Challenges in Automated Driving

Reiner Höger

FISITA World Automotive Summit, Mainz, Nov 12th, 2013
# Challenges in Automated Driving

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Why Do we Strive for Automation?

› We started from intelligent propulsion with automation functionalities.
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Challenges in Automated Driving
From Assistance to Automation

- **Human Assisted** driving in complex scenarios
- **Human Assisted** driving in simple scenarios
- **Partially Automated** driving at lower speed in simple scenarios
- **Highly Automated** driving at lower speed in complex scenarios
- **Fully Automated** driving at higher speed in complex scenarios

Discontinuity
Challenges in Automated Driving

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Challenges in Automated Driving
Use cases with high customer value

Parking
Cruising
Traffic jam
Road works lanes
Challenges in Automated Driving
Automation on the road, a possible scenario

- **>2025 (FULLY AUTOMATED)**
  - Monitoring of the system not required
  - Driver does not need to be able to take over the driving task
  - Example: Highway driving up to 130 km/h

- **2020 (HIGHLY AUTOMATED)**
  - Monitoring of the system not required
  - Driver needs to be able to take over the driving task with lead time
  - Example: Stop-and-go up (highway)

- **2016 (PARTIALLY AUTOMATED)**
  - Monitoring of the system required
  - Driver needs to be able to take over the driving task at any moment
  - Example: Stop-and-go up to 30 km/h
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Challenges in Automated Driving
The Challenge Clusters

- Legal and Rule Making Bodies (4)
- Cooperation Models (3)
- Technology (2)
- Human Being (1)
Understanding Driver, Passengers and other Road Users is Vital

› Challenge: The vehicle must be predictable to
  › Driver,
  › Passengers
  › Humans outside the vehicle

› Approach
  › Context sensitive information
  › Adaptation to driver

› Solution
  › Driver monitoring and modeling
  › New HMI concepts

› Research need:
  › Driver modeling
  › Communication and take over in critical situations
  › Take over time
  › Communication between
    › Automated vehicles
    › Automated vehicles and other road users
The Human Being is Imperfect but Superior

**Pros**
- Superior sensor fusion and situation analysis
- Can train complex action patterns
- High capacity of learning and making associations
- Can take responsibility

**Cons**
- Slow and sometimes false reaction
- Falls victim to his temper
- Gets bored
- Distraction by other tasks

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Challenges in Automated Driving
The Back End the new Infra-Structure Element
Challenge: Failure Robustness, Controlled Degradation

Functional Safety

Chassis, actuators
EE architecture

Sensor systems

Total system architecture
Data transport, - handling
Challenge: System Development
Top down approach is a must to manage complexity

Complex use cases
- Parking
- Highway
- Road
- New:
  - Complex scenarios
  - Sensor groups
  - Backend Services

Backend Services
- Through the necessity of the Backend Services
  - New interfaces
  - New optimisation options

Vehicle

Modules/Functions

Components
Challenge: A Legal Framework has to be Established

International
Vienna convention
Art. 8 / § 5

National
Germany StVO
§ 1 (1)

The participation at the road traffic requires permanently caution and mutual consideration.

Legislation will determine the pace of the introduction of Automated Driving.

Partly Automated 2016
Highly Automated 2020
Fully Automated >2025
Challenge: New partnerships and co-operations to pave the way and harvest the fruits
Challenge: New partnerships and co-operations to pave the way and harvest the fruits

- Do we need an International Expert Group on Automated Driving?
- Agreed standards in
  - Save system design, testing
  - System validation (functionality, availability, reliability…)
- Minimum data set for a proven environmental/scenery model for a function
- Infra-structure requirement for AD
- Figure of merit for third party data
- Quality of transmission channels
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Summary

1. Automated driving is in reach and will deliver benefits in terms of safety, efficiency and comfort
2. It will come fast but in steps
3. Some challenges require cooperation
4. There is ample room for customer value and differentiation/competition
5. We will see new business models
Challenges in Automated Driving

Thank You