Graphics **Interface** 2022

Montreal, QC
16–19 May 2022

Proceedings

Edited by

Deborah Fels
Shedon Andrews

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President's Welcoming Letter

Canadian Human-Computer Communications Society / canadienne du dialogue humain-machine

Paul G. Kry
School of Computer Science
McGill University, Canada

The Canadian Human-Computer Communications Society (CHCCS) / Société Canadienne du Dialogue Humaine Machine (SCDHM) is a non-profit organization dedicated to advancing research and education in computer graphics, visualization, and human-computer interaction. The primary activity of CHCCS/SCDHM is sponsoring the annual Graphics Interface conference, the longest-running regularly scheduled conference on interactive computer graphics.

We are now back to an in-person conference model for ETS Montreal in 2022 with an excellent virtual component. An in-person conference is likewise being planned for Victoria in 2023. The early career researcher award continues this year, and I am very grateful to Alec Jacobson and Audrey Giraud for their efforts in the continuation of this award. The nominations committee (provisionally chaired by Kelly Booth) is continuing efforts for recruiting future chairs and leadership positions.

I will take a moment to remind everyone that in addition to its annual conference, CHCCS/SCDHM sponsors several awards. The annual Michael A.J. Sweeney Award recognizes best student papers presented at the conference. The annual Alain Fournier Dissertation Award and the Bill Buxton Dissertation Award recognize the best Ph.D. dissertations awarded in Canada during the previous year for computer graphics and human-computer interaction, respectively. The annual CHCCS/SCDHM Achievement Award is presented to a Canadian who has made substantial research contributions to computer graphics, visualization, or human-computer interaction. The CHCCS/SCDHM Service Award is presented to a Canadian who has rendered substantial service contributions to the society or to the research community. Each year the Awards Committee receives nominations and selects a winner of the Achievement Award and, from time to time, a winner of the Service Award. I thank the Awards committee for their efforts in selecting very well-deserving recipients. Winners of the Alain Fournier Award and Bill Buxton Award are selected by independent committees coordinated by Pierre Poulin. I am very grateful to Pierre and the members of the respective committees for their work in identifying the top dissertations of 2021. The Michael A.J. Sweeney Award winners are selected by the program co-chairs in consultation with the program committee.

The Annual General Meeting of CHCCS/SCDHM is held every year during the Graphics Interface conference, to review the previous year's activities and elect the executive committee. Current members of the executive committee are

- Paul Kry, McGill University, president
- Pierre Poulin, Université de Montréal, vice president and treasurer
- William Cowan, University of Waterloo, past president
- Derek Reilly, Dalhousie University, editor-in-chief

All Graphics Interface attendees are invited to attend the annual general meeting. I encourage everyone interested in the future of Graphics Interface to attend and get involved.

On behalf of the society, and of all those who have worked to put on this year's conference, I extend a warm welcome to all the attendees of GI 2022. I wish to thank this year's chairs, Adrien Gruson, Deborah Fels, and Sheldon Andrews, along with the committee members and referees for all their hard work in creating the conference program. Most important, I wish to thank all the authors who submitted their research. Without their commitment there would be no conference.

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Michael A. J. Sweeney Award 2022

Canadian Human-Computer Communications Society /
Société canadienne du dialogue humain-machine

The CHCCS/SCDHM honours the memory of Michael A. J. Sweeney through an annual award to the best student papers presented at each year's Graphics Interface conference. The winning papers selected by the program committee, one graphics paper and one HCI paper, are chosen from among accepted papers that have a student as lead author and for which one or more student authors are presenting the paper.

Best Student Papers 2022

In Memory
Michael A. J. Sweeney, 1951-1995

Acceleration Skinning: Kinematics-Driven Cartoon Effects for Articulated Characters

Niranjan Kalyanasundaram (Clemson University), Damien Rohmer (École Polytechnique), Victor B. Zordan (Clemson University, Roblox)

Tutorials for Children by Children: Design and Evaluation of a Children's Tutorial Authoring Tool for Digital Art

Ananta Chowdhury (University of Manitoba), Andrea Bunt (University of Manitoba)

Alain Fournier Award 2021

Canadian Human-Computer Communications Society / Société canadienne du dialogue humain-machine

On August 14th, 2000, Dr. Alain Fournier passed away. He was a leading international figure in computer graphics, and a strong and frequent contributor to the Graphics Interface conference. His insights, enthusiasm, wisdom, vast knowledge, humour, and genuine friendship touched everyone he met.

The "Alain Fournier Memorial Fund" was created to celebrate his life, to commemorate his accomplishments, and to honour his memory. It rewards an exceptional computer graphics Ph.D. dissertation defended in a Canadian University over the past year. The winning dissertation is selected through a juried process by a selection committee consisting of accomplished researchers in computer graphics.

For more information about the "Alain Fournier Memorial Fund", and information about donation, please visit http://graphicsinterface.org/awards/alain-fournier/.

Ryan Goldade
University of Waterloo
CHCCS/SCDHM Alain Fournier Award Recipient 2021

Ryan Goldade is the recipient of the 2021 Alain Fournier Award for Outstanding Doctoral Dissertation in Computer Graphics. Dr. Goldade's dissertation, titled, Efficient Liquid Animation: New Discretizations for Spatially Adaptive Liquid Viscosity and Reduced-Model Two-Phase Bubbles and Inviscid Liquids, made outstanding contributions to the field of computer graphics.

Dr. Goldade's research focused on improving the computational efficiency of simulating viscous liquids and air bubbles immersed in liquids. He devised a novel domain discretization method to focus computational effort near the fluid surface in order to more efficiently capture intricate details of viscous liquids. He also proposed a novel approach to simulating bubbles within liquids as constraints on surrounding liquid, which was able to achieve realistic bubble animations with no significant additional computational cost to a standard liquid simulator. These primary contributions are supported by a large number of additional contributions and practical considerations, including model reduction approaches, a volume tracking method, a convenient tile-based adaptivity model, and a tailored multigrid solver.

Dr. Goldade's dissertation comprises three top-tier publications, two in ACM Transactions on Graphics and one in Eurographics. His proposed techniques for fluid simulation have already been adopted by the visual effects industry. The committee felt that Dr. Goldade wrote a coherent, comprehensive, and complete dissertation, which is a notable accomplishment for a manuscript-style dissertation. The three publications are synthesized and presented in a compelling way to demonstrate an overarching contribution of work that is greater than the contribution of each individual publication. The dissertation introduces mathematical concepts in a rigorous, but accessible way, supported by clear figures and diagrams that add substantial clarity to the exposition. The dissertation includes an excellent background chapter and a comprehensive review of related work. Dr. Goldade's dissertation represents an outstanding achievement in the area of fluid simulation and is well deserving of the 2021 Alain Fournier Award.

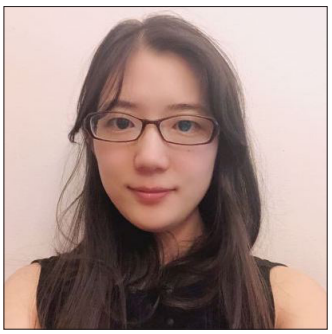
Dr. Goldade obtained his Bachelor and Master of Applied Science in Engineering Science at Simon Fraser University in 2009 and 2014, respectively. He graduated in 2021 with his PhD in Computer Science from the University of Waterloo under the supervision of Prof. Christopher Batty. He obtained Graduate Excellence Awards and a President's Graduate Scholarship from the University of Waterloo, as well as a Queen Elizabeth II Graduate Scholarship. During most of his PhD studies, he worked part-time at SideFX on various fluid implementations.

Bill Buxton Dissertation Award 2021

Canadian Human-Computer Communications Society /
Société canadienne du dialogue humain-machine

The award is named in honour of Bill Buxton, a Canadian pioneer who has done much to promote excellence, both within Canada and internationally, in the field of Human-Computer Interaction. Bill truly advocates HCI. He challenges how academics and practitioners think, and inspires them to do things differently. This is why we are proud to name this award after him.

The award is determined through a juried process by a selection committee consisting of accomplished researchers in Human-Computer Interaction, and this process was organized by Dr. Celine Latulipe (University of Manitoba). This year, the selection committee consisted of Dr. Charles Perrin (University of Victoria) who chaired the committee, Dr. Christopher Healey (North Carolina State University), Dr. Rita Orji (Dalhousie University), and Dr. Ryo Suzuki (University of Calgary).



Xin Tong
Simon Fraser University
CHCCS/SCDHM Bill Buxton Award Recipient 2021

The recipient of the 2021 award for the outstanding doctoral dissertation completed at a Canadian university in the field of Human-Computer Interaction is Dr. Xin Tong.

Dr. Tong's dissertation, Bodily Resonance: Exploring the Effects of Virtual Embodiment on Pain Modulation and the Fostering of Empathy toward Pain Sufferers, combines both technical and human aspects of research to explore how virtual embodiment through the use of virtual reality technology can affect people's perception of pain and address the biological, psychological and social challenges that chronic pain patients face. Dr. Tong first investigated how avatar features such as movements of virtual arms modulate virtual embodiment and pain. This step in the research was achieved through a combination of literature review, controlled lab studies and longitudinal studies that relied on technical implementations. Dr. Tong then built on these foundations that focused on chronic patients themselves to study in a second step how embodied avatars can stimulate non-patients' empathy towards chronic pain patients. This was achieved by designing and implementing a VR game prototype that made it possible to study the extent to which such a game can improve non-patients' empathy towards chronic pain patients.

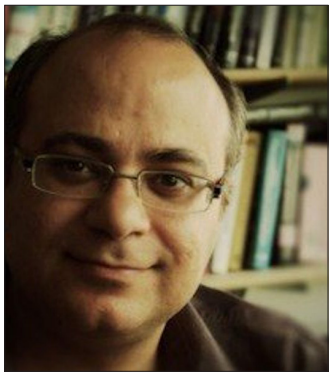
Findings from Dr. Tong's studies result in a series of important design recommendations for using embodied VR to generate empathy. This work identifies factors that impact the effect of embodiment on pain, including features of avatars, combinations of multiple modalities to communicate pain, and the integration of narratives into games. Building on those results, Dr. Tong proposes Bodily Resonance, a design framework for pain and VR for empathy. The framework connects the real body that is in pain, the VR content, the illusion of presence in the virtual world and the narrative, to mediate the perception of pain and empathy. The research presented in this dissertation will inform future research and applications concerned with modulating pain; beyond pain specifically, it will inform the design of VR applications that aim at generating empathy.

Dr. Xin Tong is currently an Assistant Professor in Computation and Design at Duke Kunshan University (DKU). Previously, she was a postdoctoral fellow affiliated with the Pervasive Wellbeing Technology Lab at Stanford University and prior to that, she was a member of the Pain Studies Lab and received her Ph.D. at Simon Fraser University (SFU), under the supervision of Dr. Diane Gromala with co-supervisors Dr. Chris Shaw and Dr. Dave Fracchia. Xin's research contributes to the larger understanding of how people with physical and psychological disabilities experience and interact with technology, e.g., VR, games, wearables, and AI. Dr. Tong has published in many top-tier academic venues on HCI areas. She has been a reviewer and paper chair for high-impact conferences and journals, such as CHI, CSCW, DIS, Frontiers, IEEE VR, and so on. She is also a recipient of many international, national, and university fellowships and awards, such as Best Game Awards and Nominations at ACM CHI and Microsoft Unite Conference, SFU Provost Prize of Distinction Award, C.D. Nelson Memorial Scholarship, MITACS Research Training Award, SFU Big Data Graduate Scholarship, McQuarrie Chronic Pain Scholarship, and NSERC Post-Doctoral Fellowship.

Achievement Award 2022

Canadian Human-Computer Communications Society / Société canadienne du dialogue humain-machine

The CHCCS/SCDHM Achievement Award is presented periodically to a Canadian researcher who has made a substantial contribution to the fields of computer graphics, visualization, or human-computer interaction. Awards are recommended by the CHCCS/SCDHM Awards Committee, based on nominations received from the research community.



Pourang Irani
University of British Columbia Okanagan
CHCCS/SCDHM Achievement Award
Recipient 2022

The 2022 CHCCS/SCDHM Achievement Award of the Canadian Human-Computer Communications Society is presented to Professor Pourang Irani from the University of British Columbia Okanagan for his significant research contributions in the areas of Human-Computer Interaction (HCI) and Information Visualization. His work has inspired many colleagues and young scholars and has put the University of Manitoba on the international map in HCI research.

Pourang is a Professor in Computer Science and Principal Research Chair, at the University of British Columbia Okanagan (UBCO). He earned his Ph.D. in Computer Science from the University of New Brunswick in 2002 under the supervision of Dr. Colin Ware. Pourang started his career at the University of Manitoba (UofM) and served there for 19 years as a faculty member in Computer Science and as Acting Associate Dean for the Faculty of Science before moving to UBCO in January 2022. Pourang held a Canada Research Chair in Ubiquitous Analytics at the UofM and was a recipient of many best paper awards and honorable mention awards at the top tier conferences in his field (ACM CHI, UIST). In addition to making contributions with his students, Pourang has collaborated with researchers from top industrial research laboratories and universities. He was a visiting researcher at the Université de Toulouse, Ecole Nationale d'Aviation Civile, INRIA, and Microsoft Research Redmond.

Pourang joined the UofM in 2002. He formed the HCI lab in the Computer Science department, which by that time was one of the earliest HCI labs in Canada. Soon he became one of the most research-active members in his department. Pourang has published over 160 peer-reviewed papers, including four dozen at CHI/UIST/Vis, and others at many reputable venues including MobileHCI, VAST, ISMAR, Graphics Interface, Spatial User Interfaces, and AVI. Over the years, his impact on research has gone beyond the confines of his group and has made Manitoba one of the most competitive and attractive places for young scholars and junior faculty members in HCI, leading to significant growth in student body and tenure track HCI faculty. Manitoba's HCI group is now one of the largest and most influential in the country with three professors and over 140 student alumni.

As an educator, perhaps Pourang's greatest contribution to the Canadian and International HCI community has been the training of the next generation researchers through his mentorship of over 83 students and post-doctoral fellows which has led to the growth of HCI as a field in Manitoba, and beyond. As a substantial impact of Pourang's work, almost all of his Ph.D. students and PDFs have gone on to successful faculty and research positions in Canada, Europe, China, and the US, including Google, Microsoft, ESTIA, Université de Toulouse, Monash University, Simon Fraser University, the University of British Columbia Okanagan, Xi'an Jiaotong-Liverpool University, and the Chinese Academy of Sciences.

Achievement Award 2022

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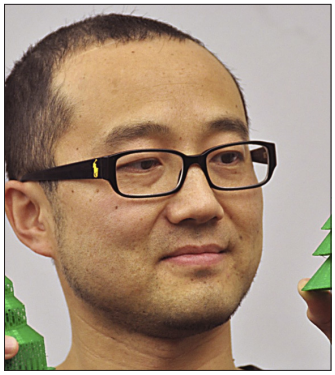

Hao (Richard) Zhang
Simon Fraser University
CHCCS/SCDHM Achievement Award Recipient 2022

The 2022 CHCCS/SCDHM Achievement Award of the Canadian Human-Computer Communications Society is presented to Dr. Hao (Richard) Zhang for his numerous high-impact contributions to computer graphics. His research addresses fundamental problems in geometric modeling, shape analysis, geometric deep learning, and computational design and fabrication. Richard is a Distinguished Professor at Simon Fraser University and an Amazon Scholar. He directs the GrUVi (Graphics U Vision) lab at SFU. He has also been a visiting professor at Stanford University (2016-17), Shenzhen University (2017-now), and the Beijing Film Academy (2018-20).

Richard obtained his Ph.D. from the University of Toronto, under Eugene Fiume, and MMath and BMath degrees from the University of Waterloo, all in computer science. To date, he has published more than 160 papers on various topics in visual computing, including 60+ articles in SIGGRAPH, SIGGRAPH Asia, and ACM Trans. on Graphics, the most prestigious venue in computer graphics. Methods from three of his papers on geometry processing have been adopted by CGAL, the open-source Computational Geometry Algorithms Library. According to Google Scholar, Richard has a total citation count of 13K+ and an h-index of 55. Richard is an associate editor-in-chief for IEEE Computer Graphics & Applications (CG&A), a past editor-in-chief for Computer Graphics Forum, and an associate editor for ACM Trans. on Graphics and IEEE TVCG. He has served on the program committees of all major computer graphics conferences and is SIGGRAPH Asia 2014 course chair, a paper co-chair for SGP 2013, GI 2015, and CGI 2018, and a program chair for International Geometry Summit 2019.

In the early stages of Richard's career, he made seminal contributions to spectral geometry processing. His mesh segmentation paper in 2004 was the first to bring the spectral approach to shape analysis in graphics. He also wrote the first survey on the topic. Spectral methods have since become a standard tool in visual computing. In 2009-10, Richard published several foundational papers on using symmetry priors for shape analysis and representation, in particular, symmetry hierarchies. This work laid the groundwork for his SIGGRAPH 2017 paper on GRASS, the first deep generative neural network for 3D shape structures. Also, in his early works, Richard already realized a connection between symmetry and functionality, which led to a series of SIGGRAPH papers (2015-18) on functional analysis of 3D shapes. These works are ground-breaking in graphics and critical to 3D shape understanding, design, and generation for which the ultimate goal is at the functional level.

Richard is best known for his sustained and impactful contributions to learning-based analysis and synthesis of visual data, especially 3D shapes and indoor scenes. His ICCV 2017 paper DualGAN, together with CyclaGAN, pioneered the dual learning approach for unsupervised domain translation using a cycle consistency loss. Most recently, at CVPR 2019, he published a paper on learning implicit fields for generative shape modeling. This work, called IM-Net, together with DeepSDF and OccNet, started a mini revolution on neural implicit representations for geometric deep learning. In a very short time, significant advances over implicit models have been achieved, leading to BSP-Net, which won the Best Student Paper Award at CVPR 2020. Other major awards won by Richard include an NSERC DAS (Discovery accelerator Supplement) Award in 2014, a National Science Foundation of China (NSFC) Overseas Outstanding Young Researcher Award in 2015, a Google Faculty Research Award in 2019, a Best Dataset Award from ChinaGraph (2020), as well as Best Paper Awards at SGP 2008 and CAD/Graphics 2017. As of 2022, both Richard's CVPR and SGP works have been the only award-winning papers at these venues for which all authors had Canadian affiliations at the time of publication: four from SFU and one from Google Brain Toronto, who happens to be a former PhD of Richard's from SFU.