Abstract

With the introduction of assisted and automated driving functions, driver-vehicle interaction fundamentally changes. In that context, drivers' mental models of these functions play a central role. However, due to the novelty of these systems it can be assumed that a lack of knowledge and misconceptions of automated functions are common among drivers. For this reason, this thesis sought to shed light on the question of how the formation of adequate mental models can be supported, and to derive recommendations on the design of driver instruction for assisted and automated driving functions.

In a first study ($N = 45$), the effect of lack of information prior to the first assisted/automated drive on drivers' mental model formation, attitudes, and interaction with the automated vehicle was assessed. The results of this study emphasize the relevance of driver instruction and its benefits for mental model formation and attitudes towards the vehicle. Based on these findings, the focus of the following three studies was to develop recommendations for approaches to driver instruction.

In that context, intrinsic motivation to learn can be expected to be central to enhance learning outcomes. In an online study ($N = 220$), elements aimed at enhancing learning motivation were added to an instruction on assisted and automated functions, and their effects on learner motivation and mental model formation was assessed. Results indicate that elements providing feedback to the learner on their progress on the instruction help to increase learning motivation.

Based on this finding, a gamified instruction was developed and subsequently evaluated in a driving simulator study ($N = 65$). Gamification is expected to increase intrinsic motivation and thus learning outcomes. Indeed, this study showed that gamification benefits learning motivation, mental model formation, and reliance behaviour.

In order to make user education easily accessible to drivers, the fourth study within this thesis comprised the development and evaluation of a tutorial concept that supports drivers *during* their first drive with an automated vehicle. Results ($N = 32$) indicate that learning during the drive can be as efficient as before the drive, and benefits acceptance of the automated driving function as well as driver interaction with it.

Overall, this thesis provides recommendations for the design of driver education for drivers of current and future automated vehicles. It emphasizes the need to consider learner motivation as a central element of instructional design and provides evidence of the positive effects that low threshold driver education for automated functions can have.