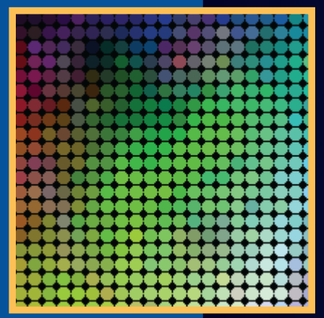

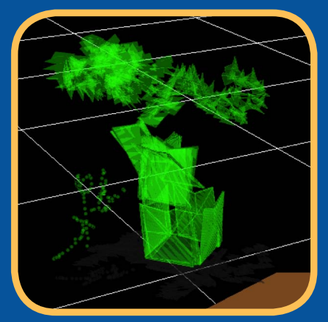

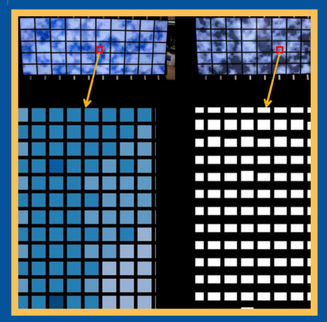

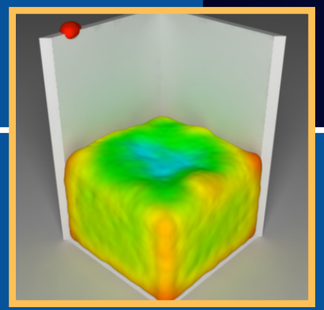

Graphics **Interface** 2011

Proceedings

Graphics **Interface** 2011

25 - 27 May 2011
St. John's, Newfoundland, Canada

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President's Welcoming Letter

Canadian Human-Computer Communications Society / Société Canadienne du Dialogue Humain Machine

William Cowan
David R. Cheriton School
of Computer Science
University of Waterloo, Canada

The Canadian Human-Computer Communications Society (CHCCS) / Société Canadienne du Dialogue Humain Machine (SCDHM) is a Special Interest Group within the Canadian Information Processing Society. It is a non-profit organization with the goal of advancing education and research in computer graphics, visualization, and human-computer interaction.

Each year CHCCS/SCDHM sponsors Graphics Interface, the longest-running regularly scheduled conference in interactive computer graphics. Most years it is co-located and co-organized with several other conferences: this year the AI/CRV/GI 2011 conference, encompassing Artificial Intelligence and Computer and Robotic Vision, along with Graphics Interface, is located at the Memorial University of Newfoundland in St. John's. Graphics Interface promises to be an exciting event, with a selection of high quality papers in computer graphics, visualization, and human-computer interaction.

Complementing the annual conference, CHCCS/SCDHM sponsors four annual awards: the Michael A. J. Sweeney Awards for the best student papers presented at the conference; the Alain Fournier Ph.D. Dissertation Award and the Bill Buxton Ph.D.Dissertation Award presented for the best Ph.D. Dissertations in computer graphics and human-computer interaction, respectively awarded in Canada during the previous year; the CHCCS/SCDH Achievement Award, presented to a Canadian who has made substantial research contributions to computer graphics, visualization, or human-computer interaction; and the CHCCS/SCDH Service Award, 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. At this year's conference we will provide an Achievement Award to Brian Wyvill. I wish to thank the Awards committee, which consists of Richard Bartels, University of Waterloo (emeritus), Chair, Kellogg Booth, University of British Columbia, and Eugene Fiume, University of Toronto, for their efforts in finding a well-deserving recipient.

This year's winner of the Alain Fournier Award is Stelian Coros; the Bill Buxton Award is split between Daniel Vogel and Garth Shoemaker. I would like to thank Pierre Poulin, who supervised the process of judging many excellent dissertations that were submitted for the awards. 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 Bill Cowan, University of Waterloo, President, Kellogg Booth, University of British Columbia, Past President, Pierre Poulin, Université de Montréal, Vice President, Stephen Mann, University of Waterloo, Treasurer, Ted Kirkpatrick, Simon Fraser University, Editor-in-Chief, and James Stewart, Queen's University, Webmaster.

All Graphics Interface attendees are invited to attend the General Meeting, or to contact any member of the executive committee about CHCCS/SCDHM.

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 AI/CRV/GI 2011. I also wish to thank Stephen Brooks and Pourang Irani, the chairs of the program committee, along with the committee members and referees who created the conference program. And most important, I wish to thank all the authors who submitted their research. Without their commitment there would be no conference.

Preface

A Message from the Program Chairs

Stephen Brooks
Dalhousie University, Canada

Pourang Irani
University of Manitoba, Canada

You are looking at the proceedings for Graphics Interface 2011. Now in its 37th year, Graphics Interface is the oldest continuously-scheduled conference in computer graphics and human-computer interaction; the conference dates back to 1969, when it was the "Canadian Man-Computer Communications Seminar", changing its name in 1982 to Graphics Interface. This year, Graphics Interface takes place in St. John's, Newfoundland, from May 25th to May 27th.

The program for Graphics Interface 2011 features 29 regular papers. We received 44 (HCI) + 30 (Graphics) submissions and had some difficult decisions in arriving at the final selection. While we observed a surge in papers submitted to the HCI track, we have roughly equal numbers of papers for both tracks, with acceptances rates of 32% for the HCI track and 53% for the Graphics track.

The GI committee comprised 20 experts from Graphics and HCI. Each paper was formally reviewed by two committee members, at least two external reviewers, and often received informal reviews from more. A fully double-blind reviewing process was used: the identity of the paper authors was known only to the program committee chairs and to the primary committee member assigned to the submission. We thank the program committee and the external reviewers for ensuring rigor and integrity in the reviewing process.

We are proud to include keynote talks from two invited speakers and one Achievement Award winner. The two invited speakers, Carl Gutwin, University of Saskatchewan, and John C. Hart, University of Illinois, Urbana-Champaign, are both well known for their exemplary contributions to their disciplines. Our congratulations to Brian Wyvill, University of Victoria, this year's recipient of the Canadian Human-Computer Communications Society (CHCCS) / Société Canadienne du Dialogue Humain Machine (SCDHM) Achievement Award.

We would like to thank various people who contributed to the behind-the-scenes conference organization, especially Stephen Mann, William Cowan, Kelly Booth, Pierre Poulin, and Meghan Haley. Thanks also go out to Elodie Fourquet, the poster chair, and Minglun Gong, the local organizer. We would also like to thank David Mould for help organizing the in-person committee meeting at Carleton University. Lastly, we owe a great debt to James Stewart and Precision Conference Solutions for handling the electronic submission and review system; James's patience and responsiveness made the process run as smoothly as we could have hoped.

For further information about the conference series, you can visit the official web site, http://www.graphicsinterface.org.

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Michael A. J. Sweeney Award 2011

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 paper(s) presented at each year's Graphics Interface conference. The winning paper(s) selected by the program committee are chosen from among the papers accepted for the conference for which one or more student authors are presenting the paper.

Best Student Paper 2011

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

Graphics 2011 Award Winner

"Structure-Preserving Stippling by Priority-Based Error Diffusion" by Hua Li, David Mould.

Biographies

Hua Li is presently pursuing her Ph.D. in computer science at Carleton University. She received her B.Eng. and M.Eng. degrees from the University of Science & Technology Beijing in 1997 and 2000 respectively. Her current research interests include digital halftoning, non-photorealistic rendering, tessellation, 3D stereo, Web3D, and terrain LOD.

David Mould is an Associate Professor at Carleton University, specializing in computer graphics. Before moving to Carleton, he was a faculty member at the University of Saskatchewan. He received his Ph.D. from the University of Toronto in 2002. His research interests include image processing, non-photorealistic rendering, and procedural texturing and modeling.

HCI 2011 Award Winner

"Ubiquitous Cursor: A Comparison of Direct and Indirect Pointing Feedback in Multi-Display Environments" by Robert Xiao, Miguel Nacenta, Regan Mandryk, Andy Cockburn, Carl Gutwin.

Biographies

Robert Xiao is an undergraduate researcher with the Interaction Lab at the University of Saskatchewan. His main research interests are the design and evaluation of interaction devices and techniques.

Miguel Nacenta is a lecturer at the University of St Andrews, Scotland. His main research interests are perception and new forms of human-computer interaction, including surface computing, multi-display, multi-touch and multi-modal interfaces.

Regan Mandryk is an Assistant Professor in the Interaction Lab in the Department of Computer Science at the University of Saskatchewan. Her main research areas are affective computing, persuasive games for healthy living, and interaction techniques.

Andy Cockburn is a Professor of Computer Science at the University of Canterbury, Christchurch, New Zealand. He is interested in designing, modelling, and evaluating interaction devices and techniques.

Carl Gutwin is Professor of Computer Science at the University of Saskatchewan, and holds a Canada Research Chair in Next-Generation Groupware. His research covers a variety of topics in HCI and CSCW including information visualization, modeling of human performance, groupware usability, and groupware performance.

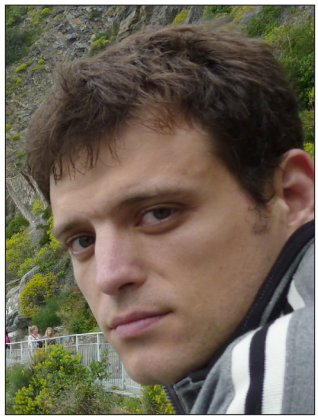
Alain Fournier Award 2010

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://www.cs.ubc.ca/~fournier.



Stelian Coros

University of British Columbia
CHCCS/SCDHM Alain Fournier Award Recipient 2010

This year, Stelian Coros is the recipient of the Alain Fournier Ph.D. Dissertation Award. His dissertation, entitled "Real-Time Planning and Control for Simulated Bipedal Locomotion", made several outstanding research contributions to computer graphics.

Stelian's dissertation addresses the challenging problem of learning locomotion strategies for physically-simulated characters. His work makes particular contributions towards developing abstract models of step-to-step dynamics, hierarchical control policies, foot placement strategies, and internal virtual force abstractions. These allow autonomous physics-based characters to robustly perform a large variety of new skills, including locomotion across terrain with gaps, agile walking and running towards a target location, carrying heavy crates, ducking under and stepping over obstacles, and stooping to pick up objects placed at any height. A generalized locomotion controller is developed which is demonstrated to work well across a broad range of tasks, character proportions, and motion styles. The dissertation has resulted in an impressive series of publications and contains a body of work that promises to have a significant influence on physics-based character animation.

Stelian completed a Bachelor of Computing at the University of Guelph in 2006, and a Ph.D. in Computer Science at the University of British Columbia under the supervision of Professor Michiel van de Panne. As a graduate student, Stelian received several scholarships and was active in a number of leadership roles in his laboratory, department, and research community. He has even presented a SIGGRAPH ASIA conference paper on behalf of colleagues from another university who were unable to attend. After his Ph.D., Stelian joined Disney Research in Zürich as a postdoctoral researcher under the supervision of Dr. Robert Sumner.

For more information, please visit: http://www.cs.ubc.ca/~scoros/

Bill Buxton Award 2010

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 winning dissertation is selected through a juried process by a selection committee consisting of accomplished researchers in Human-Computer Interaction. This year, that jury was Drs. Saul Greenberg (University of Calgary), Carl Gutwin (University of Saskatchewan), and Pourang Irani (University of Manitoba).

This inaugural year has two recipients for the best doctoral dissertation completed at a Canadian university in the field of Human-Computer Interaction: Daniel Vogel and Garth Shoemaker.

Two recipients for this award is not the norm. However, we (the selection committee) were compelled to award a 'tie'. Essentially, we thought other PhD students could benefit by reading both dissertations as they are quite different in approach, scope and perspective. Yet in spite of these differences, they share much that makes them award-worthy. They both make significant contributions to HCI. They both exhibit the range of skills expected of an excellent researcher in Human-Computer Interaction: creativity and design, ability to conduct rigourous studies, technological prowess, intellectual thought, and literary competence.

Garth Shoemaker

University of British Columbia
CHCCS/SCDHM Bill Buxton
Award Recipient 2010

Daniel Vogel

University of Toronto
CHCCS/SCDHM Bill Buxton
Award Recipient 2010

Garth Shoemaker's dissertation, entitled "Body-Centric and Shadow-Based Interaction for Large Wall Displays" is an example of an innovative research project that introduces and expands upon body-based interaction techniques. While body-based interactions have recently entered the public eye through systems such as the Microsoft Kinect, Garth's work (started in 2006) not only anticipates this novel way of interacting with computers, but situates it in an intellectual framework. As such, the dissertation will likely spark considerable future work in this area.

Garth completed his Honours Bachelor of Physics and Computer Science at Queen's University. He received his Masters in Computer Science under the supervision of Dr. Kori Inkpen (Simon Fraser University), and his PhD under Dr. Kellogg Booth (University of British Columbia). As a graduate student, he served as a visiting researcher at Osaka University Human Interface Engineering Lab. Earlier, he was the Director of Research (and also a senior developer) at Idelix Software, where he led research into new visualization technologies. He also received several NSERC Postgraduate Scholarships, and has a variety of publications and patents.

Daniel Vogel's dissertation "Direct Pen Input and Hand Occlusion" is an example of a highly rigorous, systematic and very thorough investigation into hand occlusion. It investigates the largely overlooked problem of a user's hand blocking the display when using a direct input device such as a pen. His work reveals the many problems that arise from hand occlusion, particularly how it affects target selection. Daniel developed a sophisticated geometrical model to represent the shape of the occluded area, and introduced novel techniques that mitigated this problem via occlusion-aware interfaces. His work exhibits considerable attention to details, to visual presentation of results, and to novel methodologies for study design, logging, and analysis.

Daniel completed his BA in Computer Science & Visual Arts at the University of Western Ontario, his BFA Intermedia at Emily Carr, and his MSc and PhD in Computer Science at the University of Toronto under the supervision of Dr. Ravin Balakrishnan. He is well published, including best paper awards and nominations at various high-end HCI conferences. He is a patent holder, and also received various Fellowships and Scholarships (including NSERC). He is now an Adjunct Professor at Mount Allison University.

Achievement Award 2011

Brian Wyvill

University of Victoria
CHCCS/SCDHM Achievement
Award Recipient 2011

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. The 2011 members of the Awards Committee are Richard Bartels, Eugene Fiume, and Kellogg Booth.

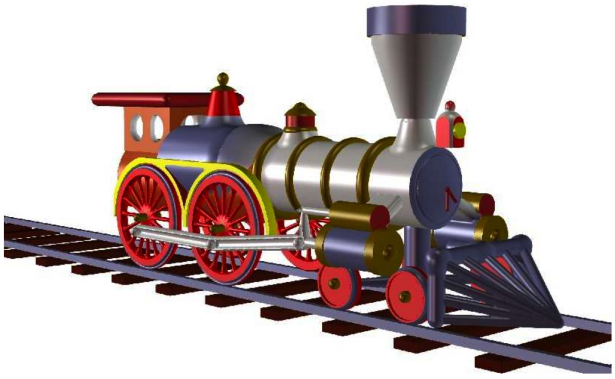
The 2011 CHCCS/SCDHM Achievement Award of the Canadian Human-Computer Communications Society is presented to Brian Brian Wyvill of the University of Victoria.

Brian Wyvill is Professor and Canada Research Chair in Computer Science at the University of Victoria. His B.Sc. was 1970 from the University of London and his Ph.D. was 1975 from the University of Bradford. He took a post-doc at the Royal College of Art in London and then worked at System Simulation. He held faculty positions at the University of Calgary from 1981 to 2006 before coming to the University of Victoria. In the last six years alone, he has published over 30 refereed articles. He has supervised 10 PhD students and over 20 MSc students.

His central research theme has been on methods to visualize implicit solid models; that is, those defined by processes identifying whether or not given points belong to the model. Implicit models have advantages for many design and visualization applications. Brian Wyvill's approach represents solid models by volumes inclosed in scalar-field isosurfaces. Various scalar fields can generate a large catalog of volume elements, and these can be combined by tools extending those conventionally used in solid modelling.

Brian Wyvill has pioneered the field. In 1986, with his brother Geoff, he developed the first polygonizer for implicit and iso-surfaces in volume data. Their work introduced features that were seminal and highly influential. In 1999, Brian Wyvill extended the CSG tree, the basic data structure for solid models, to include implicit models, producing the BlobTree. It provides a consistent system to evaluate objects, becoming a common way of organizing data for implicit modellers. A potential function he introduced, the Wyvill function, is widely used. Visualizing implicit surfaces demands rapid spatial searching, and Brian Wyvill has improved the search speed so that implicit surface techniques are now practical. Work with Kees van Overveld in the early-1990's led to a newer polygonization technique and offered a method for overcoming artifacts in a mesh approximation.

Brian Wyvill's recent research forms implicit models by sketch-based methods. This involves speeding tree traversal, generating implicit sweep surfaces, and building



a sketch based modeller called ShapeShop. With his collaborators he offered a novel texturing method in 2006 called decal compositing. Recent collaborations have led to a new method for applying free form deformation to implicit models and have contributed to solutions to three well known problems of implicit modelling: blending at distance, unexpected blending, and lack of fine detail.

During his career, Brian Wyvill has published in areas as varied as interactive modelling, sketch-based systems, illumination and rendering, animation, texturing, hierarchical and subdivision methods, biological and medical models, and physical simulation. Brian Wyvill has promoted implicit modelling through journal and conference papers; he has started two conference series and given many invited international lectures and seminars. Other fields of modelling owe much to the methods based on his algorithms.

No coverage of Brian Wyvill's activities would be complete without mentioning that he is also a stage actor and director, has just completed a novel, and is an avid mountaineer and rock climber with new routes and first assents to his credit.

For more information, please visit: http://www.csc.uvic.ca/Faculty_Staff/View/Brian_Wyvill

Keynote Speaker

Spatial Memory in User Interfaces

Carl Gutwin

University of Saskatchewan, Canada

Abstract

Humans have amazing spatial abilities - even people who claim that they can't read maps still remember the locations of thousands of objects in everyday life (alarm clocks, toasters, televisions, to name a few). User interfaces have made some use of spatial memory (everyone remembers where the File and Edit menus are), but this natural human capability is surprisingly underused in visual design. In this presentation, I will explore the principles underlying human spatial memory, and I will talk about some of our recent projects that demonstrate the power of spatial memory as a design tool for human-computer interaction.

Biography

Carl Gutwin is Professor of Computer Science at the University of Saskatchewan, and holds a Canada Research Chair in Next-Generation Groupware. His research covers a variety of topics in HCI and CSCW including information visualization, modeling of human performance, groupware usability, and groupware performance.

For more information, please visit: http://www.cs.usask.ca/~gutwin/

Keynote Speaker

Assistive Technology for the Aesthetically Impaired

John C. Hart

University of Illinois, Urbana-Champaign, USA

Abstract

We have inexpensive cameras for creating digital content like pictures and video, powerful image and video editing software for manipulating the content and popular social internet websites for sharing our results. But while most of us know how to operate these tools, we have no idea how to use these tools to make our digital content attractive and effective. For example, apps like Photoshop provide a wealth of tools for improving photographs, but no advice on how to use these tools to make a picture look better. This talk analyzes this situation, targets it with a novel research initiative, and summarizes some of our recent challenges and results for tools to assist users untrained in the established principles of the visual arts.

Biography

John C. Hart is a Professor in the Department of Computer Science at the University of Illinois, Urbana-Champaign, where he studies computer graphics, computational topology and computational aesthetics. His work there on high-performance graphics, shape modeling and rendering are supported by Adobe, Intel, Microsoft, NAVTEQ, NVIDIA and the NSF. He is a past Editor-in-Chief of ACM Transactions on Graphics, a co-author of "Real-Time Shading," a contributing author for "Texturing and Modeling: A Procedural Approach" and an executive producer of the documentary "The Story of Computer Graphics." He received his B.S. from Aurora University in 1987, and a Ph.D. in 1991 from the Electronic Visualization Laboratory at the University of Illinois at Chicago.

For more information, please visit: http://graphics.cs.uiuc.edu/~jch/

Keynote Speaker

Announcing the Sad Death of the Triangle Mesh

Brian Wyvill

University of Victoria, Canada

Abstract

Despite great advances in precise modeling methods the triangle mesh still dominates both as a subject of most modeling research and as a medium for content creation. GPU hardware for processing and scanning hardware for capture all support this methodology over anything else.

In this talk I resurrect the idea of the nearly extinct implicit modeling approach, and claim that such a methodology has some advantages over current popular techniques. The BlobTree structure is an extended CSG tree that combines a scene graph with nodes that relate skeletal implicit models, such as blending, CSG and deformations. Recent work in sketch-based modeling and the introduction of new field functions and operators permit a user to rapidly prototype implicit models without the drawbacks that became associated with this methodology in the 1980s and 1990s.

Unlike the ubiquitous triangle mesh, the BlobTree is a volume representation. This implicit representation requires no further complex algorithms to segment it into a hierarchy of parts, and sketch-based interfaces allow direct manipulation taking into account both local and global deformations. Additions and deletions at a high level or at a detailed level are simple to perform and the surface is an exact representation of the designer's concept. Classifying points as inside or outside requires a function evaluation and collision response and contact deformations are easy to implement. None of the above is true for triangle mesh representations.

Content creators want to build more complex models in an efficient fashion. One way of accomplishing this is to develop prototypes in a networked collaborative system. Passing large meshes across a network becomes a bottleneck in such a system. On the other hand, implicit models can be represented by a small hierarchy (the BlobTree). Information needed to build this can be highly condensed. With the advent of more local processing power, traversing a tree structure to produce a complex implicit model can be done interactively for highly complex models.

The next generation of GPU seems to be going in the direction of supporting more general purpose computing in a massively parallel manner. I'm looking forward to hardware support for functional models and the exploitation of their many advantages.

Biography

Brian Wyvill graduated from the University of Bradford, UK with a PhD in computer graphics in 1975. As a postdoc he worked at the Royal College of Art and helped make some animated sequences for the *Alien* movie. He emigrated to Canada in 1981 where he has been working in the area of implicit modeling, sometimes with his brother Geoff Wyvill (University of Otago). He is also interested in sketch based modeling and NPR and enjoys combining these areas of research.

Brian spent a quarter of century at the University of Calgary and is now a Professor and Canada Research Chair at the University of Victoria, in British Columbia.

For more information, please visit: http://www.csc.uvic.ca/Faculty_Staff/View/Brian_Wyvill