# PROCEDURE FOR TRANSPARENT LEVEL 2 AV HMI

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It might sound easy to let automated system assist you or even drive for you. But do we really know what they are doing? In this research, we aim to develop a procedure for transparent AV HMI (Human Machine Interface) which allows human users to correctly and easily understand the status of the automated vehicle.

## WHAT DO WE KNOW ABOUT THEM?

Here we have 3 HMI images took from vehicles equipped with Level 2 automated systems. Please observe and try to answer the following questions:

1. Is the automated system controlling longitudinal movement?

2. Is the automated system controlling lateral movement?

3. Could you activate Level 2 automation? (the system takes over both longitudinal and lateral control)



(HMI image of Tesla Model 3, Tesla 2021)



(HMI image of BMW 3 er, BMW 2021)



(HMI image of VW Passat, VW 2021)

Did you get all of them right? Obviously, not all of them are easy to understand, and should be even harder for those who use this system for the first time. In the work of Boelhouwe et al. (2020), a significant amount of driver using ADAS system did not receive any information regarding the ADAS (Advanced Driver-Assistance Systems) equipped. In many cases, users tend to learn about how the system works by trial-and-error. Hence, it is critical to have a transparent HMI that could easily be understood, so that the risks of accident could be minimized.

Answer: Tesla HMI: No/No/Yes; BMW HMI: Yes/No/Uncertain; VW HMI: Yes/No/Uncertain

## PROJECT OUTLINE

To achieve our ultimate objective, i.e., developing a procedure for transparent AV HMI, the following sub-goals should be fulfilled:

- A standardized transparency assessment method

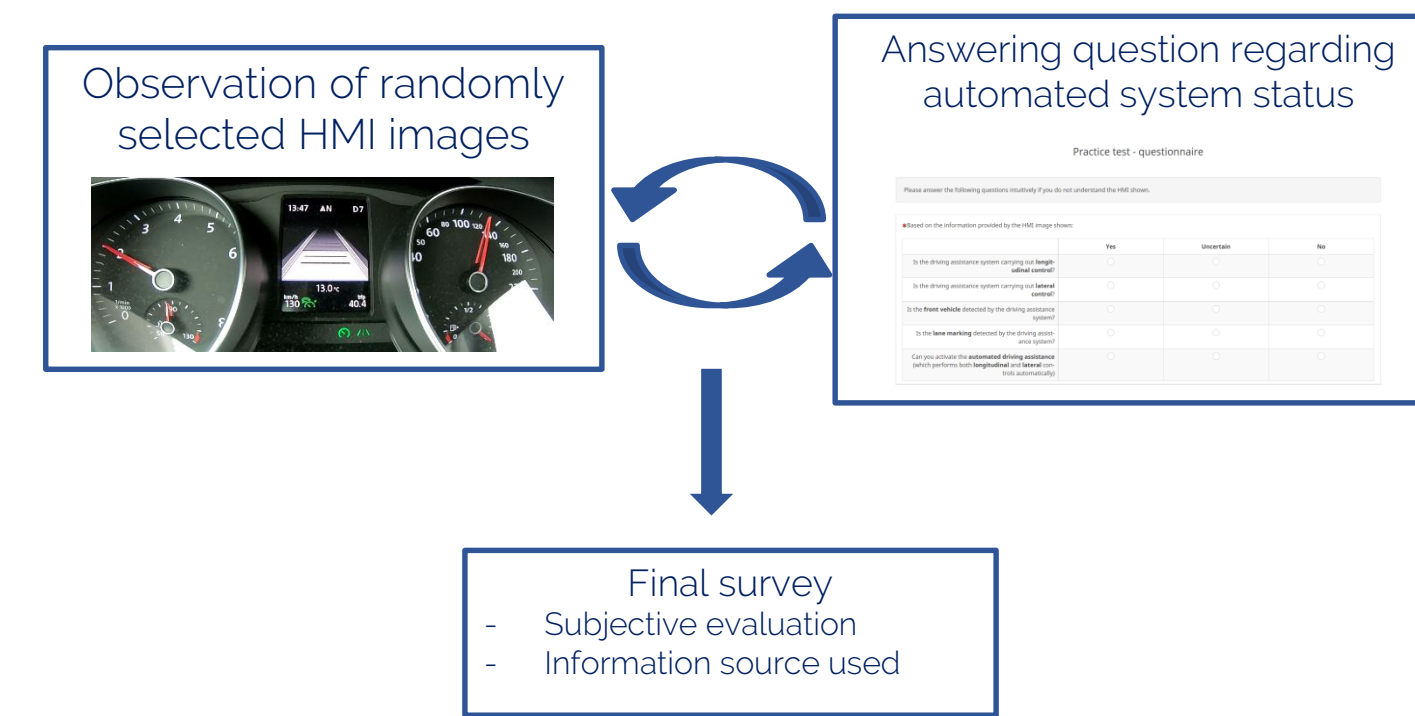- Identify variables affecting perceived transparency

Together, we will have a systematic way to evaluate the transparency of the HMI, and to design one.

## 1st STUDY: ASSESSING LEVEL 2 AV TRANSPARENCY

In the first study (online study), participants are asked to observe multiple HMI images in random orders. Then, questions regarding the understanding of the situation will be evaluated. In the end of the survey, participants are also asked to identify the information used while answering the questions. The objective of this study are:

- Define transparency assessment method

- Verify if different HMI designs result in different perceived transparencies

- Identify critical information source on HMI designs

Below is a brief flow chart of the experiment:



Observation of randomly selected HMI images

Answering question regarding automated system status

Final survey
- Subjective evaluation
- Information source used

## FUTURE OUTLOOK

The data collected from the first study is now analysing. In the mean while, similar experiments using driving simulator would soon be conducted as a validation for environments with higher fidelity.

## SUPERVISION AND CONTACT DETAILS

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## AFFILIATIONS AND ACKNOWLEDGEMENT

Boelhouwer, A., Van den Beukel, A. P., Van der Voort, M. C., Hottentot, C., De Wit, R. Q., & Martens, M. H. (2020). How are car buyers and car sellers currently informed about ADAS? An investigation among drivers and car sellers in the Netherlands. Transportation Research Interdisciplinary Perspectives, 4, 100103.