HoliDes

HOLISTIC HUMAN FACTORS AND SYSTEM DESIGN
OF ADAPTIVE COOPERATIVE HUMAN-MACHINE SYSTEMS

Adapted Automation AdCoS

ARTEMIS

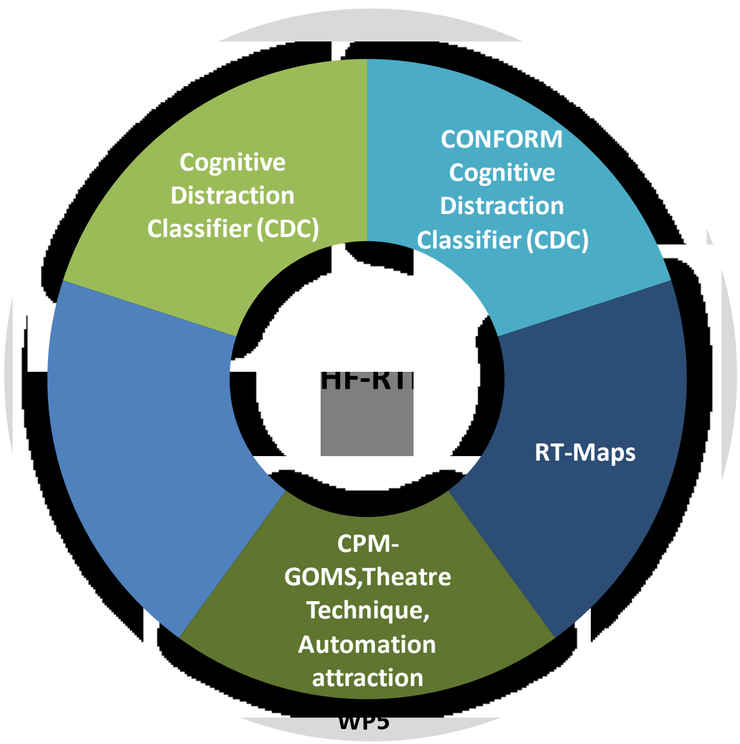
Domain

Motivation

A major need regarding automated vehicles is an increased usability and operability for the human driver. This encompasses cooperation and adaptation of the machine agent to the human driver and other road users, with a human-centred design process.

The main challenges are the development of a fluent, yet transparent task allocation and transition between human driver and the machine agent and at the same time integrating the host vehicle into the flow of other road users, where a number of agents are acting in a shared space with shared resources. This aims at increasing the confidence of the human driver in a highly automated system.

Applied MTTs



Tailored HF-RTP

The adapted automation AdCoS addresses four different key features to realize an advanced cooperation and adaptation between a machine agent and a human driver. The adaptation will take into account the capabilities, needs and preferences of the driver, other road users and the

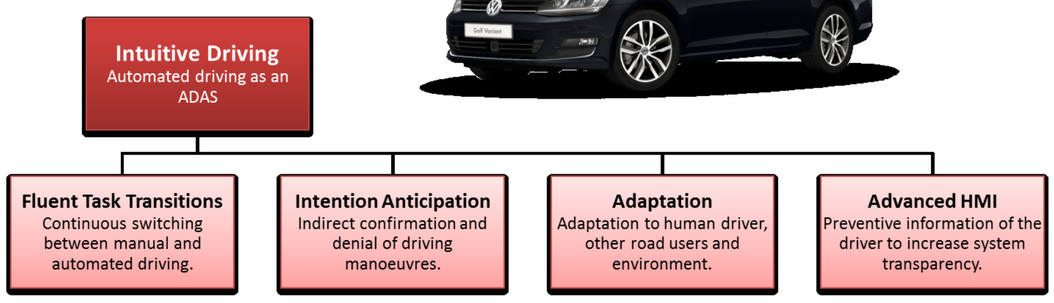


Figure 1: Key features of the Adapted Automation AdCoS

The system architecture to target the different key feature is illustrated in figure 2. Related to the human driving task and the process of driving the machine agent consists of four layers similar to the human driver. These layers are perception, interpretation, planning and action. The interaction and communication between the human driver and the machine agent happens explicitly via the HMI and implicitly via CONFORM and the Cognitive Distraction Classifier.

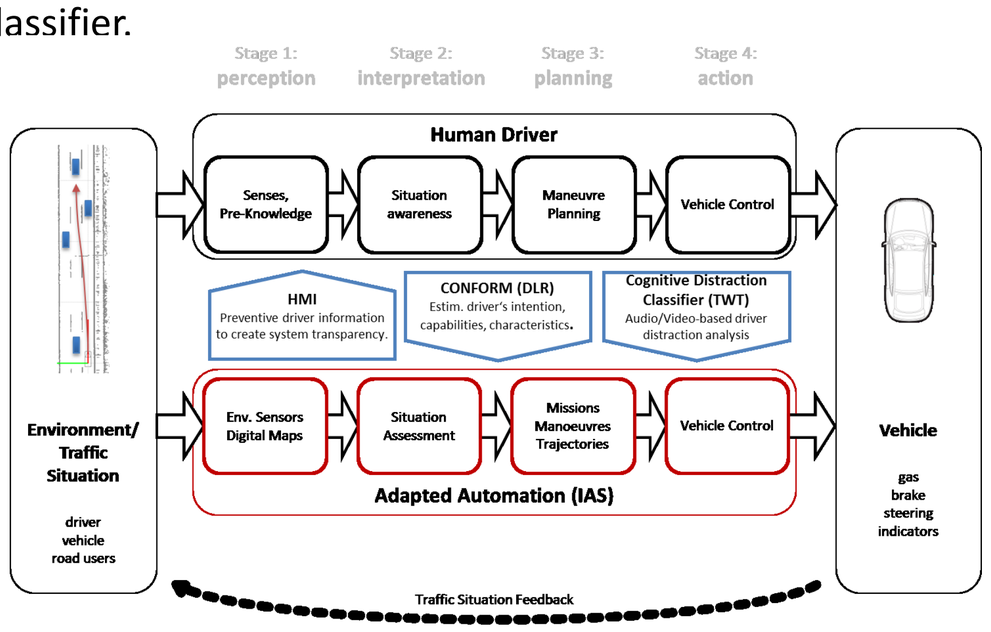
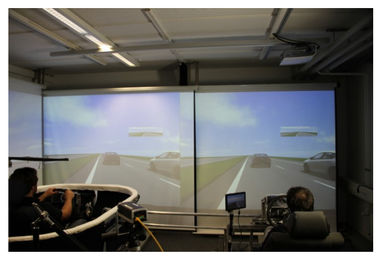


Figure 2: High Level Architecture of Adapted Automation AdCoS

Partner	Role
ibeo	• Development of the machine agent for Highly Automated Driving • Coordination of the AdCoS development • Providing interfaces for adaptation to the human driver
DLR	• Implement a driver model (CONFORM) to characterize the individual, manual driving style to adapt the driving style of the machine agent accordingly • Determine the relation between manual driving style and preferred automation characteristics • Apply theatre technique to develop transition strategies
TWT	• Development of cognitive and computational models to assess the drivers' level of cognitive distraction • Experiments with human subjects in simulators, recor-ding behavioural, video-, audio-, and eye-tracking data • Machine Learning Algorithms classifying data real-time

Results

- Volkswagen Golf VII equipped with a laser scanner fusion system allowing a 360 degree field of view
- Interface to the vehicle CAN-Bus installed
- Creation of digital maps, and the trajectory planning
- Inter-action design developed in the theater technique



- Conducted two experiments in the dynamic driving simulator

- Driver Distraction Module implemented as RT-Maps package and first integration and test in test vehicle

Highway overtaking situation - Gain of appealing compared to baseline

- No approaching vehicle on left lane: +17%
- Approaching vehicle on left lane 20 km/h faster: +74%
- Approaching vehicle on left lane 40 km/h faster: +110%

Contact

Ibeo Automotive Systems GmbH
Merkurring 60-62
22143 Hamburg

Martin Krähling
martin.kraehling@ibeo-as.com

Consortium

OFFIS INSTITUTE FOR INFORMATION TECHNOLOGY, Atos, DLR, TAKATA, Honeywell, AIRBUS DEFENCE & SPACE, CRF CENTRO RICERCHE FIAT, CIVITEC, AnyWI, Ergoneers, Human Factors Consult, BRNO UNIVERSITY OF TECHNOLOGY, ibeo, IFSTTAR, INTEGRASYS, INTEMPORA, iren, Lufthansa, AIRBUS GROUP, RE:Lab, UNIVERSITÀ DEGLI STUDI SUOR ORSOLA BENINCASA, tecnalia, PHILIPS sense and simplicity, TWT, ENAC, TRUESTREAM AEROSPACE HUMAN FACTORS, UNIVERSITÀ DEGLI STUDI DI TORINO

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