

VR2008

IEEE VR 2008 Tutorial on: “Integration of Haptics in Virtual Environments: from Perception to Rendering”



Abstract:

The design of virtual environments using haptic interfaces remains often driven by the availability of technology than by the necessity to solve real users' issues. There is a need today for a clear change of perspective and it is time to search how to design virtual environments that match properly the real expectations of the user. For instance, haptic hardware could be restricted to stimulate the part of the haptic channel which provides the best contribution to the final percept in the VE. Having a deeper understanding of the characteristics of the human haptic system, as well as of the human perceptual processes would help us to define more effective guidelines for developing and evaluating virtual environments and applications using haptic devices.

Therefore, this tutorial will provide the audience with recent findings in the field of haptics, multimodal perception and rendering. It will give methodological guidelines for the design of virtual environments that better match the characteristics of the human haptic sense and the expectations of the user. We will illustrate our approach with successful applications and systems, which benefited from information stemming from human perception and from user-centred approach.

This tutorial is a follow-up of the previous tutorial organized at IEEE VR last year on a similar topic (www.irisa.fr/bunraku/VR07haptic). We will extend and complete the results presented last year. Envisioned topics of the tutorial include:

- Recent results in the field of human haptics and multimodal perception
- Design of virtual environments and haptic interfaces based on a user-centred approach
- Software simplifications related to haptic perception, i.e., “perception-based haptic rendering”

Tutorial website: www.irisa.fr/bunraku/VR08haptic

Organizers:

- Anatole Lécuyer (INRIA, France), anatole.lecuyer@irisa.fr
- Matthias Harders (ETH-Zurich, Switzerland), mharders@vision.ee.ethz.ch

Sponsors:

The tutorial is supported by the INTUITION European Network of Excellence (IST-NMP-1-507248-2) and by the INTUITION Working Group on Haptic Interaction (www.intuition-eunetwork.net/).

The tutorial is endorsed by the IEEE RAS/CS Technical Committee on Haptics (www.worldhaptics.org).

Tentative program:

IEEE VR 2008 – Tutorial on “Integration of Haptics in Virtual Environments : from Perception to Rendering” (1:30 – 5:00 p.m.)	
Vincent Lévesque and Jérôme Pasquero (McGill University, Canada)	Laterotactile Displays and Rendering: from Illusion to Application
Tomohiro Amemiya (NTT, Japan)	Haptic Interface using Sensory Illusion
Anatole Lécuyer (INRIA, France),	Pseudo-Haptics and Interaction Techniques to Improve Integration of Haptics in VE
Break	
Katherine Kuchenbecker (Pennsylvania University, US)	Rendering Realistic Contact with Virtual Surfaces via Event-Based Haptic Feedback
Timothy Edmunds (Rutgers University, US)	Multisensory Rendering of Interaction Events and Applications to Skill Training
Matthias Harders (ETH-Zurich, Switzerland)	Data-Driven Haptic Rendering

Bio of the speakers:

Vincent Lévesque (McGill University, Canada) received the BEng degree in computer engineering and the MEng degree in electrical engineering from McGill University (Montréal, Canada) in 2000 and 2003 respectively. He has been with McGill’s Haptics Laboratory since 2000 and is currently pursuing a Ph.D. His research interests include tactile displays and rendering, human-computer interaction, and applications of haptics for persons with visual impairments.

Jérôme Pasquero (McGill University, Canada) received the BEng and MEng degrees from McGill University, Montréal, Canada, in 2001 and 2003 respectively. Since 2001, he has been with the McGill University Haptics lab where he is currently pursuing his Ph.D. His research interests include tactile displays, Braille displays, tactile perception, human-computer interactions and tactile rendering for mobile devices.

Tomohiro Amemiya (NTT, Japan) received B.S. and M.S. degrees in mechano-informatics from the University of Tokyo, Japan, in 2002 and 2004, respectively. Since 2004, he has been a researcher at NTT Communication Science Laboratories. He was awarded a Ph.D. in biomedical information science by Osaka University, Japan, in 2008. His research interests include haptic perception, wearable interfaces, and assistive technologies. He received the Young Researchers Award from the Virtual Reality Society of Japan in 2004, the Outstanding Paper Award from the VRSJ in 2005, the Best Presentation Award from the Human Interface Society in Japan in 2005 and 2007, and "Grand Prix" Award and VR Interfaces Award at the Laval Virtual International Awards in 2007. (<http://www.brl.ntt.co.jp/people/t-amemiya/>)

Anatole Lécuyer (INRIA, France) is a senior researcher at INRIA-Rennes and a member of the BUNRAKU research team. He is also affiliated with the Laboratory of Physiology of Perception and Action headed by Pr. Alain Berthoz at Collège de France, in Paris. He received a Ph.D. in Computer Science from University of Paris XI in 2001. He is currently the coordinator of the Open-ViBE project on Brain-Computer Interfaces (www.irisa.fr/bunraku/OpenViBE/) and leader of the Haptic Interaction Working Group of INTUITION Network of Excellence (www.intuition-eunetwork.net/). His main research interests include: virtual reality, 3D interaction, haptic feedback, pseudo-haptic feedback and brain-computer interfaces (www.irisa.fr/siames/GENS/alecuyer).

Timothy Edmunds (Rutgers University, US) is doctoral candidate in the Computer Science program at Rutgers University, where he is a member of Dinesh Pai's Multisensory Computation Lab. His research focus is the use of event-based haptics to augment simulators for surgical training. His work also includes the development of architectures for rendering multisensory events in distributed virtual environments.

Katherine J. Kuchenbecker (the University of Pennsylvania, US) is the Skirkanich Assistant Professor of Innovation in Mechanical Engineering and Applied Mechanics at the University of Pennsylvania. Her primary research interest is the design and control of haptic interfaces for virtual environments and teleoperation. She directs the Haptics Research Group, which is part of Penn's General Robotics, Automation, Sensing, and Perception (GRASP) Laboratory. Prior to becoming a professor, she worked with Dr. Allison Okamura as a postdoctoral research fellow at the Johns Hopkins University. Previously supported by NSF and ARCS fellowships, Katherine was the first doctoral student of Dr. Günter Niemeyer at Stanford University, graduating in June of 2006. She completed a Master's degree in Mechanical Engineering at Stanford in June of 2002, focusing on mechatronics, robotics, and design. She also did her undergraduate work in M.E. at Stanford, graduating as the Henry Ford scholar, the top engineering student in her class, in June of 2000.

Matthias Harders is lecturer and senior researcher at the Computer Vision Lab of ETH Zurich, and leader of the Virtual Reality in Medicine Group. Current research focuses on surgical simulation (www.hystsim.ethz.ch), human computer interaction with medical data, and haptic interfaces. He studied Computer Science with focus Medical Informatics at the University of Hildesheim, Technical University of Braunschweig and University of Houston. He finished his doctoral thesis on visual-haptic medical segmentation at ETH Zurich in 2002. For his work he has received the ETH-TIT Award 2003 and the CAOS Award 2006. He is the local lead of the EU projects Immersence, CyberWalk, and INTUITION, as well as the SYNOS foundation project on orthopedic planning. He is principal investigator of the SNSF Co-Me project 4 on Virtual Reality-based training of medical procedures (www.co-me.ch). He is co-founder of the EuroHaptics conference, the IEEE Robotics and Automation/Computer Science Haptics Technical Committee, and the EuroHaptics Society.