*e*Safety Systems

Vehicle based *e*Safety systems

Adaptive Brake Lights
Triggered by the strengths of brake activation the rear brake lights are illuminated in different ways to indicate emergency braking manoeuvres to the following vehicles.

Adaptive Head Lights
The system consists of electromechanical controlled headlights to ensure optimum illumination of the lane in-bends. The headlight is directed into the bend as soon as the vehicle begins cornering. A reduction of the glare to the upcoming vehicles is possible. Vehicle speed, yaw-rate and steering wheel angle can be used as input data for the controller of the system.

Alcohol (inter)lock
The system checks the alcohol intoxication of the driver (breath test) when starting the vehicle and prevents the start of the vehicle when the driver is intoxicated. When driving, the system also checks intoxication at specific intervals and takes preventive actions with pre-warning.

Automatic Headlight Activation
When activated, the system switches on the headlights automatically when major environmental conditions for the use of headlights are present. The system detects the darkness and the light conditions in the environment.

Blind spot monitoring
At both sides of a vehicle there are blind spots, if using a mirror for a backward view. Different systems can either provide better vision into the blind spot area or supplemental information regarding an obstacle being there, e.g. by warning signals. Wide-angle side mirrors reduce the blind spot area. If the mirrors are heated, the vision in bad weather conditions is optimised further on. Camera techniques with image processing or radar sensors can give addition information about the situation in the blind spot. An adequate HMI solution is generally a prerequisite for an effective system.

Driver Condition Monitoring
The system monitors the condition of the driver. Discussed parameters today are drowsiness, distraction, and inattention.

Dynamic control systems
Active Front Steering (AFS): The AFS allows - electronically controlled - a variable steering transmission and steering force support. Two different inputs overlap, the steering angle from the steering wheel and a correction angle given by a controller through a special gearbox.
Electronic Stability Control (ESC): Stabilises the vehicle under all driving conditions and driving situations within the physical limits. Helps to stabilise the vehicle and prevent skidding when cornering or driving off through active brake intervention on one or more wheels and intelligent engine torque management.
Active Body Control (ABC): Active damping and suspension system minimising car body roll and pitch motion, adjusting ground clearance according to speed, allowing for a two stage ride height including load-independent all-round self-levelling.

Lane Departure Warning
Warning given to the driver in order to avoid leaving the lane unintentionally. Video image processing is the most important technology.

Lane Keeping Assistant
Active lane-keeping support through additional and perceptible force e.g. in the steering wheel.

Obstacle& Collision Warning
System detects obstacles and gives warnings when collision is imminent. Current solutions with limited performance are a separate feature of Adaptive Cruise Control systems, which use information obtained from radar sensors to give visual and acoustic warnings. Future systems will use long range/near range radar sensors or LIDAR and video image processing.

Runflat Indicator /Tire Pressure Monitoring System
In case of air loss in a tire the systems gives a warning to the driver. With the runflat indicator the system detects the different rotation speed of the tire, which is under-inflated. In case of a tire pressure-monitoring system the air pressure in each tire is directly measured and displayed if necessary.

Vision enhancement
Assistance Functions with camera techniques like infra-red which enhances the perception of pedestrians and other relevant objects at night or in otherwise bad vision conditions.

Infrastructure related *e*Safety systems

eCall
The emergency-call gives precise coordinates of the location of an accident to the emergency services, which are responsible for the help. The service is a multi-stakeholder function of public organisations, telecom companies and service providers and car manufacturers.

Event data recorder
On-board EDR collect certain vehicle parameters to be stored in case of an accident. Those data, before, during and after the event, can be used for scientific, technical and legal purposes. Driver awareness of such a system might reduce the number and severity of drivers' crashes.

Extended environmental information
Data from different sources of the vehicle e.g. switched on lights, windscreen wipers on, fog lights on, information from ABS, stability control systems can be used to create useful information about the environmental situation where the vehicle is driving. They are called extended floating car data, which can - after filtering - provide information about potentially dangerous situations at certain locations. These data are handled like floating car data (high quality congestion- / traffic information)

High quality Congestion/Traffic Information / RTTI (Real Time Travel and Traffic Information)
This is information to the driver about the traffic (congestion) and weather conditions for choosing the most effective route or for preparing to cope with the foreseeable situation ahead on the route. Important is the actuality of the information about the traffic situation to maintain the credibility of the function. The information is transmitted to in-vehicle and nomadic devices. Short-term forecasting is essential for these systems. Information can be personalised.

Infrastructure Based Warning Systems /Local Danger Warning
Warning systems about dangerous locations or situations do not necessarily have to rely on vehicle-based technology. There are solutions, which are only based on the infrastructure to warn the drivers. Spot-wise warning can be given via variable message signs, flashing or electronic beacons, radar based excessive speed information.

Inter vehicle hazard warning
To transmit warnings about hazards and extended data to other vehicles in the vicinity, the function uses technologies of wireless local area networks between cars. Vehicle can be used as sender, receiver and relay stations for that information. Other technologies using communication infrastructure can provide local hazard warnings with the help of extended floating car data too.

Speed Alert
The system alerts the driver with audio, visual and/or haptic feedback when the speed exceeds a limit set by the driver or the legal fixed speed limit. The speed limit information is either received from transponders in speed limit signs or from a digital road map, requiring reliable positioning information.

Traffic sign recognition and alert
The function uses camera technologies and image processing to perceive the traffic signs and give an alert about the content of the sign to the driver. The HMI is an important aspect for the information process.

Dynamic traffic management
Influencing traffic flow by influencing speeds, lane use, route choice, merging operations by employing variable message signs (VMS) in order to improve safety and network utilisation. Applications include also e.g. ramp control, access control, tunnel control and closure. Three categories of VMS are identified: 'regulatory messages', 'danger warning messages' and 'informative messages'. Uses for motorway links, for network situations and for rerouting are also recognised as functionally separate domains.