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Richard T. Skarbez

Education

August 2016 **Ph.D in Computer Science**, *The University of North Carolina at Chapel Hill*, Chapel Hill, NC, USA.
Dissertation Title: *Plausibility illusion in virtual environments*
Advised by Mary C. Whitton and Frederick P. Brooks, Jr.

May 2010 **M.S. in Computer Science**, *The University of North Carolina at Chapel Hill*, Chapel Hill, NC, USA.

December 2004 **B.S. with Honors in Computer Engineering**, *Pennsylvania State University—University Park*, University Park, PA, USA.
Thesis Title: *A presentation of the semantics and formal properties of C3L, an event-driven distributed control language*

Current Appointment

Title: Postdoctoral Associate

Institution: Virginia Polytechnic Institute and State University
Grado Department of Industrial and Systems Engineering

Supervisor: Joseph L. Gabbard

Description: Since May of 2017, I have been working as a co-investigator (PI: Joseph L. Gabbard) on an industry-sponsored research project. This project involves the use of human-factors methods to evaluate the effects of various physical parameters of virtual rooms on users' sense of presence, reality judgment, and preference. In the course of this work, I have designed a series of three experiments to investigate the importance of these parameters for users, implemented virtual environments for these experiments using the Unity game engine and C#, applied for and received IRB approval to run these experiments, performed the data analysis on these experiments, and written technical reports for the sponsor explaining the results.

Research interests

- Virtual environments
- Mixed display environments
- Human computer interaction
- Immersive analytics

Dissertation

Title *Plausibility illusion in virtual environments*

Supervisors Mary C. Whitton and Frederick P. Brooks, Jr.

Description In 2009, Professor Mel Slater first proposed that in addition to *presence*, the feeling of "being there" in a virtual environment, researchers also need to consider the feeling that the events depicted in the VE appear real. He coined the terms *Place Illusion* (PI) and *Plausibility Illusion* (Psi), respectively, to refer to these subjective feelings. I investigated Psi over the course of several experiments, demonstrating that Psi can be detected using existing presence measures including questionnaires and physiological metrics, that inconsistent behavior of virtual objects causes increased heart rate in participants, that Psi is affected by individual differences (as is presence), and that it is feasible to determine a rank ordering of VE factors that affect Psi in VEs, with the presence of the virtual body being most important of those factors tested.

Publications

Richard Skarbez and Mary C. Whitton. (2018). *Check Your Work: Evaluating VE Effectiveness Using Presence.* Book chapter in *VR Gems*, edited by William R. Sherman. (To appear.) 15 pages.

Richard Skarbez, Frederick P. Brooks, Jr., and Mary C. Whitton. (2017). *A survey of presence and related topics.* ACM Computing Surveys, 50(6), Article 96. 39 pages. DOI: 10.1145/3134301

Richard Skarbez, Solène Neyret, Frederick P. Brooks, Jr., Mel Slater, and Mary C. Whitton. (2017). *A psychophysical experiment regarding the components of plausibility illusion.* IEEE Transactions on Visualization and Computer Graphics (TVCG), 23(4), pp. 1369-1378. DOI: 10.1109/TVCG.2017.2657158

Richard Skarbez, Frederick P. Brooks, Jr., and Mary C. Whitton. (2017). *Immersion and coherence in a visual cliff environment.* Poster. IEEE Virtual Reality conference. 2017 IEEE Virtual Reality (VR), Los Angeles, pp. 397-398. DOI: 10.1109/VR.2017.7892344

Richard Skarbez, Greg Welch, Frederick P. Brooks, Jr., and Mary C. Whitton. (2017). *Coherence changes gaze behavior in virtual human interactions.* 2017 IEEE Virtual Reality (VR), Los Angeles, pp. 287-288. DOI: 10.1109/VR.2017.7892289

Richard Skarbez. (2016). *Plausibility illusion in virtual environments.* Doctoral dissertation. The University of North Carolina at Chapel Hill. 122 pages. [Download from UNC libraries]

Richard Skarbez, Aaron Kotranza, Frederick P. Brooks, Jr., Benjamin Lok, and Mary C. Whitton. (2010). *An initial exploration of conversational errors as a novel method for evaluating virtual human experiences.* Poster. 2010 IEEE Virtual Reality (VR), Singapore, pp. 243-244. DOI: 10.1109/VR.2011.5759489

Richard Skarbez and Mary C. Whitton. (2009). *Enabling distributed collaboration among heterogeneous devices.* Presentation & extended abstract. ACM CHI 2009 Workshop on the Changing Face of Digital Science, Boston, MA, USA. 4 pages. [Download]

Tyler Johnson, Florian Gyarfas, **Richard Skarbez**, Herman Towles, and Henry Fuchs. (2007). *A personal surround environment: projective display with correction for display surface geometry and extreme lens distortion.* 2007 IEEE Virtual Reality (VR), Charlotte, NC, USA, pp. 147-154. DOI: 10.1109/VR.2007.352475

Tyler Johnson, Florian Gyarfas, **Richard Skarbez**, Patrick Quirk, Herman Towles, and Henry Fuchs. (2006). *Multi-projector image correction on the GPU.* Poster. Workshop on Edge Computing, Chapel Hill, NC, USA. [Download]

Patrick Quirk, Tyler Johnson, **Richard Skarbez**, Herman Towles, Florian Gyarfas, and Henry Fuchs. (2006). *RANSAC-assisted display model reconstruction for projective display.* IEEE Virtual Reality 2006 Workshop on Emerging Display Technologies, Alexandria, VA, USA. 4 pages. DOI: 10.1109/VR.2006.115

Mendel Schmiedekamp, **Richard Skarbez**, and Shashi Phoha. (2006). *Formal methods for verification and validation of distributed interacting devices.* 10th Annual IASTED International Conference on Software Engineering Applications, Dallas, TX, USA.

Richard Skarbez. (2004). *A presentation of the semantics and formal properties of C3L, an event-driven distributed control language.* Honors thesis. The Pennsylvania State University. [Download]

Research and Development Experience

2016–2017 **Systems Programmer**, *iRODS Consortium*, Chapel Hill, NC, USA.

- Implemented the iRODS Python rule engine plugin and its test rules
- Carried out performance evaluation on the iRODS 4.2 release
- Redesigned and re-implemented iRODS code to improve performance
- Wrote blog posts and other supporting documentation

2014–2016 **Graduate Student Researcher**, *National Consortium for Data Science*, Chapel Hill, NC, USA.

- Designed and implemented metadata template functionality for iRODS in Java (Jargon)
- Installed, configured, and maintained NCDS iRODS and Dataverse installations
- Wrote, revised, and helped prepare materials for NSF site review
- Curated a variety of large datasets for the NCDS

2011 **Graduate Research Assistant**, *Avatar project–UNC Department of Computer Science*, Chapel Hill, NC, USA.

- Designed experiments to evaluate the effectiveness of novel display technologies
- Wrote documents for and interacted with UNC's Institutional Review Board
- Conducted experiments and interviews with experimental participants
- Processed and analyzed experimental data using Python, MATLAB, and SPSS

2008–2009 **Graduate Research Assistant**, *NC-FIRST*, Chapel Hill, NC, USA.

- Developed a mobile web interface for the NC-FIRST weather site
- Contributed to several proposals regarding the use of sensor networks and mobile computing devices in emergency response applications

2008 **SDET Intern**, *Microsoft Corporation*, Redmond, WA, USA.

- Designed and implemented in Python a framework for automating multi-computer test scripts for the Mac Messenger test team
- Wrote test plans for new Messenger features

2005–2007 **Graduate Research Assistant**, *Wide Area Visuals project–UNC Department of Computer Science*, Chapel Hill, NC, USA.

- Developed software in C++ and MATLAB for calibration of projector-camera systems
- Contributed to posters and papers published by the WAV research group

2004–2005 **Student Researcher**, *Applied Research Laboratory*, University Park, PA, USA.

- Wrote the semantics for the Command, Control, and Communications Language (C3L) developed at the ARL
- Developed components of the C3L interpreter, including a pathology checker

2002 **Intern–End-of-line processing**, *IBM Corporation*, Endicott, NY, USA.

- Developed a procedure for automatic generation of drill machine programs from test data identifying circuit panel defects
- Performed panel testing and drill machine programming

2001 **Intern–Digital Video Products Group**, *IBM Corporation*, Endicott, NY, USA.

- Implemented a relational database to store test procedures and results
- Performed hardware and software validation testing

Teaching Experience

2010 **Graduate Teaching Assistant–COMP 116 (Introduction to Scientific Programming)**, *UNC Department of Computer Science*, Chapel Hill, NC, USA.

- Acted as lead TA for the course
- Lectured weekly in recitation sections
- Assisted students during office hours
- Coordinated work among myself and other TAs
- Graded programming assignments and exams

2009 **Graduate Teaching Assistant–COMP 110 (Introduction to Programming–Java) and COMP 401 (Foundations of Programming)**, *UNC Department of Computer Science*, Chapel Hill, NC, USA.

- Acted as lead TA for the courses
- Led recitation sections
- Wrote exams, assignments, and lecture materials
- Assisted students during office hours
- Coordinated work among myself and other TAs
- Graded programming assignments, written assignments, and exams

2008 **Instructor of Record–COMP 575 (Computer Graphics)**, *UNC Department of Computer Science*, Chapel Hill, NC, USA.

- Had full responsibility for designing, teaching, and grading the course
- Developed a new syllabus for the course
- Wrote all assignments, exams, and lecture materials
- Graded all course materials and assigned final grades

2006 **Graduate Teaching Assistant–COMP 872 (Introduction to Virtual Worlds)**, *UNC Department of Computer Science*, Chapel Hill, NC, USA.

- Helped plan scheduling, assignments, and lecture topics
- Familiarized students with the hardware and software used for course projects
- Provided technical help for students

Activities and Honors

Professional associations

- Association for Computing Machinery (ACM)
- Institute of Electrical and Electronics Engineers (IEEE) Computing Society

Organizing experience

- 2018 IEEE Workshop on Perceptual and Cognitive Issues in AR (PERCAR) (Co-organizer)

Session chair experience

- 2018 IEEE VR (Papers session 1: Avatars and Virtual Humans)

Reviewing experience

- IEEE Transactions on Visualization and Computer Graphics
- Elsevier Computers & Graphics
- PRESENCE: Teleoperators and Virtual Environments
- IEEE Virtual Reality (VR) conference
- IEEE International Symposium on Mixed and Augmented Reality (ISMAR)
- IEEE Symposium on 3D User Interfaces (3DUI)

Student activities

- Team leader, UNC Effective Virtual Environments research group, 2011–2015
- President, UNC Computer Science Student Association, 2007–2008
- Coordinator, UNC Computer Science Graphics Lunch, 2005–2009
- President/Editor-in-chief, PHROTH (Penn State's Humor Magazine), 2003–2004
- Penn State Debate Team
- HKN Electrical and Computer Engineering Honors Society
- Golden Key National Honors Society

Technical

Programming Languages

- C
- C++
- Java
- C Sharp
- Python
- MATLAB

Statistics and analysis

- SPSS
- SAS

Game engines

- Gamebryo
- Unity

Other

- LaTeX
- git

Media appearances

Appeared on the Voices of VR podcast, episode 130, "Richard Skarbez on Immersion & Coherence being the two key components of Presence in Virtual Reality" [link]. This episode was chosen by host Kent Bye as #1 of his top 10 episodes for getting started in VR [link].

Also appeared on the Voices of VR podcast, episode 555, "VR Presence Researcher Finds Full Embodiment to be Key Component in Plausibility" [link].

Appeared on the Beyond the Headset podcast, episode 5, "How We Fool Ourselves into Thinking We're Somewhere Else" [link].