VIAVISION

VOLKSWAGEN GROUP • SHAPING THE FUTURE OF MOBILITY

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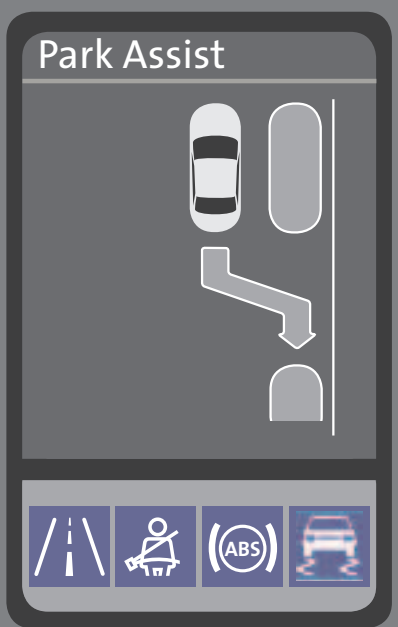
Intelligent Driving

The Car with an Independent Mind

99 out of 100 new cars
in Germany are equipped with the anti-lock braking system (ABS).

¼ of a second
is how long an on-board computer needs to react to an emergency situation.



Editorial

Dr. Ulrich Hackenberg, Member of the Board of Management of Volkswagen Brand with responsibility for Research and Development.

Today assistance systems are almost as natural a part of a new car as the engine. This issue of *VIAVISION* provides an overview of the assistants and shows the vision of the future that is being widely discussed in the automobile industry.

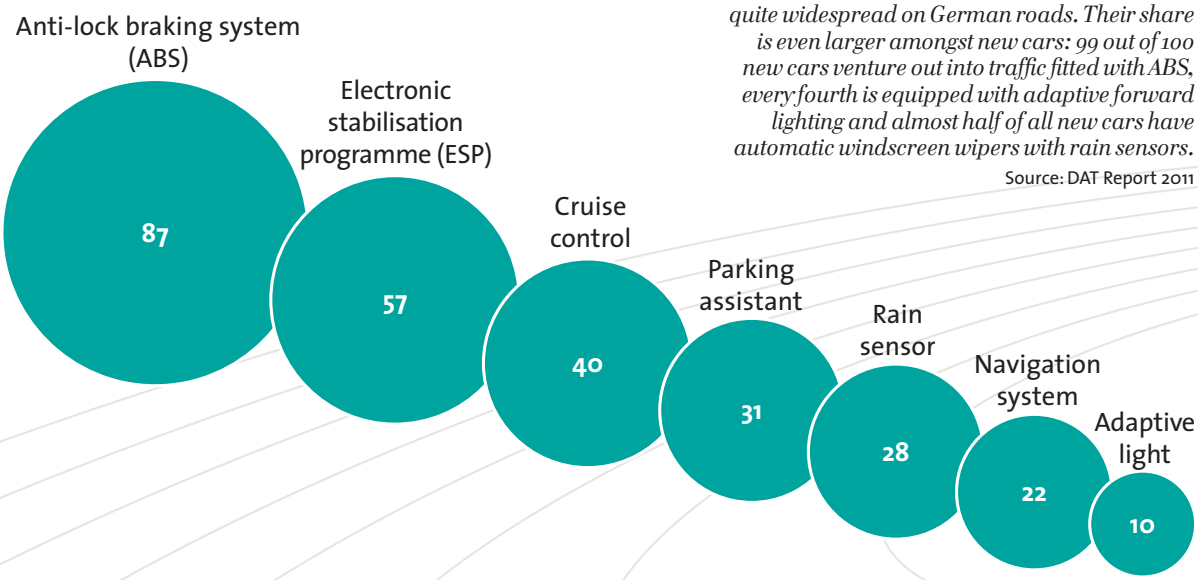
Happy reading.

Clever Companions

Safety and Comfort on the Road

ABS, ESP, ASR – when it comes to automotive assistance systems some people may wish for a dictionary. The German Association of the Automotive Industry currently counts 27 categories of vehicle assistants on the German market. They serve safety and comfort. Thanks to the interaction of the systems, the car is becoming increasingly more intelligent and supports the driver in more and more tasks. The vision is of an automatic car, in which the driver can lean back and let the system take the wheel. However, at any time the driver has the option of manually overriding the assistant and therefore bears full responsibility.

Common assistance systems in German cars 2010:
(in percent)



Assistance systems such as the anti-lock braking system (ABS), the electronic stabilisation programme (ESP) or cruise control are already quite widespread on German roads. Their share is even larger amongst new cars: 99 out of 100 new cars venture out into traffic fitted with ABS, every fourth is equipped with adaptive forward lighting and almost half of all new cars have automatic windscreen wipers with rain sensors.

Source: DAT Report 2011

Safety assistants:

Assistance systems that primarily improve safety are activated immediately upon start up. They support the driver with the goal of reducing the impact of an accident and, ideally, avoiding accidents altogether.

Brake assist

The brake assist increases the breaking power to a maximum in dangerous situations. ABS prevents the wheels locking up. The additional emergency brake assist can activate full braking at speeds up to 30 kilometres per hour.

Source: German Association of the Automotive Industry, Annual Report 2011; Continental (as of 2012)

Anti-slip regulation (ASR)

Sensors monitor wheel speed, compare it to the performance data and, if necessary, apply the brake. This prevents the powered wheels from spinning and therefore increases directional stability.

Source: Bosch (as of 2012)

Pre-crash-system

Cameras or radar recognise imminent accident situations in order to prepare both car and passengers – for example, by adjusting the seating positions or tightening the seat belts.

Source: Hella Aglaia Mobile Vision (as of 2012)

Anti-lock braking system (ABS)

The anti-lock braking system reduces brake pressure in rapidly succeeding intervals during hard braking, preventing the wheels from locking up. This way it remains possible to steer the car.

Source: German Association of the Automotive Industry, Annual Report 2011

Electronic stabilisation programme (ESP)

The system recognises when the front or rear wheels of the vehicle do not have ideal surface contact. It prevents the car from losing traction by applying the brake specifically to individual wheels.

Source: FOCUS Online (as of 2012)

Adaptive cruise control

Distance control, called adaptive cruise control (ACC), maintains a distance, set by the driver, to the car driving in front. The distance control **ACC plus** features an additional emergency braking system, in order to avoid collisions.

Source: German Association of the Automotive Industry, Annual Report 2011

Active steering system

The angle of the wheels can be made greater or smaller in relation to the angle of the steering wheel, depending on driving speed. This increases directional control at high speeds and eases parking at low speeds.

Source: ZF Lenksysteme (as of 2012)

Future safety

The AKTIV research project has seen companies from the car and electronics industry test new possibilities for traffic management, safety systems and communication between cars, in 15 subprojects. One example is the Volkswagen Roadworks Pilot, a combination of distance control and traffic management: the vehicle receives information on the route and can calculate the optimal driving strategy, by communicating with the infrastructure. This way traffic congestion can be reduced.
A similar goal is pursued by intelligent lateral control. This assistance system not only orientates using the road markings but also factors in the surroundings and other road users. So it helps the driver to stay in lane and, at the same time, determines the optimal position on the road.

Source: Volkswagen

Assistants in the Passat Alltrack

Various safety assistants are on-board, in the Passat Alltrack, the cross-country version of the Passat: driver fatigue detection, ACC Front Assist with city emergency brake function, traffic sign recognition, light assist, Park Assist for parallel and perpendicular parking, and a combination of lane change assistance and lane departure warning systems, the Lane Assist Plus. Source: Volkswagen

Pedestrian detection with emergency brake
A camera and radar monitor the lane and compare the information received to pre-installed situational pictures. If a pedestrian is detected, the car either brakes or reduces speed.
Source: TRW Automotive (as of 2012)

Lane change assistance
The system, also called blind spot monitor, is activated by the indicators. When overtaking it warns of vehicles located at the rear – for example with light signals on the exterior mirror.
Source: German Association of the Automotive Industry, Annual Report 2011

Volkswagen Lane Assist

The NCAP Advanced Reward was awarded to Volkswagen's Lane Assist in 2010. The reward is given for assistance systems which help lower the risk of accidents. Source: Volkswagen

Lane departure warning system
The system warns the driver via vibration or tone signals if he unintentionally departs from his lane. In addition, the **lane keeping assistant** brakes if required and steers back automatically.
Source: German Association of the Automotive Industry, Annual Report 2011

Comfort assistants:

Assistance systems for comfort support the driver during complex driving tasks. Most of these systems have to be activated by the driver while driving.

Intelligent driver information system
The system analyses performance data and shows incoming text messages and calls only when the driving situation allows for it.
Source: German Association of the Automotive Industry, Annual Report 2011

Night view assist
Infrared cameras make people, animals or obstacles visible on a display in the vehicle, before they are recognisable with the headlights.
Source: Fraunhofer Institute for Microelectronics Circuits and Systems IMS (as of 2010)

Automatic windscreen wipers
Sensors in the windscreen automatically switch on the windscreen wipers in the event of rain and adjust their frequency according to the intensity of the rain.
Source: German Association of the Automotive Industry, Annual Report 2011

Fatigue detection
Steering errors or the sudden correcting movements made by tired drivers are recognised by the system. The driver is warned visually and audibly, and asked to take a break.
Source: German Association of the Automotive Industry, Annual Report 2011

Voice recognition
Infotainment systems in cars can be operated via voice commands with this assistance system, in order to not distract the driver any more than necessary.
Source: German Association of the Automotive Industry, Annual Report 2011

Tyre pressure monitoring indicator
Sensors in the wheel or rim measure tyre pressure: the driver is warned visually if it is no longer sufficient.
Source: German Association of the Automotive Industry, Annual Report 2011

Cruise control
The cruise control allows for constant driving at a given speed by regulating the amount of fuel injected into the motor. Additionally, intelligent cruise control controls the distance to the car in front using a radar sensor.
Source: Continental (as of 2012)

Navigation system
Using stored maps and GPS navigation the system calculates the fastest route to the destination point.
Source: TomTom (as of 2012)

Traffic sign recognition
A camera recognises traffic signs as well as electronically variable signs. They are either displayed on a screen or projected onto the windscreen.
Source: ADAC (as of 2011)

Adaptive high beam assist
This serves for maximum visibility during darkness.
It is controlled principally by a camera which detects oncoming traffic, vehicles driving ahead and roadside street lighting, and adjusts the headlight range accordingly.
Source: Hella (as of 2011)

Parking assistant
This passive assistant warns using optical or audible signals during parking, while active assistance systems take over the steering. In this case, the driver only has to operate the clutch and accelerator pedal.
Source: German Association of the Automotive Industry, Annual Report 2011

Congestion assist
This radar-based assistance system supports the driver in traffic jams and roadworks by automatically accelerating and braking. It adjusts the speed to accommodate to the speed of the car in front and, for example, reacts to yellow road markings.
Source: German Association of the Automotive Industry, Annual Report 2011; Continental (as of 2011)

Keyless locking and starting system
The car is opened without the active use of the key. The engine too starts at the push of a button, without the key leaving the pocket.
Source: German Association of the Automotive Industry, Annual Report 2011

Adaptive forward lighting
There are either additional lights installed which switch on during cornering or the low beam is adjusted towards the corresponding direction when cornering.
Source: German Association of the Automotive Industry, Annual Report 2011

Hill start assist
This automated assistant stops the car from rolling backwards when starting on steep, uphill inclinations, without the driver having to manually operate either the hand brake or brake pedal.
Source: German Association of the Automotive Industry, Annual Report 2011

Connected

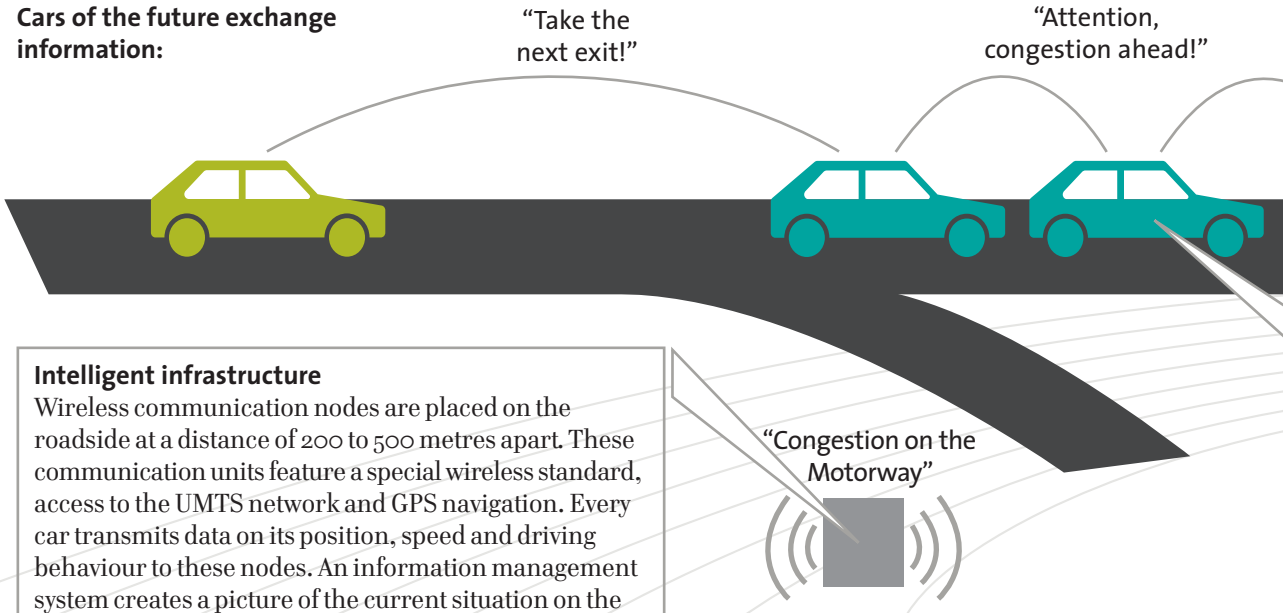
When Cars Learn to Communicate

Electronics grant cars the ability to communicate. Via the internet and cellular network, cars can communicate with each other (Car-to-Car) or communicate with infrastructure such as traffic management centres, traffic lights or roadworks (Car-to-X). In this way the driver is kept informed about congestion, accidents and diversions. Researchers hope that traffic flow and road safety will improve in the long term because of car drivers' improved anticipation. Access to the network in a car can also save lives; thanks to the eCall system that is mandatory in every new car from 2015. In the event of an accident, it automatically dials the emergency number and transmits the position of the vehicle.

40 to 50 percent less time passes until the arrival of an ambulance, if it is called using eCall.

Source: European Commission (as of 2011)

Cars of the future exchange information:

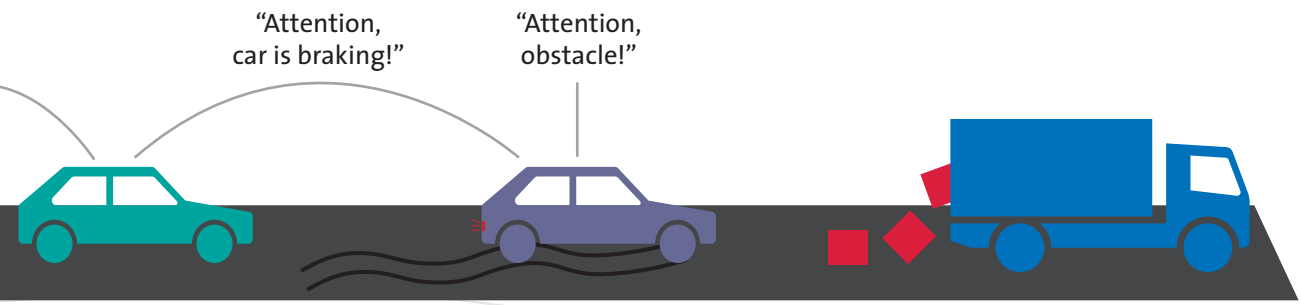


Intelligent infrastructure
Wireless communication nodes are placed on the roadside at a distance of 200 to 500 metres apart. These communication units feature a special wireless standard, access to the UMTS network and GPS navigation. Every car transmits data on its position, speed and driving behaviour to these nodes. An information management system creates a picture of the current situation on the roads, on the basis of which traffic can be directed.

Seeing around the corner

Volkswagen, together with other manufacturers, is working on an assistance system, within the framework of the Intersafe-2 research project, which can look around the corner at intersections. The car communicates with the infrastructure at the crossing, which are accordingly equipped with laser scanners, infrared sensors and WLAN. It warns the driver of pedestrians and cars that are out of the field of vision with audible and visual signals, and a jerk on the brake. For example, an ambulance about to pass the intersection which cannot be seen, can be indicated to the driver.

At intersections of the Intersafe-2 research project that have been specially modified, the driver is informed about what hides around the corner – in this case an ambulance.
Source: Volkswagen



Connected vehicles
The vehicles are equipped with a special wireless standard for operation during driving and UMTS and GPRS mobile communication technologies. When a car approaches one or another of the nodes an ad hoc network is established automatically and the information exchange begins. Messages relevant to the driver are displayed on a screen on the dashboard.

From this spring, a test fleet of cars communicating with each other is driving in the Rhine-Main area, as part of the SimTD project. The car manufacturers, research institutes, component suppliers and telecommunication companies involved are testing how the traffic situation in this congested area improves when the cars can exchange information.
Source: Fraunhofer Institute for Secure Information Technologies SIT (as of 2012)

Vision of the Future

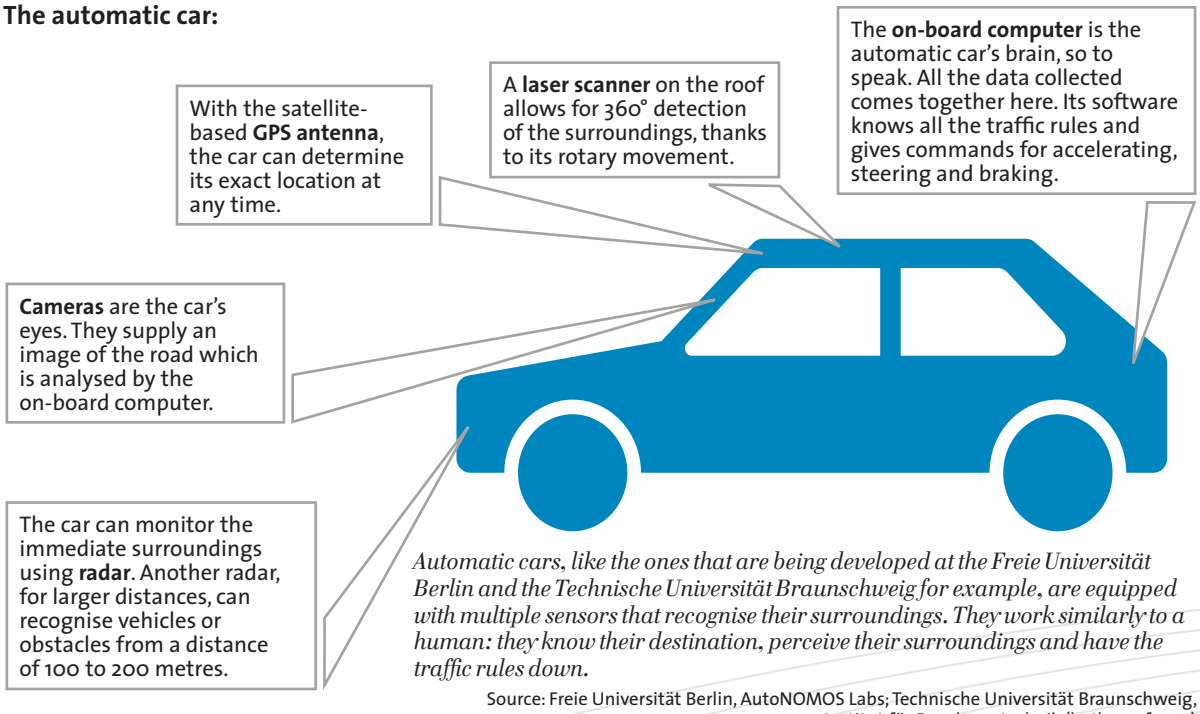
Driver Becomes Passenger

1/4 of a second is how long an on-board computer needs to react to an emergency situation. A human can only act after a moment of shock.

Source: Karlsruhe University, Sonderforschungsbereich Kognitive Automobile (as of 2012)

While assistance systems today can support a driver in many ways, scientists are working on vehicles that can drive automatically on demand. The vision: if the driver desires, he is chauffeured to his destination by his car. Currently automatic cars exist only as test vehicles and require a safety driver, who monitors the activities of the on-board computer.

The automatic car:



Automatic cars, like the ones that are being developed at the Freie Universität Berlin and the Technische Universität Braunschweig for example, are equipped with multiple sensors that recognise their surroundings. They work similarly to a human: they know their destination, perceive their surroundings and have the traffic rules down.

Source: Freie Universität Berlin, AutoNOMOS Labs; Technische Universität Braunschweig, Institut für Regelungstechnik (both as of 2012)

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