DLR makes highly automated driving a real prospect for the future

21 June 2011

Road traffic accidents are often the result of errors made by inattentive, overstressed or tired drivers. The objective of the EU project HAVEit (Highly Automated Vehicles for Intelligent Transport), in which the German Aerospace Center (Deutsches Zentrum fuer Luft- und Raumfahrt; DLR) played an active role, was to minimise the number of this kind of accidents. The results were presented at the final meeting in Boras, Sweden, on 21 and 22 June 2011.

A total of seven vehicles – four cars, two trucks and one bus – demonstrated their capabilities on a test track in Sweden. FASCar II travelled there from the Braunschweig-based DLR Institute of Transportation Systems (Institut fuer Verkehrssystemtechnik) to act as one of the test vehicles. Using FASCar II and the DLR driving simulator, researchers were able to demonstrate how assistance and automation are best able to support drivers.

Hands off the steering wheel

The driver can choose between three types of assistance; at the touch of a button, they decide if their vehicle’s driving mode is going to be 'assisted', 'semi-automated' or 'highly-automated'.

Drivers who select the 'assisted' option receive only guidance. For example, the driver has to do the actual steering, but if the vehicle is at risk of coming off the road or leaving a traffic lane, the steering wheel will warn the driver with a slight movement. In the 'semi-automated' mode, the car actually relieves the driver of certain tasks. This can include the car automatically driving at the desired speed with the help of the intelligent Adaptive Cruise Control (ACC) and maintaining an adequate distance from slower moving vehicles on the road ahead. In this mode, the driver is able to resume control of all driving tasks at any time. 'Hands off the steering wheel' is an option in the 'highly automated' mode; the vehicle handles speed control, distance adjustment and staying in lane automatically. The system delivers greater safety, while also making driving much more pleasant.

Of course, the driver must remain attentive and focussed even while the vehicle is driving 'on its own', so a camera monitors the driver's level of attentiveness. If at any point the driver is not paying attention, the system can issue a warning in good time or, in emergency situations, can intervene automatically. However, responsibility ultimately remains with the driver, who can decide to override the system at any time and in any situation.

How is this possible?

Special equipment is required to enable a vehicle to accomplish all these tasks. FASCar II, one of DLR's research vehicles, has environment sensors and a precise navigation system on board. These enable it to identify obstacles and objects, and to precisely detect traffic lanes. In addition, FASCar II is equipped with what is known as steer-by-wire. Instead of a mechanical connection between the steering wheel and the road wheels, all steering inputs are transmitted electronically, or 'by wire'. "Unlike the steering wheel in today’s cars, which always moves in synchrony with the swivelling of the road wheels, in FASCar II it can remain stationary during automated driving, or during normal driving it can assist the driver by providing information," explains Karsten Lemmer, Director of the DLR Institute of Transportation Systems. "In this way, the vehicle can give the driver useful feedback while the steering of the road wheels is being controlled completely independently," continued Lemmer.

The automated driving research demonstrated in Borås is in some aspects unique – for example, with respect to the interaction between the driver and the automated systems – and will undergo continuous further development. At the moment, HAVEit is designed and configured for use on motorways, but in the near future it will be extended to deal with more complex environments such as urban traffic. DLR is currently building the Applications platform for Intelligent Mobility (Anwendungsplattform Intelligente Mobilitaet; AIM), for which the city of Braunschweig will become a flexible test site for traffic research. For example, there will be traffic lights – which are a challenge for FASCar II – that communicate with passing vehicles.

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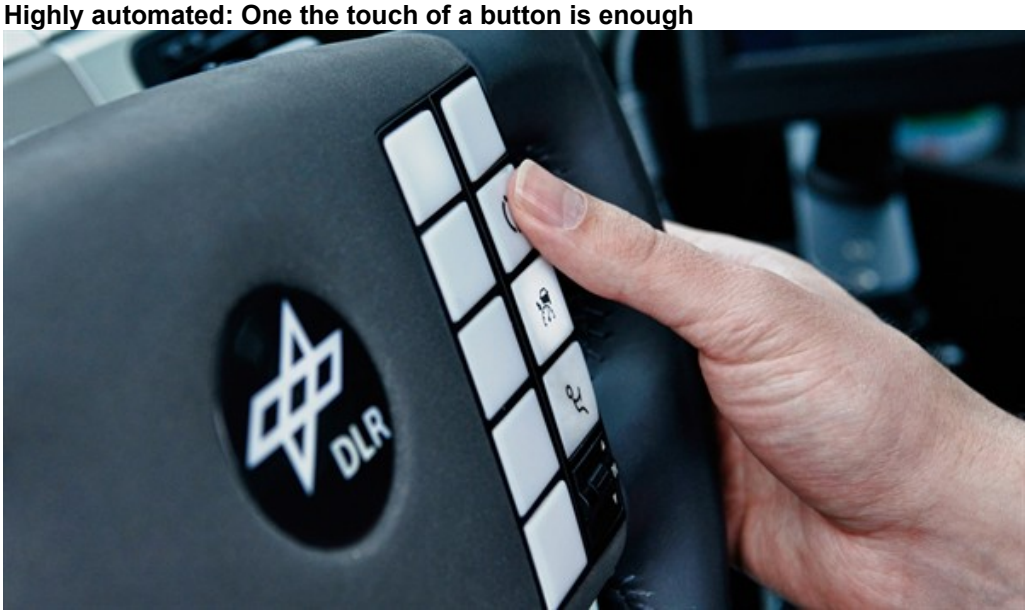
Highly automated: One the touch of a button is enough



With the touch of a button, the driver can select the level of automation. Road traffic accidents are often the result of errors made by inattentive, overstressed or tired drivers. The objective of the EU project HAVEit (Highly Automated Vehicles for Intelligent Transport), in which the German Aerospace Center (Deutsches Zentrum fuer Luft- und Raumfahrt; DLR) played an active role, was to minimise the number of this kind of accidents.

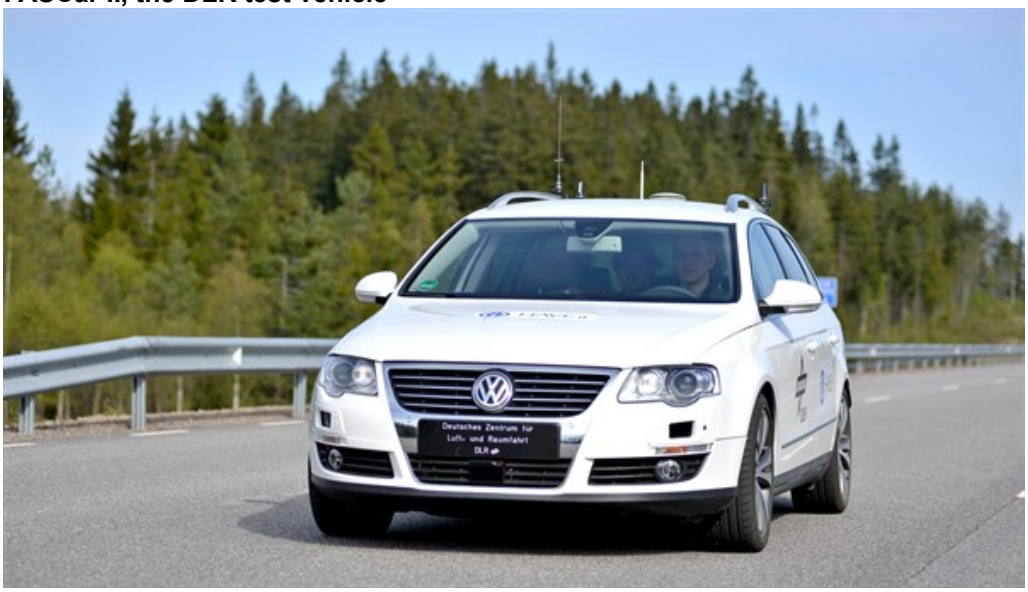
Credit: HAVEit.

Demonstration of the HAVEit vehicles

With seven test vehicles, the EU project demonstrated HAVEit solutions for highly automated driving.

Credit: HAVEit.

FASCar II, the DLR test vehicle



Equipped with sensors and an electronic steering system, steer-by-wire, the FASCar II is used to test innovative driver assistance and automation systems.

Credit: HAVEit.

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