

Humanising automation: fitting automation to the human

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Human Factors should not be an afterthought in designing road vehicle automation, but baked in from the start

“It is increasingly recognised that human factors issues must be considered as a central part of development thinking. Experience shows that it is ineffective to address them as an afterthought. The risks associated with poor human factors can best be avoided by starting human factors activities as early as possible in the design process and continuing them throughout.”

BAE Systems report for the UK Health and Safety Executive, 2002

That means:

1. Human-centred design from the beginning, but it should also mean
2. A human-centred regulatory processes

Think about who: not carefully selected and trained
airline pilots but diverse mostly non-professional drivers



Don't blame users for the shortcomings of ADS

Conclusions of HF-IRADS on user responsibility

- When an ADS is operating the vehicle, the safety of driving is the responsibility of the manufacturer
- It cannot be expected that the human driving in a vehicle with automated systems can take back control immediately and with “high quality”
- ADS should be designed in the hope that humans will be responsible and responsive, but in the expectation that they will not

Addressing mode errors: simplicity

I would suggest replacing the SAE Levels of Automation with three human-facing levels:

1. I am driving
2. I am assisted in driving, but I am responsible for the safety of the driving task
3. My vehicle is driving for me and so I can engage in NDRA
 - Even airline pilots can sleep in their seats under the rules for “controlled rest”

We are not licensed just to drive a single vehicle

- Users need to be able to transfer easily from driving one vehicle to driving another
- **Commonality** (harmonised design)



Skoda 422 of 1929

Social interaction

- Personality is a big risk factor in human driving
- Is the Tesla “dial” of personality (“Assertive Mode”) a good idea?
- Such a feature could end up with more confusion for other road users interacting with AVs
- Do potential users want such a feature?
“Agreeable, conscientious, and stable. These are three human personality traits that, it turns out, we want to see in our driverless cars regardless of whether we possess them ourselves, according to a new study from the University of Michigan.” (Michigan Engineering News, 7 November 2019)

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Tesla’s ‘Full Self-Driving’ beta has an ‘assertive’ driving mode that ‘may perform rolling stops’

Drivers can choose from Chill, Average, and Assertive profiles

By [Emma Roth](#) | Jan 9, 2022, 7:12pm EST

The design process

- If we agree on the principle of high-level commonality, we only need to do the full design process *once*
- But we need to do it right
- We need a combination of:
 - A top-down vision
 - Thorough experiments with users on the manifold choices for the details

Then

- Certification becomes much more straightforward
- Does it stop **innovation**? No, but for any novel idea, it would be necessary to demonstrate that users can still shift from one vehicle to another
- Examples from the past:
 - Automated transmission (good), (but it can be noted that there is a standard PRNDL pattern on the lever)
 - Single pedal to replace the accelerator and brake pedals (bad)

Back to the core of WP.1 responsibilities — the driver and driver training

- We need to explore how best to provide users with appropriate mental models of ADS functionality
- The best means for ensuring that this process is not too difficult or does not result in incorrect mental models is good design
- My **top 3 design principles** for ADS are:
 1. Commonality: all vehicles have high-level similarity in HMI
 2. Simplicity: only three Levels of Automation
 3. Clarity: clear indication of the user role and of any upcoming change in role

A precedent



Cadillac Type 53 of 1916

- This should be one of the most famous vehicles of all time
- It set the template for all modern road vehicles
- We need an HMI design that is equally simple and capable for the manual/assisted/automated vehicle of the future

Thank you for your attention!

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