

Research Report Summary



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Designing an Informative Interface for Transfer of Control in Level 2 Automated Driving System

Level 2 vehicles may encounter several situations where the system cannot work properly and the driver must take back control. The objective of this study is to develop and test an in-vehicle interface for use in these situations, with a focus on delivering feedback and alerts when drivers need to make a manual transition between Level 2 and Level 0.

The study was conducted in three experimental phases. Phase I focused on iterative development of the in-vehicle interface through an observational study conducted on a driving simulator followed by an interview. Results from the first phase were used to conceptualize and design a prototype interface. In Phase II, another group of participants were provided with prototypes in a co-design session. Results from this experiment were aggregated

to prepare a second prototype, which was applied to the driving simulator cab's dashboard. This was followed by a heuristic evaluation, carried out by four human factors specialists, to improve the design. Prior to the third phase, a pilot session was conducted to finalize the design. In Phase III, 42 participants were recruited to test the effectiveness of three interfaces (Original, Basic, and Advanced) on a driving simulator. All participants drove six scenarios in automated mode and one manually. During the experiment, we measured performance and situation awareness in transfer of control situations.

Driving Simulator



Original Dashboard



Basic Dashboard



Advanced Dashboard



Example Scenario



Outcomes

The results from Phase III showed that the percentage of participants who successfully took back control was higher in the Advanced group than in the Basic and Original groups. The results also showed that participants in the Advanced group took back control sooner than participants in the Basic and Original groups. SART questionnaire responses indicated that participants in the Advanced group were more situationally aware than participants in the Basic and Original groups. The figures below present the percentage of participants who successfully took back control, the average time to collision, and the average overall SART scores for each group.

Impacts

Results showed that the performance and satisfaction of drivers improved significantly when using the Advanced dashboard. Overall, this study showed that drivers' performance could be improved by providing additional information to drivers (e.g., roadway information) when they are operating Level 2 vehicles. This study adds to the limited literature regarding dashboard design for Level 2 vehicles and also provides implementation suggestions for both commercial vehicles and future research.

