

6th German Conference on Rail Human Factors 18th/19th February 2025

Performance and usability testing of a tablet based train remote control

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In the project 'Automated Regional Trains in Lower Saxony (ARTE)' the project partners ALSTOM (Alstom Transport Deutschland GmbH and Alstom Signal GmbH), the German Aerospace Centre (DLR) and the Department of Rail Operations and Infrastructure (BBI) at the Technical University of Berlin (TUB) are researching highly automated train operation (Grade of Automation 3 and 4, GoA 3/4) in today's rail network on the existing ALSTOM Coradia LINT 41 regional train. The train uses various sensors to recognise obstacles and interpret trackside signals.

In addition to automation in GoA 3 and 4, another focus of the project is the development of simple, mobile train remote control using a tablet computer for fallback operation. Remote Train Operation (RTO) is to be used in the event of a malfunction of the Automatic Train Operation (ATO). It is a lean technical solution that allows employees to control the vehicle remotely or on site via the tablet user interface. Hereby the consequences of a malfunction at the ATO can be compensated, tracks cleared and passengers transported to the next station.

Three user tests for the Z21 app and its development and iteration steps were carried out for remote control (RTO) using a tablet computer. A first test was carried out in a model railway setup and a second test with the real LINT 41 vehicle on the Alstom test track at the Salzgitter site. A third test was conducted with train drivers and train attendants on the public line between Northeim and Bodenfelde.

The aim of these user tests was firstly to investigate whether a tablet is a viable solution for remote control. Secondly to specify basic functions and information displays. And thirdly to research train driving performance, usability and user acceptance of the tablet remote control. Therefore, tests were carried out from different working positions. The usability of the remote control itself as well as the driving performance as a result were measured. Results were used for an iterative improvement of the user interface.

At the 6th German Conference on Rail Human Factors we aim to present our testing and latest results and review the development course throughout the tests. Finally, we like to raise a discussion with the audience on further ways of researching remote train driving on mobile devices, connecting it with existing research from other fields and raise ideas for research and testing on unresolved issues in this field.