“Investigate how drivers’ intentions and actions should be taken into account in the design of partly and highly automated vehicles”

SAE Levels 2 & 3
An Iterative Process

State of Art

Use Cases

Research questions

Experiments

Human Factors Recommendations

Demo-vehicles

Demo-vehicle owners
## SoA and Categorisation of Research Questions

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<td>Environment state</td>
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Experiments

- 16 simulator studies
- 1 ADAS study for truck drivers
- 1 large web-based survey
- Over 400 car drivers
- 90 truck drivers
- 2743 web-survey respondents
- 17 MAIN Research Questions
New Concepts, Methodologies and Measures

- Simulating the ‘out of the loop’ concept
  - Can we achieve it?
  - Where do drivers look during automation?
  - Does this have an effect on their crash propensity?

- Using the Ambient Light Display for driver support at different levels of automation
  - Can we use the driver’s peripheral vision to provide information?
New Concepts, Methodologies and Measures

- How much time do drivers need to prepare for resumption of control?
- What is the optimal degree of information required for transition of control?
- Can an uncertainty signal keep drivers more aware of their surroundings?
New Concepts, Methodologies and Measures

- Can we provide effective, yet non-intrusive HMI for unpredicted, resumption of control?

- Is there a difference between continuous and discrete interaction for valet parking?
// *Some* of the Findings *(Please go to the posters for more details!)*

- Transition: Responses/reactions (e.g. touching steering wheel, or braking) in little as 3 seconds
  
- But this is *not* the same as safe and effective control!

Louw et al, submitted
Eye-tracking data can be useful for understanding driver attention during resumption of control.
// *Some* of the Findings *(Please go to the posters for more details!)*

- Engagement in other (2ndary) tasks increased resumption of control from automation

- **Ambient Lightm Display** can help with perception, comprehension and anticipation of information.

- No major **cultural differences**, across 12 countries, regarding usefulness of parking HMI
// *Some* of the Findings *(Please go to the posters for more details!)*

- Enhanced effectiveness of take-over request via:
  - Early take over announcements
  - Presentation of *continuous information*, regarding remaining time in automated mode
  - Displaying the necessary driving manoeuvre

Please take over!
**Some** of the findings *(have you been to the posters yet? They have biscuits!)*

- (Truck) HMI with fewer levels of automation preferred
- Less information on HMI preferred by truck drivers
- Higher traffic density resulted in quicker engagement of automation (Truck)

- Engaging/disengaging methods **not intuitive**
- Learning curve is shallow
Challenges and Next Steps

- Simulators are good for controlled studies but do not tell us about user experience in the real world
- Learning effects can be a problem - one failure is enough to change behaviour
- Experiments (what we ask people to do) need to become observations (what they actually do!)
- Difficult to study long-term effects of automation (e.g. fatigue)
- Today’s cabs will not tell us about tomorrow’s problems
- We do not know much about different age groups and abilities
Thank you.

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