Human Factors & User Awareness
Interactive Symposium
Vienna, 20 April 2018
Anna Schieben, German Aerospace Center (DLR)
Agenda for today

• Position paper on Human Factors
• Position paper on Social Acceptance and User Awareness
• Statements, voting and Expert discussion
  • New HMI for Automated Vehicles
  • Driver distraction
  • AV’s interaction with other road users
  • Social Acceptance and User Awareness
  • Testing/Validation procedures for AVs
Our speakers & experts on the podium

- Riender Happee, TU Delft
- Olivier Lenz, FIA
- Francois Fischer, ERTICO
- Evangelos Bekiaris, CERTH
- Satoshi Kitazaki, AIST
- Andreas Eustacchio, Attorney at law
- Arjan van Vliet, RDW Netherlands
Voting tool

• Polls
  • Online voting yes/no
  • [www.sli.do](http://www.sli.do)
  • Event code #EUCAD2018

• Questions/Statements
  • You’re invited to leave your questions, own statements and feedback online
Position papers

Riender Happee, TU Delft
Olivier Lenz, FIA
User and Societal Awareness, Acceptance and Behaviour
Interactive Symposium
Vienna, 20 April 2018
Riender Happee, TU Delft
2035

Safe, affordable transport system
Complex HF challenges

• Manual driving will be the exception
• AVs will share the road with pedestrians and cyclists which may communicate
• We have to design AVs, infrastructure and traffic management for many new AV to human interactions
Human Factors of Automated Driving

• 1-Automated vehicles allowing manual driving
  How can we ensure a safe evolution towards a future where manual driving is the exception?

• 2-All automation levels including driverless vehicles
  How can we ensure a safe interaction with all kinds of other road users?

• 3-Design and verification
  Can we sufficiently understand the human interaction with automation to propose systematic approaches for design and verification?
User and Societal Awareness, Acceptance and Behaviour

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Olivier Lenz, FIA
Need for User-Centric Further Research

- User centric
- User Awareness
- User-Car Interaction
- User Trust
- Ethics, Liability
- Data Protection
- Driver Training
- Acceptability & cost
Four Horizontal Impact Areas

Data Management

Mobility

User

Society

Ethics

Health

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Thank you!

www.connectedautomateddriving.eu
New HMI
Statements yes/no

• New smart, personalized HMI concepts, designed for high automation, will increase system robustness, user acceptance and overall comfort.

• We need new, adapted and fully integrated HMI systems that provide advanced comfort during Level 3+ automation.
Driver Distraction

Evangelos Bekiaris, CERTH
Statements yes/no

• Driver state monitoring is a pre-requisite for Level 3 (and lower) automated driving to ensure safe and smooth transitions.

• Driver monitoring systems should follow a hybrid approach to reach robust performance and use a combination of driver state, vehicle state, environmental context and personalised driver info.
Driver State Monitoring and its role on advanced safety and comfort of Automated Driving

Evangelos Bekiaris
Mechanical Engineer Ph.D.
CERTH/HIT Director
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In general...

To err is human

Lucius Annaeus Seneca
Driver Monitoring: Facts & Challenges

- Must have for L3 and lower AD
- Robustness only through hybrid systems (driver-vehicle-environment state assessment)
- Unobtrusive, “non-contact” monitoring
- Data fusion and decision systems
- Capturing the state is important!
  - Sleepiness; Inattention; Distraction; Stress; Excessive Emotion (i.e. anger, rage, anxiety); Rest; Other (i.e. faint)
- Operator monitoring for Level 4+ automated driving (especially for public transport fleets) should be researched.
Holistic approach required for all automated vehicles in all transition cases

ATTENTIVE LONG HAUL TRUCKING

LONG RANGE ATTENTIVE TOURING WITH MOTORBIKE

RIDER FAINT

PASSENGER PICK UP/DROP OFF AUTOMATION FOR BUSES

ELECTRIC VEHICLE RANGE ANXIETY

DRIVER STATE-BASED SMOOTH & SAFE AUTOMATION TRANSITIONS (CAR)

NON-REACTING DRIVER EMERGENCY MANOEUVRE (CAR)
AV’s interaction with other road users

Satoshi Kitazaki, AIST
Interaction of AV with other road users

Satoshi Kitazaki, Ph.D.

PI, SIP-adus National Project on Human Factors in Automated Driving
Director, Automotive Human Factors Research Center
National Institute of Advanced Industrial Science and Technology (AIST)
Japan
Question;
Do we need additional external HMI for Automated Vehicles to coordinate actions with other road users?

Answer; Yes.
Benefit structure of external communication

- Social acceptance
- Traffic efficiency
- Sense of security
- Safety
Experimental method

- An experiment in a closed field.
- The subjects pressed the button when they made a decision to cross.
- The subjects were also asked about their confidence about their decision.
Results; decisions

- All the subjects made a decision to cross with deceleration +“I am going to stop”
- However, effects of the messages were generally small when deceleration was large enough.
Results; confidence

- The messages gave confidence to the subjects except for “Automated driving”.

![Bar chart showing confidence levels for different groups and messages]

- Licensed
  - Non elderly
  - Non-licensed
  - Elderly
  - Children

- Non-licensed
  - Elderly
  - Children (8-10 y.o.)

- Very confident
- Confident
- Others

- Decel. only
- Decel +“After you”
- Decel +“I’m going to stop”
- Decel +“Automated driving”
Question;
Do Automated Vehicles need to fully understand the intentions of other road users and react accordingly?

Answer; Yes.
Optimistic anticipation (personal opinion)

- **Complicated situations requiring negotiations**
- **Situations requiring multiple communications**

Number of conflicts between AV and other road users:

- **No external communication**
- **One-way external communication**
  - AV ⇒ Other road user
- **Two-way external communication**
  - AV ⇔ Other road user

You must stop!
Statements yes/no

- We need additional external HMI for Automated Vehicles to coordinate actions with other road users.

- Automated Vehicles must fully understand the intentions of other road users and react accordingly.
Social acceptance & user awareness

Andreas Eustacchio, Attorney at law
Statements yes/no

• Accident liability should be removed from drivers of conditionally automated cars (SAE Level 3) who show typical and reasonable user behaviour.

• People should have the freedom to change options for the decisions taken by the cars (e.g. driving style).
AUTOMATED DRIVING

SOCIAL ACCEPTANCE AND USER AWARENESS

VIENNA, APRIL 20, 2018

Dr. Andreas Eustacchio, LL.M. (London LSE)
Rechtsanwalt (Attorney-at-Law, Austria)
Hon.Prof.(FH) – Cavaliere
“Like it or not, the robots are slowly taking over a driver’s chores.”

Popular Science Magazine, 1958
SMART CARS?

- connected and intelligent vehicles
- combination of mechanical and digital technologies
- new ways of communication, information, safety and security
- HAV (highly autonomous vehicles) and the humanoid robot on four wheels by way of AI (artificial intelligence)?
SOCIAL BENEFITS — SOCIAL ACCEPTANCE

- increase in road safety
  - around 90% of all accidents caused by human error
  - just a small percentage due to a technical fault related to the vehicle

- „crash-optimizing“

- power efficiency und e-mobility? “platooning”

- „the last driver license holder is already born“ (Mario Herger)
  - mobility for elderly people, children, physically disabled persons

- start-ups, innovation, new business models
(UN)WANTED SIDE-EFFECTS?

- cost-reduction in the logistics industry
- pay as you drive – new insurance models?
- hacking and „carnapping“ – security comes first?
- big brother is watching you – who will get your data?
- what happens with your data when you sell your car?
AUTOMATED DRIVING AND THE LAW?

- international road traffic agreements
- Infrastructure (5G), car2car, and test tracks
- national/international technical standards, risk assessment
- necessity of a driving license?
- databox: the cars‘ black box?
- national road traffic regulations
- ethical questions: who shall be protected?
  - criminal liability
- safety, civil liability, insurance
- product liability, product surveillance and product recall
- software-developer as producer?
- connected driving and BIG DATA:
  - data protection and data security
- are car producers telecom service provider?
- patent law and software license agreements
CARTRE 2018 – Vienna: Interactive Symposium on research & innovation for connected and automated driving in Europe

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Testing & Validation procedures

Arjan van Vliet, RDW
Statements yes/no

• Legal admission of SAE Level 3 automation requires human in the loop evaluation of take-over procedures.

• Legal admission of SAE Level 4 automation in vehicles with steer and pedals does not require human in the loop evaluation of take-over procedures.
RDW’s field of work
Vehicles becoming:

- Ever changing
- Ever learning
- Ever communicating

But what about the driver?
Dutch ADAS practice

- Low penetration rate ADAS <5%
- No clear definitions ADAS
- No clear registration ADAS
- Tax focus on CO2
- Poor instruction new users
Thank you for your attention!

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Next steps/Future research needs
Thank you!

www.connectedautomateddriving.eu