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Passenger Information in Rail Transportation: A Virtual Reality Study

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The aim of this study is to provide a basis for recommendations on the design of information systems in railway stations in order to increase the efficiency of passenger flow, thus reducing passenger changeover times on the platform and ultimately enabling a more efficient rail transport network. In the study we analyze how different types of information about an arriving train are evaluated by passengers. The two types of information in focus are information about the occupancy level within each wagon of the train and information about doors of the train, exclusively intended for boarding or alighting. In addition, it will be tested how participants perceive different ways of presenting the information. For both types of information, three different modes of presentation are tested separately: (1) A display directly on the arriving train near the doors, (2) two display screens at the platform and (3) a display on the smartphone. To this end, a virtual reality study will be conducted in which participants experience the scenario of an arriving train in a simulated railway station environment six times in total. After each scenario, a questionnaire is presented containing items on various aspects of usefulness and usability. Additionally, the level of simulation sickness is assessed after each scenario. After the three presentation modes have been tested and evaluated separately, the participants are also asked to rank the three modes in terms of usefulness and usability aspects. Each participant will be asked to review both types of information.

The experiment starts with two training scenarios that allow the participants to get used to the virtual reality (VR) simulation and the controls. The sequence within the following evaluation scenario is as follows: The participants start at a certain point at the platform and have some time to orientate and view the information if already displayed. After 20 seconds, the train arrives. The participants now decide which wagon door they want to board, based on the information that was presented. The scenario ends shortly before the participant reaches the door and the test person is redirected to the questionnaire.

The evaluation criteria focus on comprehensibility and usefulness of the information. In addition, differences in usability between the different types of presentation are to be evaluated in order to identify, which form of presentation is most effective for the given type of information. This can be particularly important in scenarios with a high density of information, as is often the case in railway station environments.

Data collection is due to start at the beginning of November, with a target sample size of around 30 participants. The use of VR technology will create a controlled and realistic railway station scenario to provide comparable results between the different types of presentation and provide an accurate picture of the usability of the respective information presentation.