Augmented indication of lane change intention - Creating an assistive HMI using design thinking

Adrian Haar, Frederik Schewe, Andro Kleen, Martin Schmettow, Willem Verwey

*Group Research, Volkswagen AG, 38448 Wolfsburg, Germany
bUniversity of Twente, 7522NB Enschede, The Netherlands

INTRODUCTION

- Traffic becomes denser, space is limited and drivers interact more frequently. This raises the need for cooperation to ensure smooth traffic flow. The application of modern head-up displays (HUD) offers an ideal possibility to support cooperative interactions.
- Nowadays, information transmitted between drivers is often limited by the binary nature (on or off) of turn indicators.
- Therefore, the opportunity to provide additional information about upcoming lane change maneuvers of other cars in the drivers HUD was evaluated.
- The design process of this novel HMI was inspired by the well-known design thinking process illustrated in Figure 1.

METHOD

- Following the design thinking process, at first, four different design variations were developed by understanding, observing, defining and brainstorming.
- Using a low fidelity simulation, these designs were then prototyped and evaluated with naive participants (n=8).
- A combination of thinking aloud, interview, user sketches and questionnaires was used.
- Figure 2 summarizes the ratings of the participants on the van der Laan-scale (Van Der Laan, Heino, & De Waard, 1997). The O in Figure 2 illustrates the rating of a fictive own concept that the participants were asked to sketch.

RESULTS

- Using the results of the first iteration distinct design features of an HMI supporting the perception of others intention were developed. Based on that knowledge an optimized design was created.
- In a validation study with additional naive participants (n=8), this optimized design was than tested and compared to the previous design alternatives.
- The ratings regarding usefulness and satisfaction showed substantial improvements achieved by the optimized design (Figure 3).
- The optimized design was also described as more elaborate and convenient.

DISCUSSION

- The results of both study iterations, show a high overlap regarding the design alternatives which indicates that a high validity could be reached.
- The qualitative nature and the low sample size of this approach do not allow for further generalization.
- However the goal of this approach was to develop a design that is easily understandable and is based on the actual user needs and not merely on the intuition of the designer.
- Achieving these results within a short period of time (two weeks in total) proved the value of design thinking and rapid prototyping during the HMI development process.

References:

Design thinking and rapid prototyping proved to be valuable in the HMI design process and can be utilized to generate user centered insights at an early stage.