Visualizing Object Detection Algorithms in Highly Automated Vehicles to Improve Remote Assistant's Understanding of the Automated Driving System

Thorben Brandt[1], Stefan Brandenburg[2], Marc Wilbrink[1], Michael Oehl[1]

[1]*German Aerospace Center, Institute of Transportation Systems, Braunschweig*

[2]*University of Technology, Chemnitz*

E-Mail: thorben.brandt@dlr.de

The legal implementation of highly automated vehicles (HAV, SAE L4) in Germany into traffic depends on the availability of a technical supervisor who can be operationalized as a remote assistant. A HAV utilizes artificial intelligence (AI) that help execute the driving task. Though, this AI is highly capable to execute the driving task, but faces still technical limitations that can cause minimal risk maneuvers (MRM) in which the vehicle would stop. A remote assistant can provide support during an MRM and expand the HAV's capabilities. The effectiveness and feasibility of this depends on the remote assistant's understanding of the system. To improve the assistant's understanding a transparent human-machine interface (HMI) can be used. However, how system transparency can be achieved in an HMI for remote assistance is still unclear. Providing information about the vehicles object detection, for example by boxing detected objects, may improve understanding of the remote assistants. In an experimental online study, we investigated the influence of system transparency using different variants to highlight detected objects on the understanding of remote assistants towards the HAV's AI during an MRM. Participants experienced different MRMs in which they received information about the AI-based object detection via an HMI that augmented the vehicle's video streams (boxing vs. saliency mapping vs. combined). Results provide insights into transparent HMI design for remote assistance, to improve the understanding towards the HAV's AI. This supports the development of remote operation HMIs for an efficient and safe implementation of remote assistance into highly automated driving systems. [250 words]

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