Cost-efficient Emergency Intervention for Collision Mitigation Development and Evaluation Results

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interactIVe Final Event

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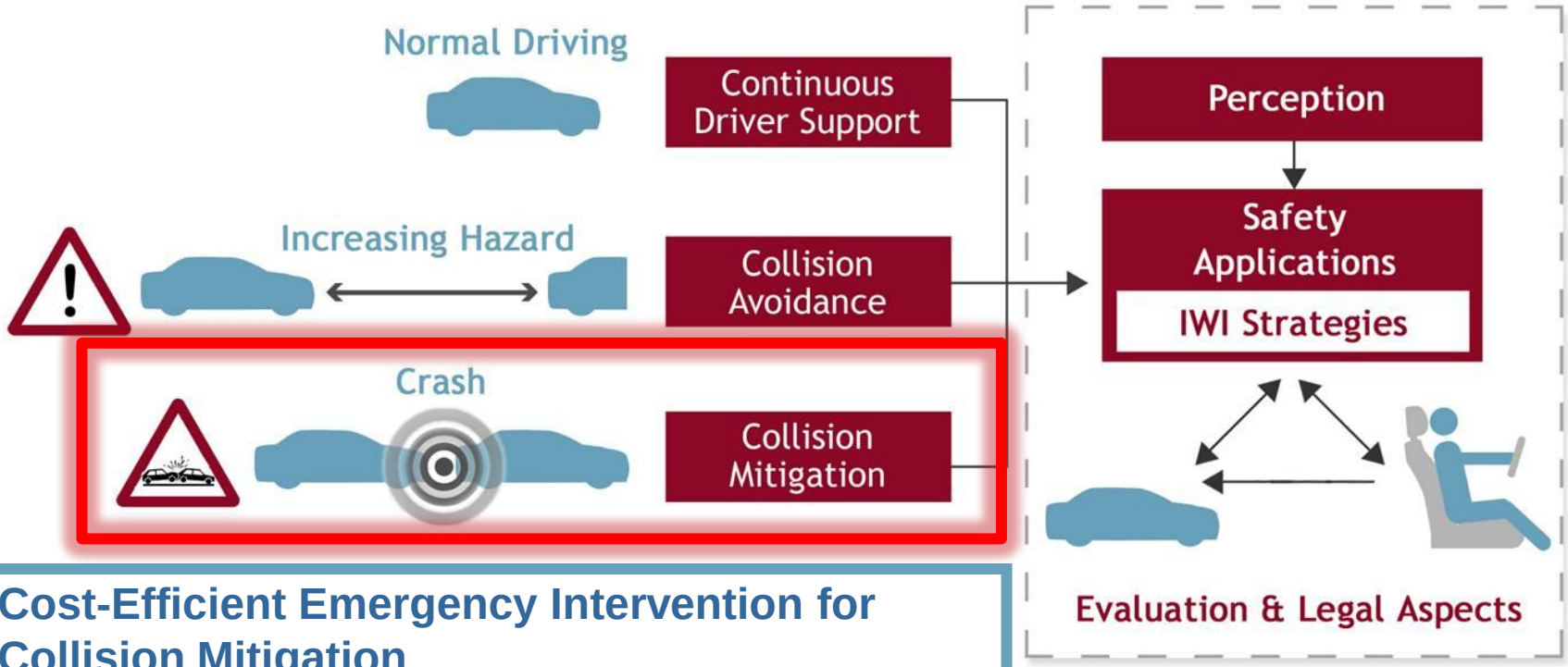
Content

- Overview
- Objectives
- Functions and demonstrator vehicles
- Final evaluation of the functions
- Sensor benchmark tests
- Conclusions

Overview



Cost-Efficient Emergency Intervention for Collision Mitigation

VOLKSWAGEN AKTIENGESELLSCHAFT · VOLVO · Autoliv · Continental · DLR Deutsches Zentrum für Luft- und Raumfahrt German Aerospace Center · Czech Technical University in Prague

Objectives

- Development of affordable collision mitigation functions
  - Extension of existing collision mitigation concepts
  - Vehicle architectures in low- and medium-segment passenger vehicles
  - Coverage of a wider range of target scenarios in frontal direction
  - Steering interventions to control the lateral vehicle path

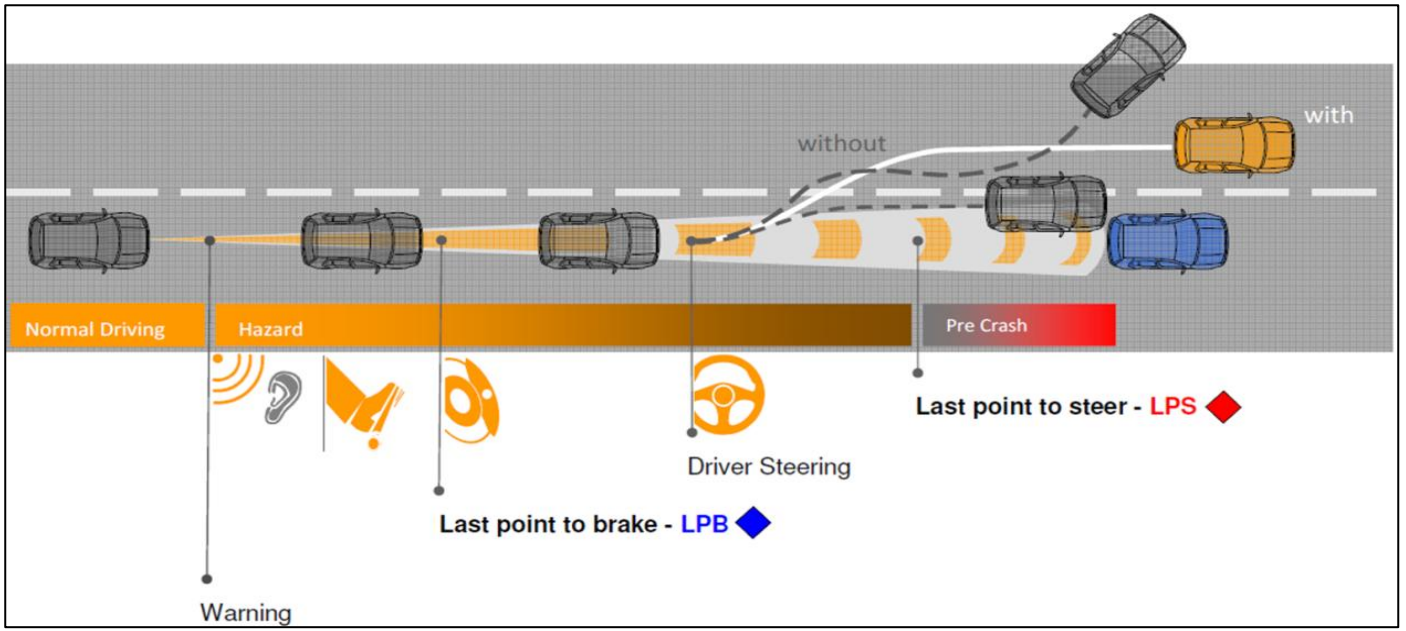
- Build-up two demonstrator vehicles
  - Emergency Steer Assist (ESA)
  - Collision Mitigation by Braking and Steering (CMBS)

- Development and evaluation of a driver model

- Benchmarking of different off-the-shelf sensor systems

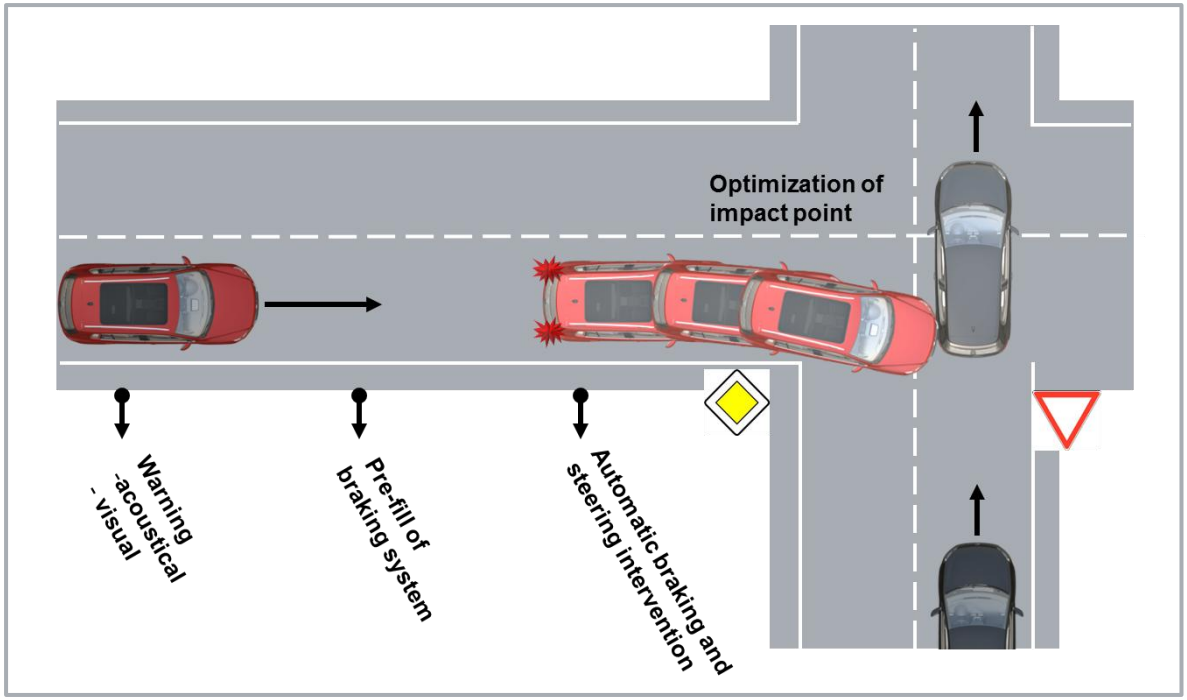
Function 1 - Emergency Steer Assist (ESA)

- Support the driver in critical situations, in which the driver tries to avoid an imminent collision by steering
- If the driver starts a steering manoeuvre to avoid the collision, the function will support the driver to stabilize the vehicle and to follow the required collision free trajectory



Function 2 - Collision Mitigation by Braking and Steering (CMBS)

- If the driver doesn't react after warning until the collision becomes unavoidable, the CMBS will be activated. The function will brake and/or steer in order to reduce the accident severity.



Demonstrator with ESA

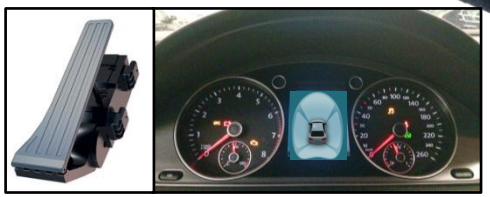
Sensor layer

Stereo camera

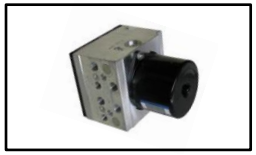
Long range radar

Processing units

IWI layer



HMI components



Brake system

Electronic power steering

Demonstrator with CMBS

Sensor layer


Stereo camera

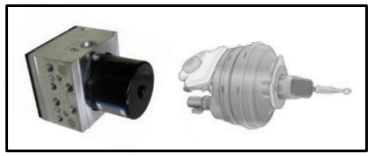

Mono camera


Short range radar


Processing units

IWI layer

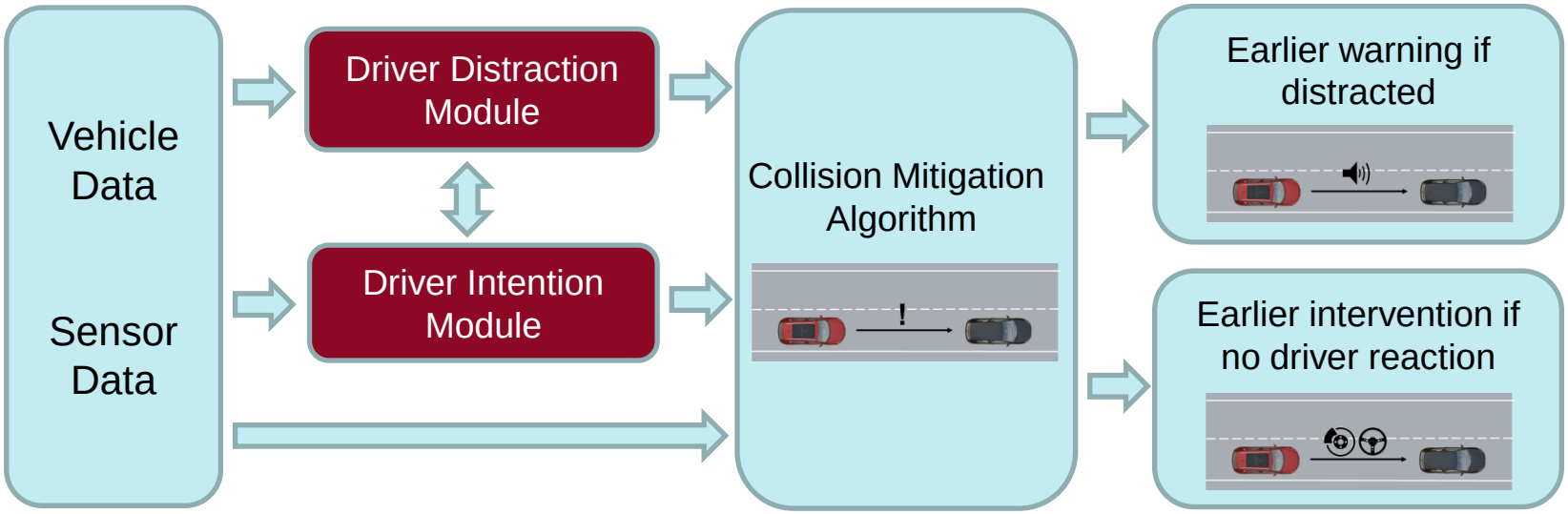

HMI components


Active brake booster


Electronic power steering

Driver Model Approach and Evaluation

- Increase of the safety benefit through early triggering of the CMBS function
- Implementation of a driver model allows driver adaptive parameterization of the CMBS algorithm

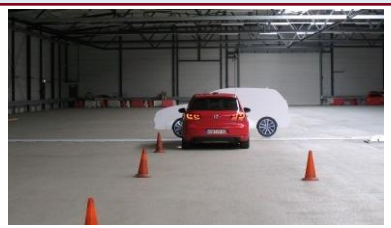


- Study 1: in case of distracted driver up to 200ms earlier warning possible.
- Study 2: up to 600ms earlier intervention with driver intention recognition.

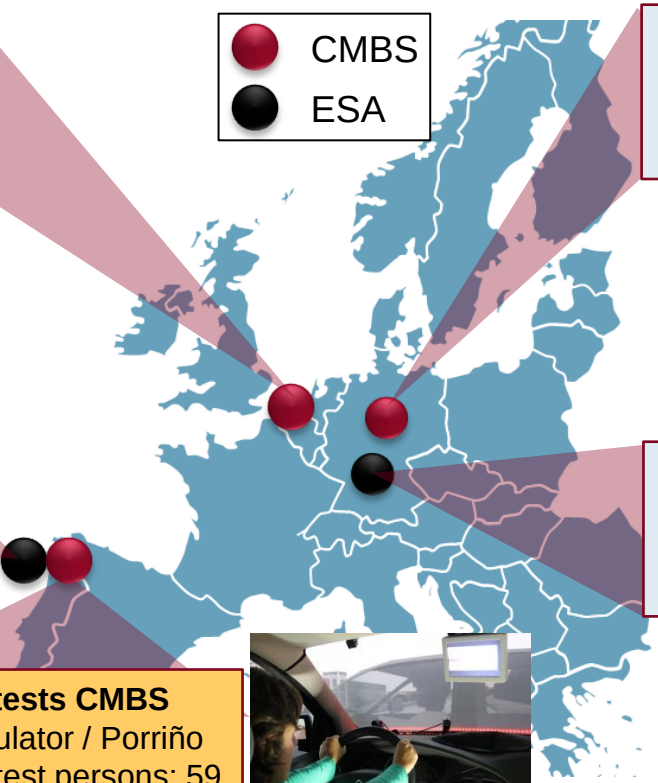
Final Evaluation of the Functions

- In total 191 tests performed on test tracks and indoor (VeHIL)
- Two driving simulator studies with128 volunteers

Technical tests CMBS
- VeHIL / Helmond
- Accident scenarios: 2
- Number of test runs: 16



User related tests ESA
- Driving simulator / Porriño
- Number of test persons: 69



User related tests CMBS
- Driving simulator / Porriño
- Number of test persons: 59

Technical tests CMBS
- Test track / Wolfsburg
- Accident scenarios: 2
- Number of test runs: 37

Technical tests ESA
- Test track / Frankfurt
- Accident scenarios: 3
- Number of test runs: 118

Sensor Benchmark Tests

- Benchmark the performance of off-the-shelf sensors with respect to key parameters relevant for emergency intervention functions (e.g. warning, braking).
- Evaluated sensors: mono camera, radar fused with mono camera, stereo camera and photonic mixing device (PMD).
- Performance of test scenarios for rear end collisions and crossing pedestrians.

- All the reviewed sensors achieved a good technical performance.
- Total performance also includes the functional algorithm and the actuator system performance.

Conclusions

- Two demonstrator vehicles have been built up;
- ESA and CMBS function developed and implemented;
- Modular driver model developed and evaluated in simulator studies;
- Sensor benchmark with different sensors executed;
- Successful final evaluation of the functions performed.

More details:

- **Exhibition area**
- **Technical presentations next day**
- **Demonstrator test drive in Lommel**

Acknowledgements

- “Evaluation and legal aspects“ team;
- “Cost-efficient emergency intervention for collision mitigation” team:

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Autoliv

Continental

DLR Deutsches Zentrum für Luft- und Raumfahrt German Aerospace Center

CZECH TECHNICAL UNIVERSITY IN PRAGUE

interactIVe

Accident avoidance by active intervention for Intelligent Vehicles

Thank you.

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SEVENTH FRAMEWORK PROGRAMME

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