Impact of the visual representation of the input device on driving performance in a power wheelchair simulator

A Alshaer[1], D O'Hare[2], S Hoermann[3], H Regenbrecht[4]

[1,4]Department of Information Science, [2]Department of Psychology, [3]Department of Medicine (DSM)
Otago University, Dunedin, NEW ZEALAND

[3]School of Electrical and Information Engineering,
The University of Sydney, NSW, AUSTRALIA

[1]*alsab548@student.otago.ac.nz,* [2]*ohare@psy.otago.ac.nz,* [3]*simon.hoermann@otago.ac.nz,*
[4]*holger@infoscience.otago.ac.nz*

[1,3,4]*www.hci.otago.ac.nz,* [2]*www.otago.ac.nz/psychology*

ABSTRACT

Virtual reality-based power wheelchair simulators can help potential users to be assessed and trained in a safe and controlled environment. Although now widely used and researched for several decades, many properties of virtual environments are still not yet fully understood. In this study, we evaluated the effects of the visual representation of the input device in a virtual power wheelchair simulator. We compared the virtual display of a standard gaming joystick with that of a proprietary power wheelchair joystick while users used either of the real world counterparts, and measured the effects on driving performance and experience. Four experimental conditions comprising of two visual virtual input modalities and their two real counterparts as independent variables have been studied. The results of the study with 48 participants showed that the best performance was obtained for two of three performance indicators when a virtual representation of the PWC joystick was displayed, regardless of what type of joystick (real PWC or gaming joystick) was actually physically used. Despite not explicitly being made aware of by the experimenter, participants reported noticing the change in the visual representation of the joysticks during the experiment. This supports the theory that the effects of virtual reality representations have a significant impact on the user experience or performance, and visual properties need to be carefully selected. This is specifically important for applications where the transfer effects to real world scenarios is sought and ecological valid simulation is aimed for.

Full papers will be published in the Conference Proceedings and will be freely available to delegates at the conference and online on September 20, 2016.