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Human Factors in International Regulations of Automated Driving Systems

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June 2020: An announcement from UNECE

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UN Regulation on Automated Lane Keeping Systems is milestone for safe introduction of automated vehicles in traffic

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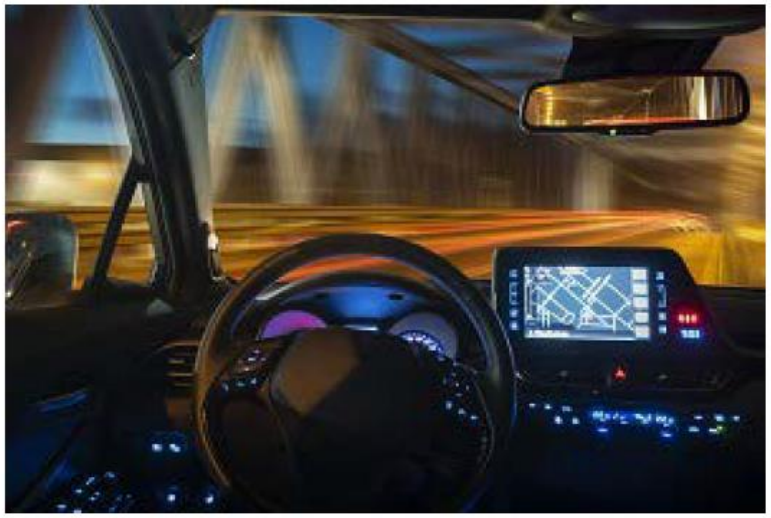
Some 60 countries have reached a milestone in mobility with the adoption of a United Nations Regulation that will allow for the safe introduction of automated vehicles in certain traffic environments.



The UN Regulation establishes strict requirements for Automated Lane Keeping Systems (ALKS) for passenger cars which, once activated, are in primary control of the vehicle. However, the driver can override such systems and can be requested by the system to intervene, at any moment.

Adopted yesterday by UNECE's World Forum for Harmonization of Vehicle Regulations, this is the first binding international regulation on so-called "level 3" vehicle automation. The new Regulation therefore marks an important step towards the wider deployment of automated vehicles to help realize a vision of safer, more sustainable mobility for all. It will enter into force in January 2021.

The UN Economic Commission for Europe (UNECE)

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- WP.29: The World Forum for Harmonization of Vehicle Regulations
  - Develops harmonised technical regulations for vehicles at a global level:
    - In some countries and regions (e.g. the EU these regulations automatically go into Whole Vehicle Type Approval
    - In North America, they go into self-certification

- WP.1: The Global Forum for Road Traffic Safety
  - Geneva and Vienna Conventions
  - Rules of the road
  - Driver regulation
  - Driver and rider behaviour
  - Road user safety
  - Road signs and signals

Who participates in meetings?

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- “Contracting Parties”
  - UN Member States + the EU

- NGOs
  - e.g. OICA (global organisation of vehicle manufacturers, ISO, etc.

What kind of expertise?

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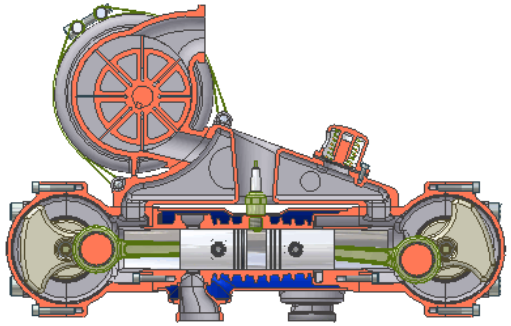
WP.29: The World Forum for Harmonization of Vehicle Regulations

Mainly vehicle engineers



WP.1: The Global Forum for Road Traffic Safety

Mainly lawyers

And WP.1 and WP.29 hardly interact

Working Groups on automation at UNECE

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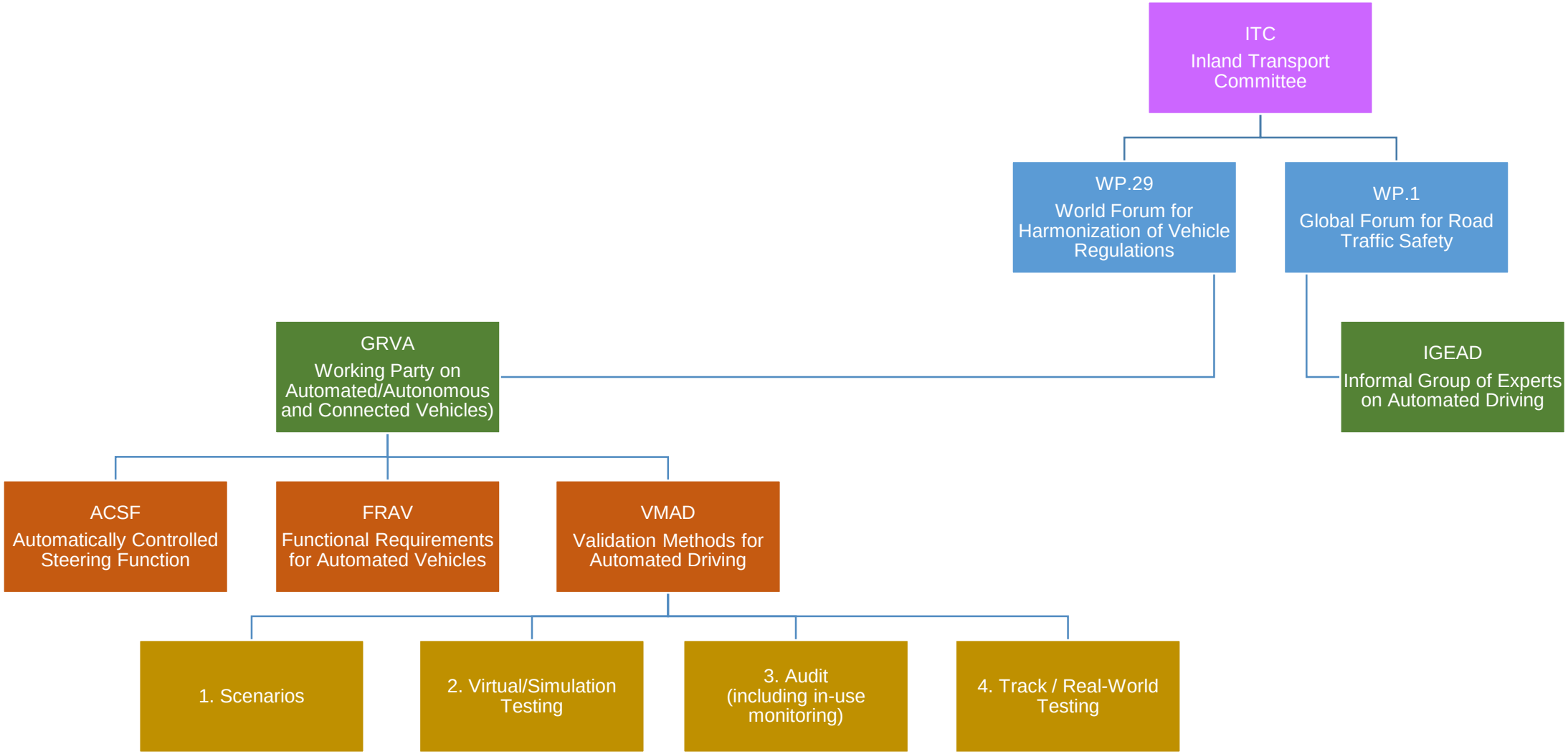

So where is the human factors expertise?

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- Lacking in WP.29
- Lacking in WP.1

A new group: HF-IRADS

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- *"Human Factors in International Regulations for Automated Driving Systems"*
- Organised under the auspices of the IEA which has NGO status at UNECE
- Aims to provide expert human factors support to the UNECE on vehicle automation in the areas of vehicle regulations and road safety
- Participants from U.S., Canada, Australia, Germany, Italy, Japan, the Netherlands, Sweden and the UK

HF-IRADS work so far

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- Comments on the IGEAD/ WP.1 draft resolution on *Activities other than Driving*
- Submission to WP.1 and GRVA of a *Position Paper on the Human Factors Challenges of Remote Support and Control*
  https://www.unece.org/fileadmin/DAM/trans/doc/2020/wp1/ECE-TRANS-WP1-SEPT-2020-Informal-8e..pdf

  https://www.unece.org/fileadmin/DAM/trans/doc/2020/wp29grva/GRVA-07-65e.pdf

IEA International Ergonomics Association

HF-IRADS position paper on remote control and operation

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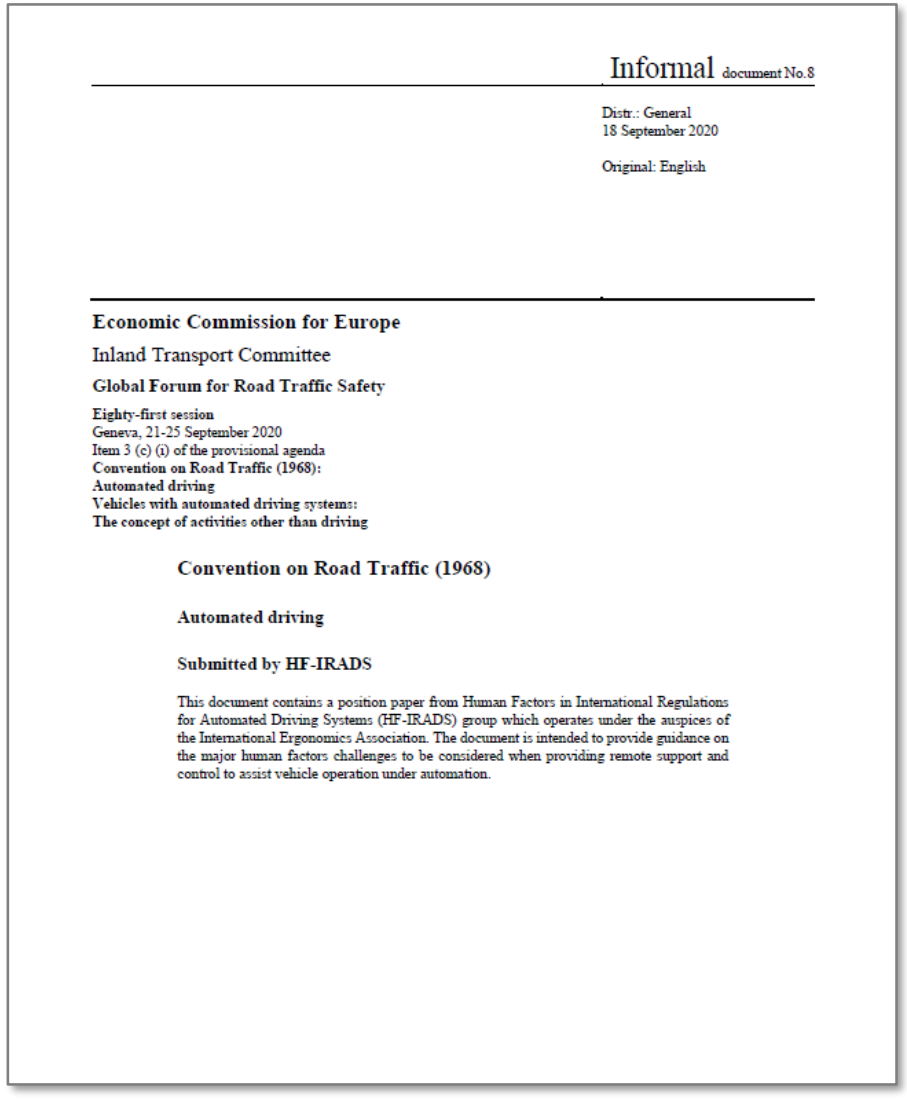

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Inland Transport Committee

Global Forum for Road Traffic Safety

Eighty-first session
Geneva, 21-25 September 2020
Item 3 (c) (i) of the provisional agenda
Convention on Road Traffic (1968):
Automated driving
Vehicles with automated driving systems:
The concept of activities other than driving

Convention on Road Traffic (1968)

Automated driving

Submitted by HF-IRADS

This document contains a position paper from Human Factors in International Regulations for Automated Driving Systems (HF-IRADS) group which operates under the auspices of the International Ergonomics Association. The document is intended to provide guidance on the major human factors challenges to be considered when providing remote support and control to assist vehicle operation under automation.

Covers:

- Categories of remote support and control
- Management of the remote environment
- Training and personnel
- Controls and displays
- Communication channels
- Needs of passengers in the vehicle
- Service design, including definition of the ODD for a service

IEA International Ergonomics Association

Categories of remote support and control

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We distinguish:

1. ***Remote assistance***, e.g. by a service provider to provide support and breakdown assistance
2. ***Remote management***, analogous to air traffic control, to allow a remote controller to assist when a vehicle requires authority to move or deviate from a prescribed path
3. ***Remote control***, which could extend from limited path guidance (e.g. around road works) to full remote driving at low speed or even high speed

IEA International Ergonomics Association

Conclusions of the *Position Paper*

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- Remote control and operation is complex. It should not be assumed that remote handling constitutes a viable backup for problems encountered by vehicles under the control of an ADS
- Thorough investigation of different use cases is needed. A safety case should be prepared for each specific application of remote support and control. Currently, there is a lack of evidence that remote vehicle operation on public roads can be performed safely.
- The proper design of the work environment for remote control and operation is vital.

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Implications of the *Position Paper* for UNECE WP.1 and WP.29

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- WP.1
  - The WP.1 Resolution on the Deployment of Highly and Fully Automated Vehicles in Road Traffic states that an Automated Driving System "refers to a vehicle system that uses both hardware and software to exercise dynamic control of a vehicle on a sustained basis."
  - No mention is made of any possible assistance from or fallback to a remote centre. In any new version of this text, there should be consideration of the possibility of remote support, and thus the definition of an Automated Driving System may need to be expanded so as to encompass any required remote support.
- WP.29
  - The WP.29 Revised Framework document on automated/autonomous vehicles states that "an automated/autonomous vehicle shall not cause any non-tolerable risk". A definition of an "automated/autonomous vehicle" is not provided, but there is no mention of remote support as means of assistance, and remote support is not listed in the priority items.
  - It is therefore suggested that a whole system approach be adopted in GRVA and its sub-groups and that remote support be added to the list of priority issues to be addressed.

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“Commonality” of HMI

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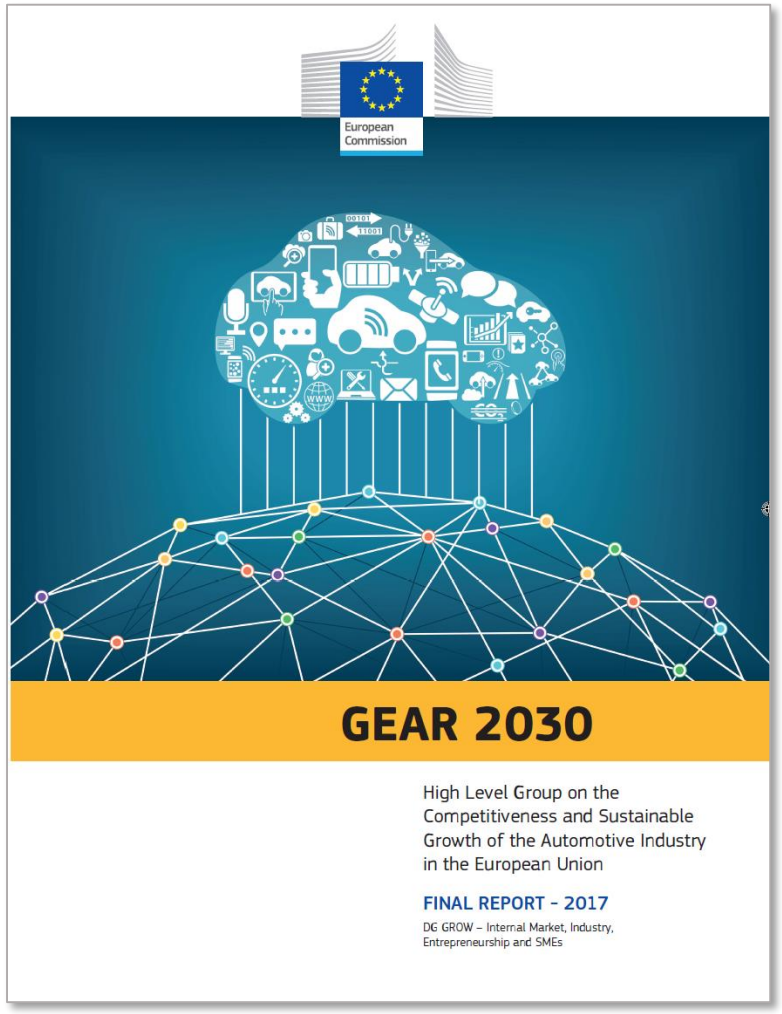

Annex on HMI states:

For automated vehicles with a driver (levels 2, 3 and 4) there is the risk of human operator confusion if the designs of HMIs are substantially different across vehicle makes and models. Therefore the major information and interaction features of the HMI should be designed in a way that allows intuitive and easy accessible control of the vehicle functions and must have a high level of commonality…

What is “commonality”?

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- From a human factors perspective, it could perhaps be defined in terms of its opposite: we don’t have commonality when we need to form a new mental model of a system
- So commonality supports the user in his/her existing mental model of a system, when transferring to a new or unfamiliar product
- At a more specific level, it means that the high-level features of the design are the same
- This still allows for distinctiveness (brand identity) in lower-level features

The Cadillac Type 53, 1916

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The vehicle that set the template for control layout and dashboard

1929 Skoda 422

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- Brake pedal on the right
- Accelerator pedal in the middle
- Clutch pedal on the left

Symbols currently in use for systems providing Level 1 and Level 2 assistance

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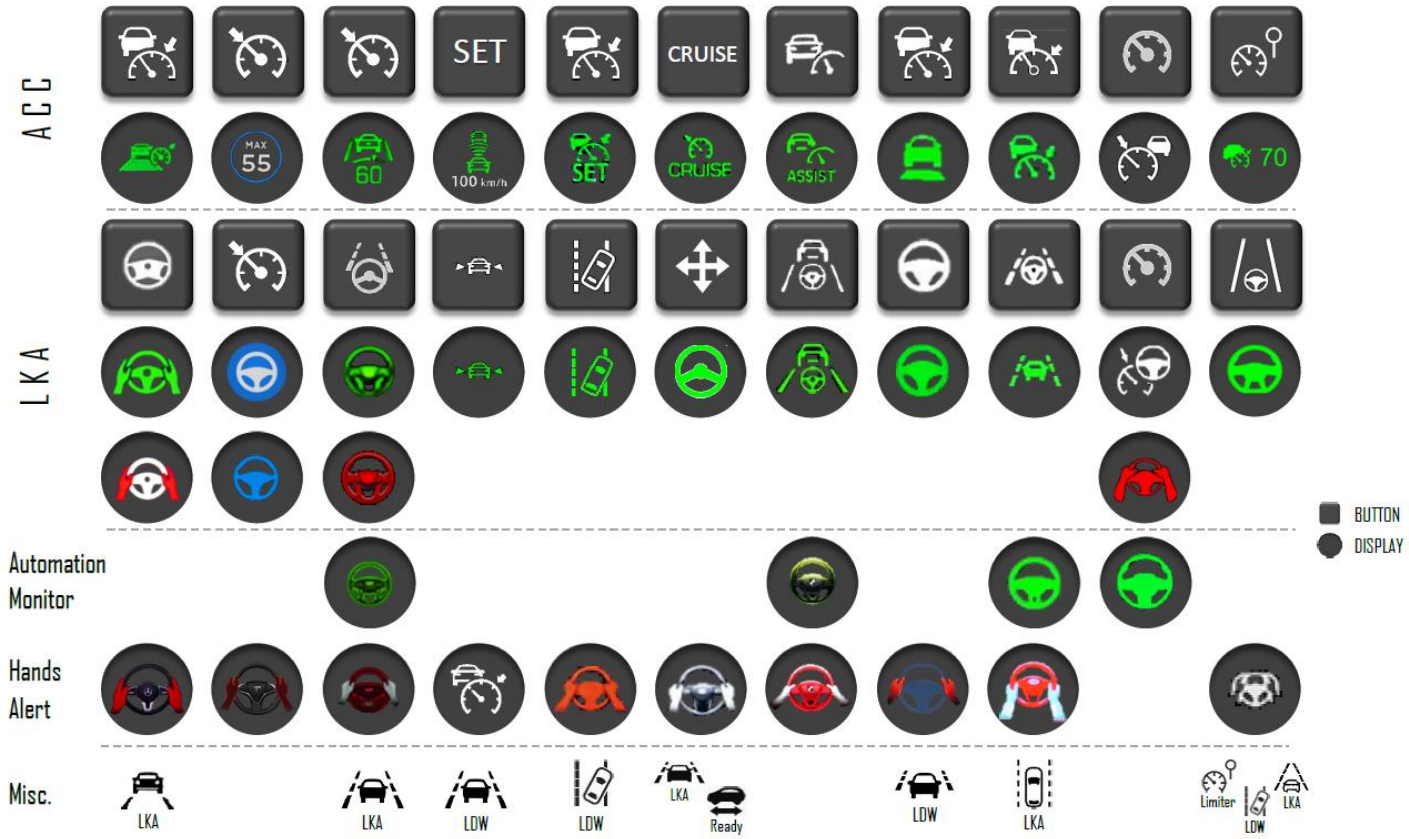

Each column represents a different manufacturer

Discussion

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- There is still a challenge in bringing a human factors perspective to international regulation of automated driving systems.
- Usability is not sufficient — we need to create a universal design for the HMI in automated vehicles
- This task will be more challenging than the creation of the original road vehicle HMI
- The design needs to encompass manual driving, assisted driving and automated driving

Thank you for your attention!

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