INSTITUT FÜR KRAFTFAHRZEUGE
RWTH AACHEN UNIVERSITY

AdaptIVe

Automated Driving Applications and Technologies for Intelligent Vehicles

Key evaluation results

Adrian Zlocki
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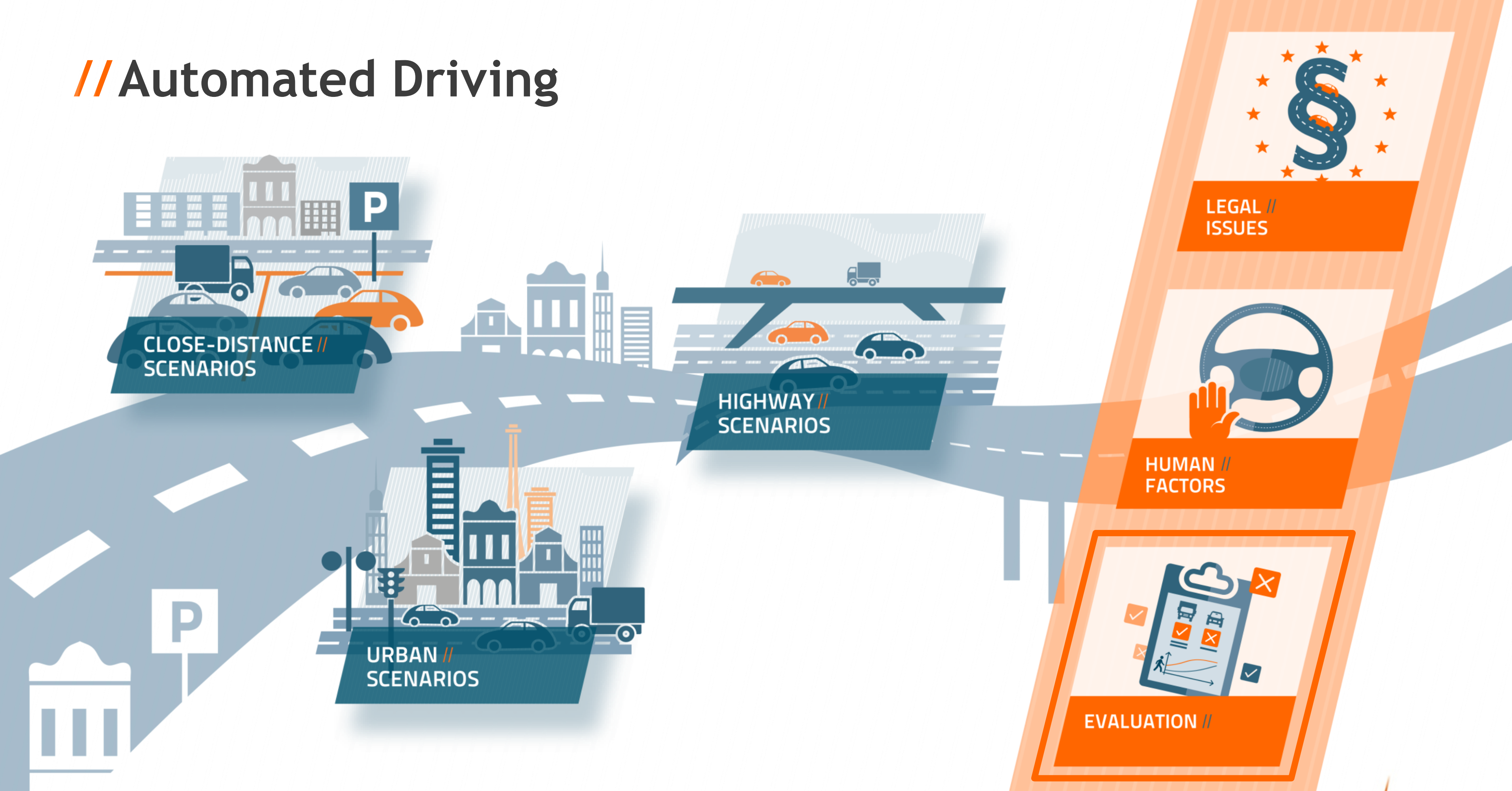
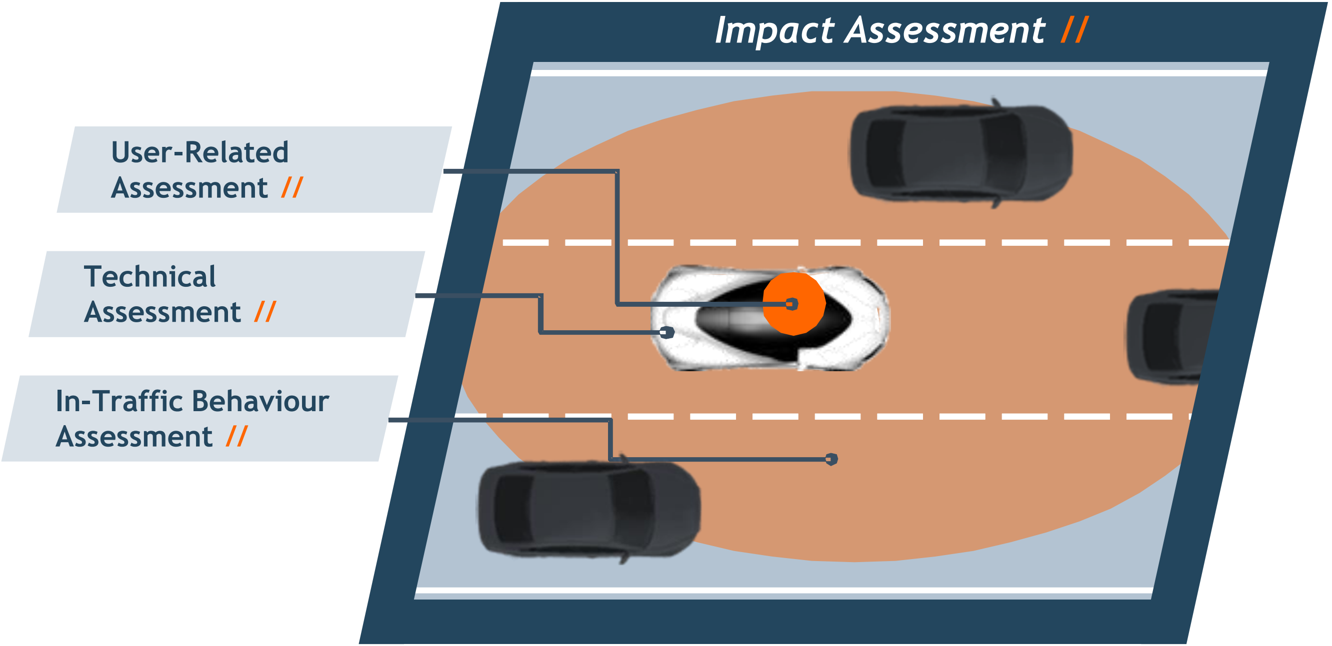
Final Event
Aachen, Germany
28 June 2017

// Automated Driving



AdaptIVe

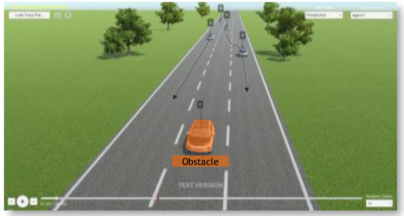
//Evaluation of AdaptIVe functions



// Real-traffic

// Test track

// Simulations



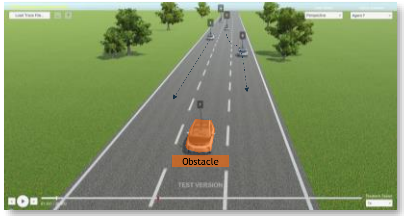
//Evaluation of AdaptIVe functions

	// Parking	// Urban	// Highway
Technical Assessment	Ford Daimler	CRF	BMW, Conti, VTEC, VW
User-related Assessment	-	VCC	VW
In-traffic Assessment		TNO	
Impact Assessment	Environment: ika	Environment: ika	Enviro.: ika Safety: BMW

// Real-traffic

// Test track

// Simulations



//Technical Assessment - Method

// Highway

Data Source//

AdaptIVe demonstrator

Reference: euroFOT

Classification of Scenarios//

Classification of Scenarios//

- Classifier Scenario 1
- Classifier Scenario 2
- Classifier Scenario x

PIs

Scenario-based Assessment//

Assessment//

Calculation of:

- Derived Measures
- Performance Indicators

Δ Frequency (Scenario)

Δ Effect (Scenario)

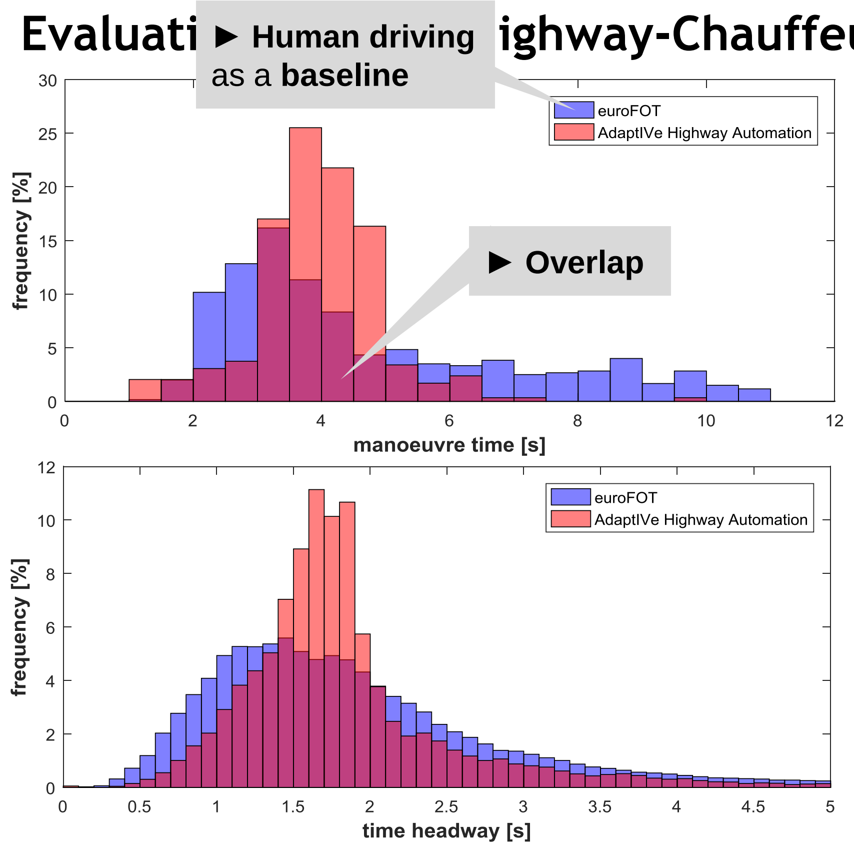
► **Human driving** as a **baseline**

► Classification of scenarios by using **time series classification algorithms**

► Assessment of Δ**frequency** and Δ**effect** of system in **scenario**

//Technical Assessment - Results

Evaluati… ighway-Chauffeur



The **AdaptIVe Highway-Chauffeur is** showing a **control capability similar to human driving** from euroFOT. Two results stand out:

- Top figure: **duration** of **lane change** is much **more uniform** with automation
- Bottom figure: **time headway** in **vehicle following** shows **much less variability** with automation

// More details in the presentation of **Christian Roesener**

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//User-related Assessment

// Highway

- **Method**
  - **Behavioural observations - two observers in the car**
  - **Logging of driving data - e.g. speed, distance, lane keeping**

- **Key Results (21 persons, Highway-Chauffeur as example)**
  - **The drivers used the system as it was intended to be used**
  - **The system affected driving positively in several ways**
    + Better speed adaptation to speed limits and conditions, less speed variations
    + Better distance keeping ahead
    + Better lane choice (prescribed use of the right lane)
    + Better indicator usage
    + Fewer dangerous lane changes
  - Due to 130 kph system limit, overtaking manoeuvres are longer

// More details in the presentation of **András Várhélyi**

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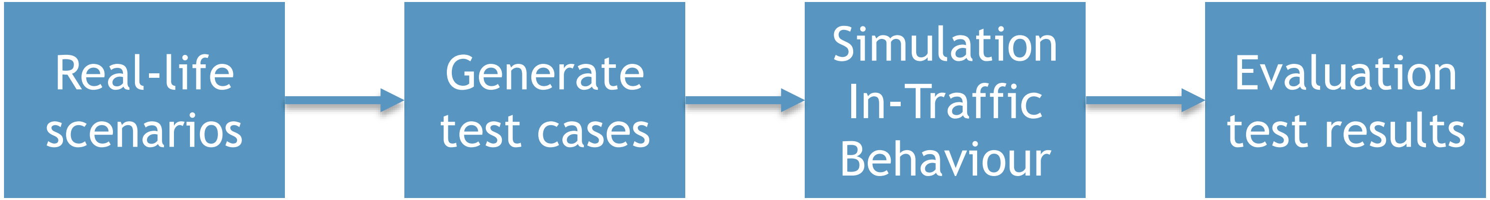
//In-traffic Assessment - Method

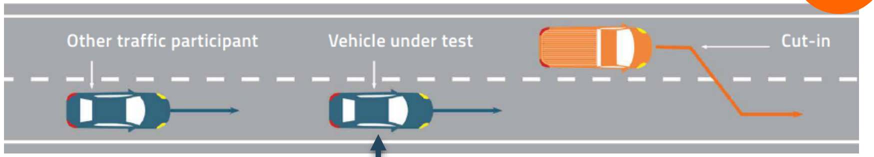
- Research focus:
  - **How is the vehicle interacting with other traffic participants?**
  - **How do other traffic participants react on the (automated) vehicle?**



- In-traffic Assessment used generated real-life scenarios with Monte-Carlo **simulations**

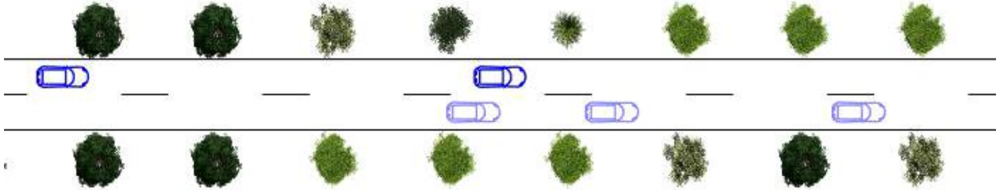
// In-traffic Assessment - Method

// Test scenario & system to test 1

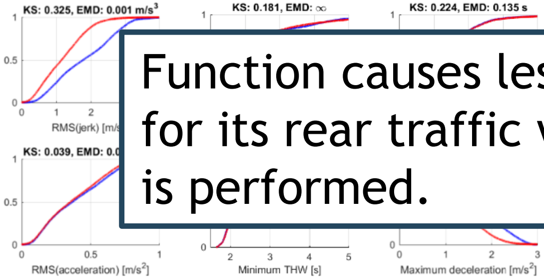


Traffic Jam Assist
(Adaptive Cruise Control)

// Simulation 2



// Analysis (Evaluation) 3



Function causes less oscillations for its rear traffic when a cut-in is performed.

// More details in the presentation of
Erwin de Gelder

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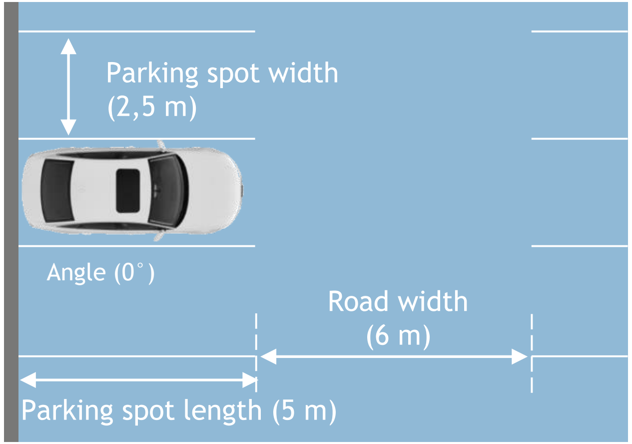
//Environmental Impact Assessment

- **Method**
  - Analysing the required parking space for automated vehicle
  - Assumption: If the driver is not in the car, it is possible to park more narrow
    1. Parking maneuver analysis to find the optimal trajectory
    2. Required parking lot and road width calculation
    3. Additional parking space determination
- **Results**

Vehicle Class	Benefit of automated driving
Minis	17%
Upper Class	5%
Average Vehicle	10%



//Safety Impact Assessment - Method & Results

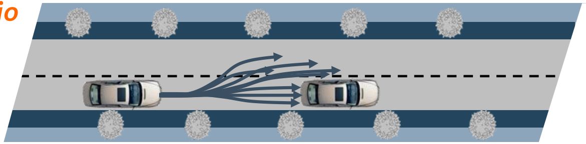
// Identification Top-Scenarios

Accident data (e.g. GIDAS) / Critical situations (FOT)

Description of function

Simulation of traffic scenarios

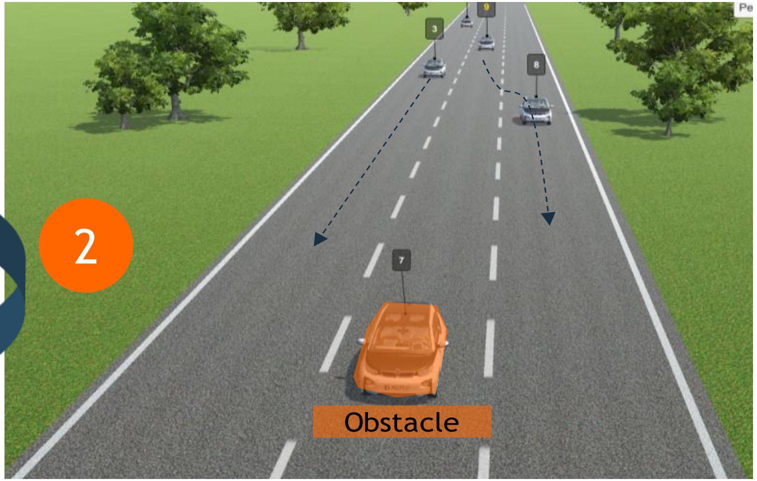
//Top-Scenario



Simulation of driving scenarios

1

// Simulation



2

// Analysis & Projection

3

	Top 1 Cut-In	Top 2 End of Lane	Top 3 Obstacle in the lane
Expected mean accident reduction rate	-83%	-14%	-40%
Accidents within the operation conditions[1]	72% (92%)	67% (83%)	78% (97%)
Change of accident risk per scenario	-60% (-76%)	-9% (-12%)	-31% (-39%)

// More details in the presentation of **Felix Fahrenkrog**

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the European Union

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Thank you.

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