

Workshop Introduction on HMI Design in the Context of DMS and Automation: How Should the System Respond?

Seeing Machines hosted a workshop on Human-Machine Interface (HMI) Design in the Context of Driver Monitoring Systems and Automation with ITS Leeds and RDW (The Netherlands Vehicle Authority). This was presented at the 2023 Automotive User Interfaces conference in Ingolstadt, Germany. They explored issues with DMS-HMI integration, considering this in both manual and assisted driving environments. This document is a summary of the workshop introduction.

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With driver fatigue and distraction-related crashes on the rise, real-time Driver Monitoring Systems (DMS) have gained increasing attention from regulators and leading road safety bodies worldwide. These in-vehicle technologies can help advanced driver assistance system (ADAS) features adapt to high-risk behaviours and encourage behavioural change in drivers to reduce the likelihood of a serious accident.

DMS refer to a category of safety features that are used to infer information about a driver's state or behaviour. There are two main categories of DMS: 'indirect' and 'direct'.

DMS are increasingly considered an important factor in understanding driver-vehicle interaction. However fully realising their safety potential requires accurate monitoring be paired with effective HMI to facilitate behavioural change when risky behaviours or unsafe driver states are detected.

"DMS as a solution to risky driver behaviour requires both reliable detection of driver state and an effective system response (or set of responses) when a risky state is detected".

System responses can range from driver alerts to adapting the vehicle's ADAS in real time, based on a driver's detected capacity.

The challenge is determining when and how a system should respond, taking into consideration a range of factors.

These include:

- the nature of different driver states (voluntary/ involuntary, transient/progressive)
- the levels of risk (criticality and immediacy)
- physical elements (for example, visual cues will be ineffective for a driver who has fallen asleep) and
- a driver's perception of their own state and the associated risk (will affect how receptive they are to HMI and vehicle intervention strategies).

"The design of vehicle responses must balance perceived risk and legality of driver states with the actual and immediate risk that particular impairment states represent".

While presenting unique challenges, DMS allow for continuous, real-time feedback on a driver's response to HMI, providing the opportunity for adaptive alerts and escalation should they continue to ignore warnings.

