

# Simulator Fidelity Influences the Sense of Presence in Driving Simulators

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## INTRODUCTION

Driving simulation, like other VR applications, aims to achieve a sense of being present in the virtual environment, also often referred to as (virtual) presence.

A strong sense of presence is believed to foster a realistic driving behavior in the simulator, which is a necessary condition when conducting human-centered research in simulated driving environments.

## FACTORS INFLUENCING PRESENCE

Presence was suggested to be influenced by *internal* and *external factors*. Internal factors depend on the interindividual influence, while external factors refer to the objective properties of the virtual environment. One external factor that is often hypothesized to influence presence is simulator fidelity. In the presented study, we therefore investigated the influence of simulator fidelity on presence.

## STUDY SETUP



Does simulator fidelity influence presence?



50 subjects (M = 40 yrs, SD = 9 yrs), 14 % female



driving scenarios: country road, driver tasks, parking, urban

WITHIN-SUBJECTS



Igroup Presence Questionnaire (IPQ),  
Slater-Usoh-Steed Presence Questionnaire (SUS\*)

## DRIVING SIMULATORS

WITHIN-SUBJECTS



### lower-fidelity simulator

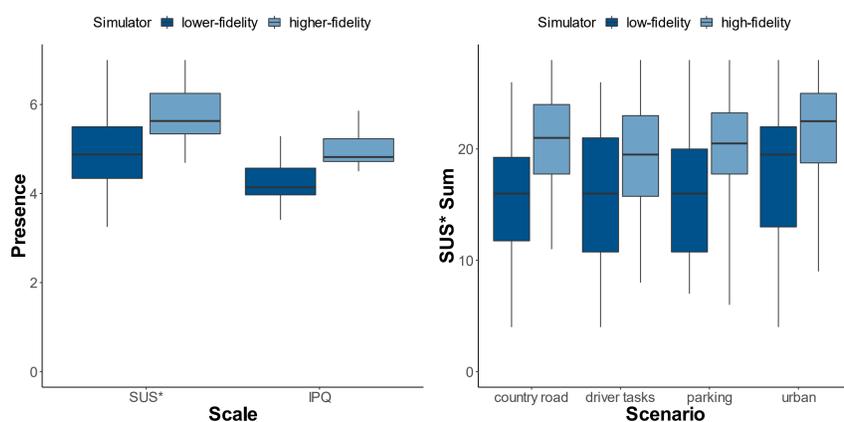
10 x 75" LED TV screens, 180° field of view  
static  
full-vehicle mockup



### higher-fidelity simulator

15 x projectors, 360° field of view  
dynamic, 6 DOF + redundant yaw table  
full-vehicle mockup, 18\*21 m x, y excursion

## RESULTS



## IMPLICATIONS FOR AUTOUI

Driving simulation is one of the most frequently used research tools in the Automotive UI community. In order to create an utmost realistic experience in simulated driving environments, factors influencing presence must be understood better. With a higher sense of presence drivers are expected to behave more natural in the driving situation.

## CONCLUSION

The present paper can serve as the basis for further considerations, as it was successfully demonstrated that presence differs depending on simulator fidelity. This knowledge can be used to further investigate the relation of presence and behavior in the driving simulator. It should also be further investigated which exact simulator factors contributed to the observed higher sense of presence in the high-fidelity simulator.

Full text:

