



1 TUTORIAL on Human-Centered Design and Evaluation of Haptic Shared Control across different Applications

Workshops and Tutorials will take place on Monday afternoon, June 22, 2015 during the IEEE World Conference 2015 in Chicago, USA.

General Information:

Please insert any URL link to workshop/tutorial if available

Type of Activity:

Please select:

Tutorial¹

Proposed Duration:

Half day

2 ABSTRACT

Haptic shared control (or haptic guidance, collaborative haptics, dynamic virtual fixtures) has been gaining increased interest in the research and engineering community. Haptic shared control can be seen as a configurable and tangible *blending* between human and automation, that promises an intuitive and useful combination of man and machine. Unfortunately, there is not much consensus yet on how to design or evaluate haptic shared control systems. In this workshop, we focus on providing design and evaluation guidelines from three important perspectives: human sensorimotor abilities and limitations, mechatronics properties of the haptic (tele)robotic interface, and haptic assistive technologies. These areas influence each other in their impact on human-in-the-loop performance in real-life tasks.

We aim to engage the audience in a stimulating discussion about establishing guidelines across different domains, guided by illustrative presentations, interaction with haptic demonstrators, and a panel discussion with experts in the field. The presentations will be given by members of the 'Human-Centered Haptics' research programme, the largest haptics collaboration in the Netherlands. This programme aims to deliver guidelines for the design and evaluation of shared control across a wide variety of haptic (tele)robotic applications (space, maritime, remote maintenance, medical, lifting aids, training), uniting the efforts of 16 PhDs, 3 postdocs, and staff from 4 Dutch universities. The demonstrators will make tangible how design choices (of the device and assistive paradigm) influence human-in-the-loop performance. The panel will include international experts from outside the project, who aim to provoke an interactive discussion with the audience about design and evaluation guidelines for haptic devices and haptic shared control.

¹ Tutorials are self-contained seminars of established research areas that should provide training within and perhaps on periphery of traditional haptic related topics. They should be focused on the proposed topic and should be presented by two or three experts in the field.



3 AUDIENCE

This tutorial is catered to both PhDs and longtime experts with an interest in human-in-the-loop design and evaluation of haptic shared control (including haptic guidance, physical human-robot collaboration, virtual fixtures), with a special focus on real-world applications for telerobotics (space, deep-sea, nuclear maintenance, steerable needles) and lifting aids.

Several key elements of telerobotics will be discussed with respect to their impact on human-in-the-loop performance: mechatronic properties of the master and slave device, controller type, human abilities and limitations in the perception-action coupling, environment-specific tasks (free-air tasks, contact tasks, presence of time-delays), interactions between haptic and visual feedback, interactions between quality of natural haptic feedback (transparency) vs. quality of haptic shared control, etc. Researchers with interest in these areas should benefit from the workshop.

4 SPEAKERS

1:30 – 2:30 Presentations

Dr. ir. David Abbink – Delft University of Technology

“Human-centered design and evaluation of Haptic Shared Control – State of the art, main contributions of the H-Haptics programme”

Prof dr. Astrid Kappers – VU University Amsterdam

“Haptic perception – The human in the loop”

Selected PhDs and postdocs of H-Haptics (e.g. dr. ir. Winfred Mugge, dr. Tricia Gibo, ir. Jeroen Wildenbeest)

“Impact of device mechatronics, haptic shared control, and sensorimotor control on human-in-the-loop haptic interaction”

2:30 – 3:00 Demonstrators (can run through break)

Demonstrators will be used to give the audience a feel for the impact of key design choices on the performance of haptic devices and assistive technologies for different tasks (slow vs. fast dynamic systems, different levels of transparency, free-air tasks vs. contact tasks, interaction between virtual (assistive) forces and natural forces).

3:00 – 3:15 Break

3:15 – 4:45 Panel Discussion

Dr. Allison Okamura – Stanford University (USA)

Prof. dr. Frans van der Helm – Delft University of Technology (The Netherlands)

Prof. dr. Astrid Kappers – VU University Amsterdam (The Netherlands)

4:45 – 5:00 Closing Remarks



5 ORGANIZERS

[Dr. ir. David Abbink](#)

Associate Professor at Delft University of Technology

David A. Abbink received the MSc ('02) and PhD ('06) degrees in mechanical engineering from the Delft University of Technology, Delft, The Netherlands. He continued his research at Delft, funded by Nissan (2007-current), Boeing (2007-2010), the prestigious VENI grant (2010-2013), and the H-Haptics Research Programme. David's research and education has received much media attention and several awards such as Best Dutch PhD Thesis, Best Faculty Teacher (2x), and the Human Factors Prize 2014. He is currently an Associate Professor at the Delft Haptics Laboratory, an IEEE Senior Member, and an Associate Editor for the IEEE Transactions on Human-Machine Systems.

[Prof dr. Astrid Kappers](#)

Full Professor at VU University Amsterdam

Astrid M. L. Kappers received the PhD degree from Eindhoven University of Technology. She studied experimental physics at Utrecht University, The Netherlands. From 1989 through September 2012, she was with the Department of Physics and Astronomy, Utrecht University. In September 2012, she moved with her whole group to the MOVE Research Institute, Faculty of Human Movement Sciences, VU University Amsterdam, The Netherlands. She was promoted to full professor in 2005. Her research interests include haptic and visual perception. In 2003, she won the prestigious VICI grant. She was member of the editorial board of Current Psychology Letters (2000-2011), and is currently a member of the editorial board of Acta Psychologica (2006-present) and an associate editor of the IEEE Transactions on Haptics (2007-2011).

[Prof dr. Frans van der Helm](#)

Full Professor at Delft University of Technology

Frans C. T. van der Helm received the MSc degree in human movement science in 1985 and the PhD degree in mechanical engineering in 1991. He is currently a Professor in biomechanics and biorobotics at the Delft University of Technology, Delft, The Netherlands, and Adjunct Professor at the University of Twente, The Netherlands and Northwestern University, Chicago, IL. He is a program leader at Medical Delta. He is the Principal Investigator at the TREND Research Consortium, the NeuroSIPE Program, and the H-Haptics Program. His most recent awards include an ERC advanced grant, the Simon Stevin award (highest award for Dutch research), and the Leermeeester Prijs (the most inspiring teacher and supervisor of TU Delft).



6 CALL FOR CONTRIBUTIONS (OPTIONAL, Compulsory for Open Workshop)

Can participants submit abstracts related to their research for presentation at the Workshop/Tutorial? NO

For further info: please contact WHC2015 Workshop/Tutorial chairs at Workshops@haptics2015.org

Workshops and Tutorials Chairs

Rob Gray (Arizona State University Polytechnic, USA)

Mounia Ziat (Northern Michigan University, USA)

Antonio Frisoli (Scuola Superiore Sant'Anna, Italy)