it is therefore necessary to have suitable procedures for prognosis, evaluation, homologation and testing, which are preceded by a risk assessment based on real traffic flows and crash occurrence.
3. As a consequence of highly automated driving, legislation has to be reviewed in a timely manner, in particular aspects related to responsibility and liability during the highly automated driving mode need clarification. It should be borne in mind that the driver should not be made liable for failures / faulty actions of highly automated driving systems.
4. During the automated driving mode information must be communicated to the driver in such a way that the driver can adequately transition between automated and manual vehicle operation. The vehicle must be able to

recognize any activity of the which is opposed to the ability to regain vehicle control . The vehicle must respond appropriately, e.g. by asking the driver to retake control. Essential criteria especially for driver vigilance should be defined in general. To this end, further research is needed.

5. The transition scenario has to be defined in such a way that it takes into account the entire driver population and typical traffic situations. Interaction schemes should be standardized. Further research is needed concerning the impact on the driver as well as driver needs (e.g. comfortable transition times). If the driver does not regain control despite intensive warnings given by the vehicle system, then the system has to ensure a minimum safe level of performance within the framework of §1 of the road traffic regulation.
6. There is a need for documentation of information which still has to be defined (as well as the clarification of access rights) for the highly automated driving mode, e.g. in case of accidents.
7. The activation of the highly automated driving functions by the driver is optional. The driver can always override the highly automated system.
8. A highly automated vehicle must be able to drive in the real world using the existing infrastructure.
9. The quality of the traffic signs and traffic furniture should correspond to the principles of visibility¹. If the quality of the visibility is not sufficient, the driver must be asked by the system to retake control.
10. It must be ensured that highly automated driving vehicles comply with the respective national traffic rules. Highly automated driving must be generally compliant and take the principles of thoughtfulness and foresighted driving into account.
11. Awareness campaigns for the driver and other road users provided by manufacturers or other stakeholders should provide an understanding of the basic operation and the limits of the systems. The sole reference to a manual is insufficient. Misleading advertising should be avoided.
12. With new automated driving concepts emerging, issues such as driving instructor training and driver training needs as well as driving tests and licensing should be regularly reviewed and adapted.
13. Cyber security and data privacy must be guaranteed. Precautions have to be taken against data abuse and data manipulation.
14. It must be ensured that the highly automated systems are regularly tested to evaluate system performance. This must also be done within the framework of the periodic roadworthiness testing. The driver must immediately be informed by the system that the system is operating in a degrade state.
15. A mandatory equipment of all new motor vehicles with a highly automated system is currently not foreseen.

¹ look at: Technical quality of vertical traffic signs; Resolution of DVR's Board from 23rd May 2014 on the basis of a recommendation of the Infrastructure Commission of DVR from 24rd March 2014

Social debate

As automated technologies progress from function-specific automation to self-driving vehicles, it is expected that vehicles will be able to distinguish and identify persons and objects. In this context, a social debate entailing legal regulations is needed to define how the basic principles of driving functions should be designed.

Furthermore, long term social consequences of automated driving such as the change of driving skills or mobility behavior in general have to be taken into account.

For the Board of Director

Dr. Walter Eichendorf
President