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Adapt/i/Ve
Automated Driving Applications and Technologies for Intelligent Vehicles

A Stepwise Market Introduction of Automated Driving

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//Facts

Budget:	EUR 25 Million
European Commission:	EUR 14,3 Million
Duration:	42 months (January 2014 – June 2017)
Coordinator:	Aria Etemad, Volkswagen Group Research
8 Countries:	France, Germany, Greece, Italy, Spain, Sweden, The Netherlands, United Kingdom

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//29 partners


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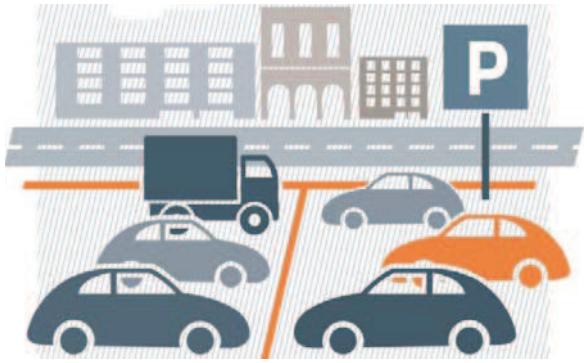
// Motivation for automated driving functions

Zero emission	Reduction of fuel consumption & CO_2 emission Optimization of traffic flow	
Demographic change	Support unconfident drivers Enhance mobility for elderly people	
Vision zero	Potential for more driver support by avoiding human driving errors	

// Challenges and project objectives

Widespread application of automated driving to improve traffic safety, efficiency and comfort



// Automation scenarios

< 30

Parking and low speed manoeuvres

< 70

Low to medium speed maneuvers

< 130

Error-free driving for cars and trucks on highways

//Terms related to automated driving

Driverless

Piloted

Self driving

Full automation

Partial autonomy

High automation

Semi automated

Partial automation

Fully autonomous

Conditional automation

Autonomous

//Levels of driving automation acc. to SAE and VDA

	LDW FCW	LKA ACC	Parking Assistance	Traffic Jam Chauffeur	Parking Garage Pilot	Robot Taxi
	level 0	level 1	level 2	level 3	level 4	level 5
	No auto-mation	Assisted	Partial auto-mation	Condi-tional auto-mation	High auto-mation	Full auto-mation

AdaptIVe levels of automation

driver "in the loop"				
secondary tasks	none	specific	all (incl. sleeping)	
min. risk condition	none	some	always (must!)	
final fallback level	driver		automation	
from origin to destin.	no (specific use cases)			yes

Source: SAE document J3016, "Taxonomy and Definitions for Terms Related to On-Road Automated Motor Vehicles", issued 2014-01-16, see also http://standards.sae.org/j3016_201401/

// Examples of ADAS functions

- ACC: Automated Cruise Control
- S&G: ACC incl. Stop & Go
- LKA: Lane Keep Assist
- PDC: Park Distance Control
- LCA: Lane Change Assistance
- LDW: Lane Departure Warning
- FCW: Forward Collision Warning
- HHC: Hill Hold Control
- ISA: Intelligent Speed Adaption
- CMBS: Collision Mitigation Brake System
- IPAS: Intelligent Parking Assist System

// Introduction scenario

ACC: Adaptive Cruise Control
LKA: Lane Keep Assist
LDW: Lane Departure Warning
FCW: Forward Collision Warning

2	Partial automation		Parking assistant Traffic jam assist.
1	Assisted	ACC LKA	City Cruise Constr. site ass.
0	No automation	LDW FCW	
		ADAS today	*ADAS tomorrow*

// Parking assistance // level 2

- **Partial automated parking** into and out of a parking space
- On public parking area or in private garage
- Via **Smartphone** or **key** parking process is started, vehicle accomplishes parking manoeuvre by itself
- Driver is located **outside** of the vehicle
- Driver has to **constantly monitor** the system, stops parking manoeuvre if required
- **Safety benefit** due to avoidance of parking damages and improved environment observation
- **Comfort benefit** because getting into and out of the car is simplified, especially for narrow parking spaces or garages

// Introduction scenario

3	Conditional automation			Traffic Jam Chauffeur
2	Partial automation		Parking ass. Traff. jam a.	
1	Assisted	ACC LKA	City Cruise Constr. ass.	
0	No automation	LDW FCW		
		ADAS today	*ADAS tomorrow*	*Automation Gen. 1*

//Traffic Jam Chauffeur // level 3

- **Conditional automated driving** in traffic jam up to 60 km/h
- On motorways and similar roads
- System can be activated, if **traffic jam scenario** exists: detection of slow driving vehicles in front
- Driver must deliberately activate the system, but does not have to monitor the system constantly
- Driver can at **all times override** or switch off the system
- Take over request if traffic jam scenario does not exist any longer
- **Safety benefit** via relief of the driver: no exhausting, manual driving during traffic jams
- **Comfort benefit** via relaxing and use of selected infotainment functionalities

// Introduction scenario

4	High				Parking garage pilot
3	Conditional automation			Traffic jam chauffeur	Highway chauffeur
2	Partial automation		Parking ass. Traff. jam a.		
1	Assisted	ACC LKA	City Cruise Constr. ass.		
0	No automation	LDW FCW			
		ADAS today	*ADAS tomorrow*	*Automation Gen. 1*	*Automation Gen. 2*

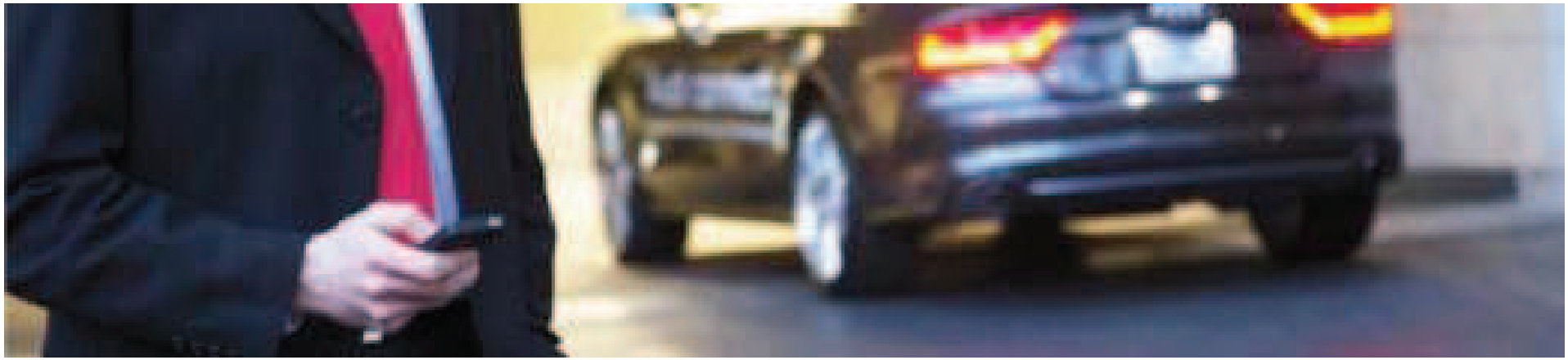
// Highway Chauffeur // level 3

- **Conditional automated driving** up to **130 km/h** on motorways or similar roads
- From entrance to exit, on all lanes, incl. overtaking
- Driver must deliberately activate the system, but does not have to monitor the system constantly
- Driver **can at all times override** or switch off the system
- Take over request in time, if automation gets to its system limits
- **Safety benefit** via relief of the driver: no exhausting, manual driving during long distance driving
- **Comfort benefit** via relaxing and use of selected infotainment functionalities

// Parking Garage Pilot // level 4

- **Highly automated parking** including maneuvering to and from parking place (driverless valet parking), in parking garage
- Driver **does not have to monitor** the system constantly, may depart
- Via **Smartphone** or **key** parking manoeuvre and return of the vehicle is initiated

- **Safety benefit** due to avoidance of parking damages
- **Comfort benefit** due to time saving: short distances, customer does not have to access the parking garage



// Introduction scenario

5	Full automation					~~Robot Taxi~~
4	High automation				Parking Garage Pilot	
3	Conditional automation			Traf. J. Cha. City Chauff.	Highway Chauff.	
2	Partial automation		Parking ass. Traff. jam a.			
1	Assisted	ACC LKA	City Cruise Constr. ass.			
0	No automation	LDW FCW				
		ADAS today	*ADAS tomorrow*	*Automation Gen. 1*	*Automation Gen. 2*	*n.a.*

// Introduction scenario

5	Full automation					Robot Taxi
4	High automation				Parking garage Pilot	
3	Conditional automation			Traf. J. Cha. City Chauff.	Highway Chauffeur	
2	Partial automation		Parking ass. Traff. jam a.			
1	Assisted	ACC LKA	City Cruise Constr. ass.			
0	No automation	LDW FCW				
		ADAS today	*ADAS tomorrow*	*Automation Gen. 1*	*Automation Gen. 2*	*n.a.*

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Thank you.

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