Challenges in Automated Driving

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Content

- What makes automated driving attractive?
- Challenges
- Automated Assistance in Road Works and Congestions
- Highly automated to fully automated what’s next?
- Summary
What makes automated driving attractive?

- Technological trends
- Safety and efficiency
- Comfort
Challenges

- Reliability of the system
- Driver’s trust
- Affordability
Drivers’ s Trust: HAVEit Interaction & Display Schemes

Automation Scale

OR

Automation Monitor

OR

Message Field

Take over control!
Drivers′s Trust:
HAVEit Interaction & Display Schemes

Joint System Demonstrator

Continental Assistant in Road Works and Congestion

VTEC Automated Queue Assistant

VW Temporary Auto Pilot

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Driver’s Trust: HAVEit Interaction & Evaluation of Principles

Driver’s State

Driver – System – Interaction

Driver's perspective
Affordability
Close to series technology and appropriate architecture
HAVEit Demonstrators
Demonstrators according to use case

- **Highly automated driving**
  - Safety enhancement
  - Driver overload (demanding driving tasks)
  - Driver underload (monotonous driving tasks)
  - Energy optimization, emission reduction

- **Automated Assistance in Roadworks (and Congestion)**
  - Continental Car

- **Temporary Autopilot**
  - Continental Truck

- **Active Green Driving (Energy Optimizing Copilot)**
  - Volvo Bus
Automated Assistance in Road Works and Congestion
Sensor system to observe environment
Highly automated to fully automated what’s next?
Legal Aspects

Assisted
Automated but supervised
Longer periods of hands free
Fully automated
### What’s Next?

**Technology**

<table>
<thead>
<tr>
<th>Results of HAVEit</th>
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<tbody>
<tr>
<td>• Definitions on automated driving</td>
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<td>• 3 commonly understood modes</td>
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<td>• Scalable Architecture</td>
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<td>• Function algorithms</td>
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<td>• Function clusters</td>
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<th>Further work toward highly automated driving</th>
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<tr>
<td>• Functional Safety, validation</td>
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<td>• Driver monitoring, driver analyzer</td>
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<td>• Architecture, higher bandwidth</td>
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<td>• Completeness and reliability of environment model</td>
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<td>• Investigations on correlation effects of automated vehicles</td>
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<td>• Platforms, building blocks of models, classifiers, functions, etc.</td>
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<td>• Standard models, standard designs</td>
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<td>• Integration of third party information, real-time and asynchronous (cooperative driving)</td>
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<td>• Legal questions</td>
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<td>• Investigations on necessary time span for re-involvement of driver who is out of the loop (hands on/off)</td>
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Summary and Outlook
We are close but some challenges remain

- Increasing the time span for driver’s mental diversification
- Completeness of environmental model
- Merging autonomous (vehicle based sensors) with cooperative data acquisition and validation
- Mixed mode traffic
  - Anticipate behavior of driver only vehicles and derive robust drive strategy
- Market challenge: Bring value to the very first buyers of automated systems
  - Congestions
  - Virtual valet parking
  - Road works zones
Acknowledgements