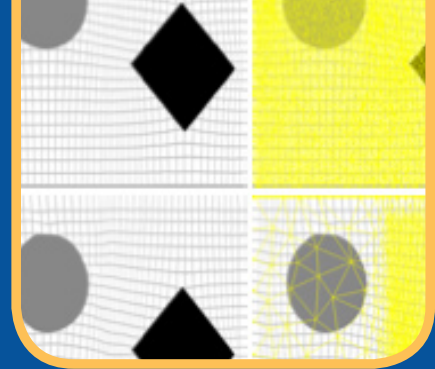


```

RCP<const FCurveUniformSamples> curve( FCurveUniformSamplesVM::toConst( state, 1 ) );
RCP<FCurveUniformSamples> result;
curve->waveletTransformPartialRevCubic( result, VM::toInt( state, 2 ) );
FCurveUniformSamplesVM::push( state, result );
return 1;
}
int
fastFourierTransformVM
( VMState* state )
{
RCP<const FCurveUniformSamples> curve( FCurveUniformSamplesVM::toConst( state, 1 ) );
RCP<FCurveUniformSamples> result;
curve->fastFourierTransform( result );
FCurveUniformSamplesVM::push( state, result );
return 1;
}
int
maxAmplitudeVM
( VMState* state )
{
RCP<const FCurveUniformSamples> curve( FCurveUniformSamplesVM::toConst( state, 1 ) );
RCP<FCurveUniformSamples> result;
curve->maxAmplitude( result, VM::toInt( state, 2 ), VM::toInt( state, 3 ), VM::toInt( state, 4 ) );
FCurveUniformSamplesVM::push( state, result );
return 1;
}
int
translateToMatchVM
( VMState* state )
{
RCP<const FCurveUniformSamples> curve( FCurveUniformSamplesVM::toConst( state, 1 ) );
RCP<const FCurveUniformSamples> other( FCurveUniformSamplesVM::toConst( state, 2 ) );
float scale, offset;
int translate = curve->translateToMatch( other, scale, offset );
VM::push( state, translate );
VM::push( state, scale );
VM::push( state, offset );
return 3;
}
CLASS RevOrdering
class RevOrdering
public:
bool operator() ( float a, float b ) const
{
return ( a < b );
}
};
class HaarWaveletOrdering
public:
/*--- methods ---*/
HaarWaveletOrdering( const FCurveUniformSamples::Container& waveletCoefficients )
: _waveletCoefficients( waveletCoefficients )
{
if ( _waveletMultiplier.size() == waveletCoefficients.size() )
{
return;
}
_waveletMultiplier.resize( waveletCoefficients.size() );
uint increment;
for ( increment=1; increment < _waveletMultiplier.size()-1; increment<<=1 )
{
uint waveletIdx;
for ( waveletIdx=0; waveletIdx < _waveletMultiplier.size(); waveletIdx += increment )
{
if ( increment == 1 )

```



# Proceedings Graphics Interface 2010

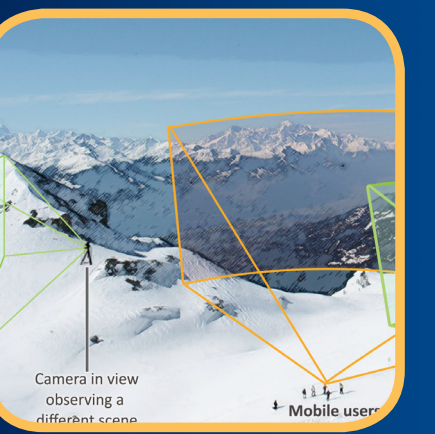
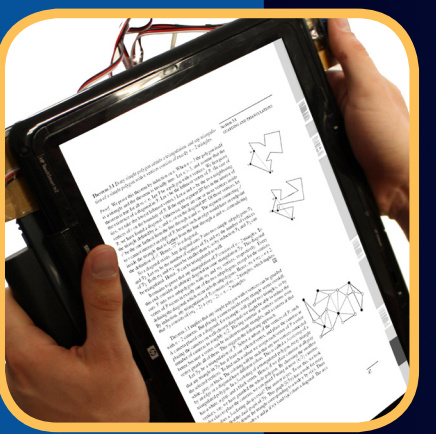
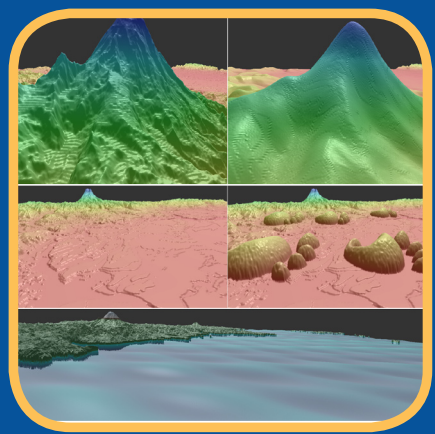
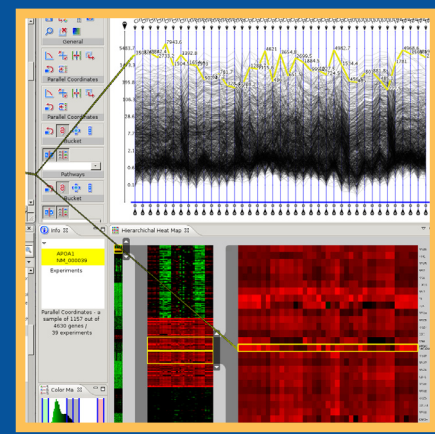
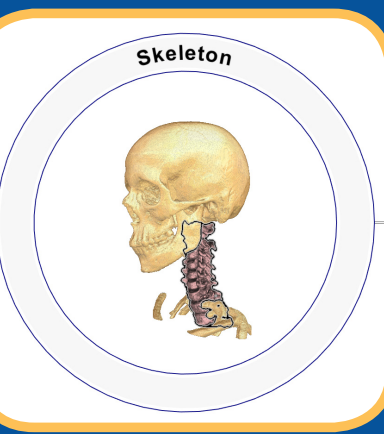
31 May - 2 June 2010  
Ottawa, Ontario, Canada

Canadian Human-Computer  
Communications Society/  
Société Canadienne du  
Dialogue Humaine Machine  
(CHCCS/SCDHM)

```

VMState* state )
{
RCP<const FCurveUniformSamples> curve( FCurveUniformSamplesVM::toConst( state, 1 ) );
RCP<FCurveUniformSamples> result;
curve->resampleLinear( result, VM::toInt( state, 2 ) );
FCurveUniformSamplesVM::push( state, result );
return 1;
}
int
waveletTransformFwdHaarVM
( VMState* state )
{
RCP<const FCurveUniformSamples> curve( FCurveUniformSamplesVM::toConst( state, 1 ) );
RCP<FCurveUniformSamples> result;
curve->waveletTransformFwdHaar( result );
FCurveUniformSamplesVM::push( state, result );
return 1;
}
int
waveletTransformRevHaarVM
( VMState* state )
{
RCP<const FCurveUniformSamples> curve( FCurveUniformSamplesVM::toConst( state, 1 ) );
RCP<FCurveUniformSamples> result;
curve->waveletTransformRevHaar( result );
FCurveUniformSamplesVM::push( state, result );
return 1;
}
int
waveletTransformPartialRevHaarVM
( VMState* state )
{
RCP<const FCurveUniformSamples> curve( FCurveUniformSamplesVM::toConst( state, 1 ) );
RCP<FCurveUniformSamples> result;
curve->waveletTransformPartialRevHaar( result, VM::toInt( state, 2 ) );
FCurveUniformSamplesVM::push( state, result );
return 1;
}
int
waveletTransformFwdLinearVM
( VMState* state )
{
RCP<const FCurveUniformSamples> curve( FCurveUniformSamplesVM::toConst( state, 1 ) );
RCP<FCurveUniformSamples> result;
curve->waveletTransformFwdLinear( result );
FCurveUniformSamplesVM::push( state, result );
return 1;
}
int
waveletTransformRevLinearVM
( VMState* state )
{
RCP<const FCurveUniformSamples> curve( FCurveUniformSamplesVM::toConst( state, 1 ) );
RCP<FCurveUniformSamples> result;
curve->waveletTransformRevLinear( result );
FCurveUniformSamplesVM::push( state, result );
return 1;
}
int
waveletTransformPartialRevLinearVM
( VMState* state )
{
RCP<const FCurveUniformSamples> curve( FCurveUniformSamplesVM::toConst( state, 1 ) );
RCP<FCurveUniformSamples> result;
curve->waveletTransformPartialRevLinear( result, VM::toInt( state, 2 ) );
FCurveUniformSamplesVM::push( state, result );
return 1;
}
int
waveletTransformFwdCubicVM
( VMState* state )
{
RCP<const FCurveUniformSamples> curve( FCurveUniformSamplesVM::toConst( state, 1 ) );
RCP<FCurveUniformSamples> result;
curve->waveletTransformFwdCubic( result );
FCurveUniformSamplesVM::push( state, result );
return 1;
}
int
waveletTransformRevCubicVM
( VMState* state )
{
RCP<const FCurveUniformSamples> curve( FCurveUniformSamplesVM::toConst( state, 1 ) );
RCP<FCurveUniformSamples> result;
curve->waveletTransformRevCubic( result );
FCurveUniformSamplesVM::push( state, result );
return 1;
}
int
waveletTransformPartialRevCubicVM
( VMState* state )
{
RCP<const FCurveUniformSamples> curve( FCurveUniformSamplesVM::toConst( state, 1 ) );
RCP<FCurveUniformSamples> result;
curve->waveletTransformPartialRevCubic( result, VM::toInt( state, 2 ) );
FCurveUniformSamplesVM::push( state, result );
return 1;
}
}

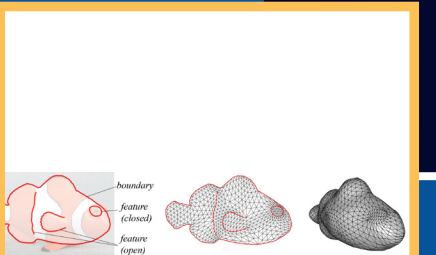
```



www.graphicsinterface.org  
www.akpeters.com



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```

TRACE( "C" << 1 << ", " << _waveletMultiplier[j] << " ) );
}
bool operator() ( uint a, uint b ) const
{
if ( a == 0 && b != 0 )

```

# Graphics **Interface** 2010

Ottawa, Ontario, Canada

31 May - 2 June 2010

## Proceedings

Edited by

David Mould

Sylvie Noël



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# President's Welcoming Letter



Canadian Human Computer Communications Society /  
Société Canadienne du Dialogue Humaine Machine

---

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

The Canadian Human-Computer Communications Society (CHCCS) / Société Canadienne du Dialogue Humaine Machine (SCDHM) is 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 2010 conference, encompassing Artificial Intelligence and Computer and Robotic Vision, along with Graphics Interface, is located at the University of Ottawa in Ottawa, Ontario. 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 awards: the annual Michael A. J. Sweeney Awards for the best student papers presented at the conference; the annual Alain Fournier Ph.D. Thesis Award, presented for the best Ph.D. thesis awarded in Canada during the previous year in an area of research supported by CHCCS/SCDH; the annual 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 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 Marilyn Mantei, a pioneer in Computer-Supporter Co-operative Work. 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 Tiberiu Popa. I would like to thank Pierre Poulin, who judged several excellent theses that were submitted for the award. 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 2010. I also wish to thank Sylvie Noël and David Mould, the co-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 Co-chairs

---

David Mould  
School of Computer Science  
Carleton University, Canada

Sylvie Noël  
Networked Media Lab  
Communications Research Centre  
Canada

You are holding the proceedings for Graphics Interface 2010. Graphics Interface is the oldest continuously-scheduled conference in computer graphics and human-computer interaction, now in its 36th year; the conference dates back to 1969, when it was the “Canadian Man-Computer Communications Seminar”. Graphics Interface was given its present name in 1982. In 2010, Graphics Interface takes place in Ottawa, from May 31 to June 2.

The program for Graphics Interface 2010 features 33 regular papers and two short papers. We received 88 submissions and had some difficult decisions in arriving at the final selection. This year, there was a surge in papers submitted to the Interface track, resulting in a final program with a slightly stronger emphasis on HCI. Both tracks had similar acceptance rates: 39% for the HCI track and 44% for the graphics track.

The GI committee comprised 26 experts from graphics and HCI. With rare exceptions, each paper was formally reviewed by two committee members and 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, Catherine Plaisant, University of Maryland, and Jos Stam, Autodesk. Both speakers are well known for their exemplary contributions to their disciplines. Also, our congratulations to Marilyn Tremaine, Rutgers University, this year’s recipient of the Canadian Human-Computer Communication Society’s Achievement Award.

We would like to thank various people who contributed to the behind-the-scenes conference organization, especially Steve Mann, Bill Cowan, Kelly Booth, and Meghan Haley. Thanks go out to the local organizers, Robert Laganierre, Jochen Lang, and WonSook Lee. We would also like to thank Eugene Fiume, Carolyn Ursabia, and Koji Yatani for their help organizing the in-person committee meeting at the University of Toronto. 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>.



## Organization

---

### PROGRAM CO-CHAIRS

**David Mould**  
School of Computer Science  
Carleton University, Canada

**Sylvie Noël**  
Networked Media Lab  
Communications Research Centre  
Canada

### POSTERS CHAIR

**WonSook Lee**  
University of Ottawa

## Program Committee

---

**Melanie Baljko**  
York University

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**Andrea Bunt**  
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**Minglun Gong**  
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**Theodore Kim**  
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**Paul Kry**  
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**WonSook Lee**  
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**Karon MacLean**  
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**Torsten Möller**  
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**Mark Perry**  
Brunel University

**Pierre Poulin**  
University of Montreal

**Jean-Marc Robert**  
Ecole Polytechnique de Montréal

**Faramarz Samavati**  
University of Calgary

**Ehud Sharlin**  
University of Calgary

**Roel Vertegaal**  
Queen's University

**Chris Wyman**  
University of Iowa

**Hao (Richard) Zhang**  
Simon Fraser University

## Reviewers

---

Brian Allen	Joe LaViola	Ingo Wald
Alissa Antle	Wilmot Li	Jue Wang
Ravin Balakrishnan	Chunyuan Liao	Rui Wang
Loic Barthe	David Lowe	Yanzhen Wang
Robert Biddle	Xun Luo	Yu-Shuen Wang
Michael Blackstock	Antoine Manzanera	Daniel Weiskopf
Tamy Boubekeur	Oliver Mattausch	Doug Wightman
Ulrik Brandes	Michael McGuffin	Jonathan Woodring
Stephen Brooks	Morgan McGuire	Xing-Dong Yang
Stefan Bruckner	Stephane Merillou	Shin Yoshizawa
Xiang Cao	Laurent Moccozet	Jim Young
Stu Card	Karyn Moffatt	Hongxin Zhang
Nathan Carr	Miguel Nacenta	
Cheng Cheng	Ahmad Nasri	
Ed Chi	Daniel Natapov	
Sonia Chiasson	Andy Nealen	
Yung-Yu Chuang	Les Nelson	
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Connor Dickie	Romain Pacanowski	
Andre Doucette	Kurt Partridge	
Andrew Duchowski	Tim Poston	
Raanan Fattal	Christoph Rhemann	
Guangzheng Fei	Tobias Ritschel	
George Fitzmaurice	Austin Robison	
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Adam Fourney	Holly Rushmeier	
Elodie Fourquet	Daisuke Sakamoto	
Miguel Granados	Paul Saulnier	
Saul Greenberg	Ryan Schmidt	
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Gaël Guennebaud	Andrei Sharf	
Stephen Gulliver	Chris Shaw	
Cheng Guo	Amit Shesh	
Carl Gutwin	Peter Shirley	
Mark Hancock	Shervin Shirmohammadi	
Mark Harris	Eftychios Sifakis	
Kirstie Hawkey	David Sprague	
Jeffrey Heer	John Stasko	
Andrew Hogue	Maureen Stone	
David Holman	Peter Sturm	
Chang Hu	Sara Su	
Petra Isenberg	Bongwon Suh	
Hao Jiang	Anthony Tang	
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ChangHun Kim	Michael Terry	
Gordon Kindlmann	Art Tevs	
Robert Kosara	Steve Thomas	
Jaroslav Krivanek	Nils Thuerey	
Joel Lanir	Melanie Tory	
Paul Lapedes	Jarke van Wijk	
Celine Latulipe	Deepak Vembar	
Christian Lauterbach	Daniel Vogel	

# Michael A. J. Sweeney Award 2010



Canadian Human Computer Communications Society /  
Société Canadienne du Dialogue Humaine 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 2010  
In Memory  
Michael A. J. Sweeney, 1951-1995

## Graphics 2010 Award Winner

---

“Interactive Illustrative Visualization of Hierarchical Volume Data” by Jean-Paul Balabanian, Ivan Viola, Eduard Gröller.

### BIOGRAPHIES

Jean-Paul Balabanian defended his Ph.D., “Multi-Aspect Visualization: Going from Linked Views to Integrated Views”, at the University of Bergen in January 2010. He works now as a consultant at Statoil in Bergen, Norway. His research interests include computer graphics, illustrative visualization, and integrated visualization.

Eduard Gröller is an associate professor at the Vienna University of Technology, Austria, and adjunct professor of computer science at the University of Bergen, Norway. His research interests include computer graphics, flow visualization, volume visualization, medical visualization, and information visualization. He has co-authored more than 175 scientific publications and acted as a co-chair, IPC member, and reviewer for numerous conferences and journals in the field. Dr. Gröller is currently Chief Editor of the *Computer Graphics Forum* journal.

Ivan Viola is an associate professor at the University of Bergen, and Scientific Adviser at Christian Michelsen Research, Bergen, Norway. He received his M.Sc. in 2002 and Ph.D. in 2005 from the Vienna University of Technology, Austria. His research is focused on the application of illustrative visualization to communication of complex scientific data. Dr. Viola co-authored several scientific works published in international journals and conferences such as *IEEE TVCG*, *IEEE Visualization*, and *EuroVis*, and acted as a reviewer and IPC member for conferences in the field of computer graphics and visualization. He is a member of Eurographics, NorSIGD, IEEE Computer Society, and VGTC.

## HCI 2010 Award Winner

---

“Visual Links across Applications” by Manuela Waldner, Werner Puff, Alexander Lex, Marc Streit, Dieter Schmalstieg.

### BIOGRAPHIES

Manuela Waldner is a Ph.D. candidate at the Institute for Computer Graphics and Vision at Graz University of Technology, Austria. She received her master's degree in Digital Media from the Upper Austria University of Applied Sciences. Her research interests include human-computer interaction and computer-supported cooperative work, in particular for multi-display environments, as well as collaborative information visualization.

Werner Puff is a research assistant at the Institute for Computer Graphics and Vision at Graz University of Technology. He received his master's degree in Technical Mathematics - Computer Sciences from Graz University of Technology. His research interests include software development in distributed systems and web technologies.

Alexander Lex studied in Graz, Austria and Hamilton, Canada and received his bachelor's and master's degree in computer science from Graz University of Technology where he is now involved in the Caleydo project as a Ph.D. candidate. His research interests are InfoVis, Visual Analytics, HCI and Bioinformatics. When he is not in the lab he enjoys traveling and riding his snowboard in the Austrian mountains.

Marc Streit is a Ph.D. candidate at the Institute for Computer Graphics and Vision at Graz University of Technology, Austria. He received his master's degree in computer science from the Graz University of Technology in 2007. His research focuses on the Caleydo project ([www.caleydo.org](http://www.caleydo.org)) where he works on topics including information visualization, visual analytics and bioinformatics.

Dieter Schmalstieg is full professor of Virtual Reality and Computer Graphics at Graz University of Technology (TUG), Austria, where he directs the “Studierstube” research project on augmented reality. Dieter Schmalstieg received the Dipl.-Ing., Dr. techn., and Habilitation degrees from the Vienna University of Technology in 1993, 1997, and 2001. His current research interests are augmented reality, virtual reality, real-time graphics, 3D user interfaces, ubiquitous computing, and information visualization.

# Alain Fournier Award 2009



Canadian Human Computer Communications Society /  
Société Canadienne du Dialogue Humaine 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. thesis defended in a Canadian University over the past year. The winning thesis 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>.

## Previous Award Recipients

2008 Samuel Hasinoff

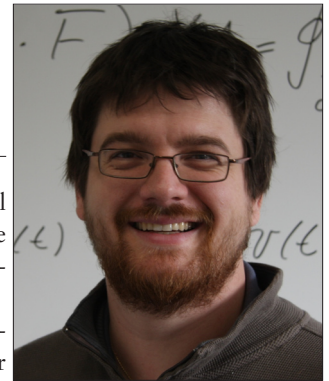
2007 Abhijeet Ghosh

2006 Celine Latulipe

2005 Michael P. Neff

This year, Tiberiu Popa is the recipient of the Alain Fournier Ph.D. Thesis Award. His thesis, entitled “Capturing and Modeling of Deformable Objects”, made several outstanding research contributions to computer graphics.

He completed with distinction his Honours Co-op Bachelor of Mathematics in Computer Science, his Master of Mathematics under the supervision of Professor Michael McCool, both degrees at University of Waterloo, and his Ph.D. in Computer Science at University of British Columbia under the supervision of Professor Alla Sheffer. As a graduate student, Tiberiu won the first place of the ACM Student Research Competition in 2005, and received several scholarships. He was also involved in peer review of papers for several conferences and journals. After his Ph.D., Tiberiu joined the Computer Graphics Laboratory at ETH Zurich as a postdoctoral researcher under the supervision of Professor Markus Gross.



**Tiberiu Popa**

University of British Columbia,  
Canada

CHCCS/SCDHM Alain Fournier  
Award Recipient 2009

Tiberiu’s thesis demonstrates considerable work in the area of acquisition, modeling, and visualization of deformable objects. The accomplished research covers each stage, with numerous and original contributions. The Ph.D. dissertation is well organized, easy to read, while presenting precisely and clearly all the work, showing the candidate’s discernment.

In addition, several high quality publications have been produced; the candidate also received great recognition from the research community with an invitation to publish his work in a special issue of a journal and a best poster award.

# Achievement Award 2010



Canadian Human Computer Communications Society /  
Société Canadienne du Dialogue Humaine 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 2010 members of the Awards Committee are Richard Bartels, Eugene Fiume, and Kellogg Booth.

Professor Marilyn Tremaine of Rutgers University has been a major contributor to the field of Computer-Human Interaction for almost as long as this field has existed. Beginning with her first publication in this area in 1979, she has nearly 80 refereed publications to her credit on topics that include computer-supported collaboration, effective data-base usage, interface formalization and design, assistive systems for the impaired and for rehabilitation, quantitative analysis of interaction methods, real-time indexing for video conferencing, tactile and audio modes of interaction, multi-modal interaction, comprehension of visualizations, distance communication and team structure issues relating to global software development, and time management tools.

In the course of her research she has advised and successfully graduated 14 Ph.D. and over 20 M.S. students. Professor Tremaine obtained her M.S. in 1978 and her Ph.D. in 1982 from the University of Southern California. She has been on the faculty of the University of Michigan as Assistant Professor of Computer and Information Systems from 1979 through 1986, the University of Toronto as Associate Professor of Computer Science from 1988 through 1997, Drexel University as Professor of Computer and Information Systems from 1997 through 2001, and the New Jersey Institute of Technology as Professor and Chair of information Systems from 2001 through 2005, where she is now Professor Emerita. During these last two appointments, she has been Research Professor in the Center for Advanced Information Processing with Rutgers University from 1997 to the present. She has also held research positions with EDS, Carnegie-Mellon University, Xerox PARC, and Lawrence Berkeley Labs.

Professor Tremaine has been a trail blazer in the field of HCI and a pioneer in applying digital media to a variety of problems. She has been a mentor to multiple generations of students, and a leader in establishing HCI as a legitimate field of research, both within computer science and on its own as a highly multidisciplinary activity that goes well beyond traditional boundaries. She has made seminal contributions via both research and professional leader-



## Marilyn Tremaine

Rutgers University, Canada

CHCCS/SCDHM Achievement  
Award Recipient 2010

ship to the emerging field of computer-supported cooperative work; carried out significant research into telepresence and video collaboration environments, and helped educate the human-computer interaction community on survey and interview methods.

During her distinguished career she established the HCI program at the University of Michigan, helped build the field of HCI at the University of Toronto and indirectly across Canada, developed one of the pioneering computer-supported meeting facilities for EDS, and headed the CAVECAT, Jabber and Nonspeach projects at the University of Toronto, for video desktop conferencing, real-time indexing of meetings, and investigating audio interface design, respectively. At Rutgers and the New Jersey Institute of Technology she has focussed on multi-modal interfaces, visualization, assistive systems and teamwork at a distance in software development. She is Vice President of Usability New Jersey. As one of the original founders of ACM SIGCHI in 1982 and the annual CHI conferences, and as SIGCHI Chair during 1999-2002, she has a long record of support and encouragement for human-computer interaction. This includes numerous important positions over the years in SIGCHI and other organizations, notably as Vice-Chair of Communications, Chair of the Advisory Council, Vice-Chair of Finance and Chair of the SIG SIGCHI Education, member of the SIGCHI Curriculum Development Committee, member of the SIGCHI Executive Committee Advisory Board, Chair of the Graphics Interface Technical Program, Chair of conferences on human factors, on computer supported cooperative work, on computer assistance and usability. She serves regularly on paper selection committees and on several editorial boards for journals.

# Invited Speaker

## Exploring Temporal Patterns with Information Visualization

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### Catherine Plaisant

Human Computer Interaction Lab

University of Maryland, USA



### ABSTRACT

After an overview of visualizations to explore temporal patterns, we will focus on interfaces for discovering temporal event patterns in electronic health records. Specifying event sequence queries is challenging even for skilled computer professionals familiar with SQL. Our novel interactive search strategies allow for aligning records on important events, ranking, and filtering combined with grouping of results to find common or rare events. A second approach is to use query-by-example, in which users specify a pattern and see a similarity-ranked list of results, but the similarity measure needs to be customized for different needs. Temporal summaries allow comparisons between groups. We will discuss the methods we use to evaluate the usefulness of our interfaces through collaborations with clinicians and hospital administrators on case studies. Finally, application of the techniques to other domains will be discussed.

### BIOGRAPHY

Dr. Catherine Plaisant is a senior research scientist at the University of Maryland, and associate director of research at the Human-Computer Interaction Lab. She earned a Doctorat d'Ingénieur degree in France in 1982 and has written over 100 refereed technical publications on diverse subjects such as information visualization, digital libraries, universal access, image browsing, help, digital humanities, technology for families, or evaluation methodologies. Catherine is a co-author with Ben Shneiderman of "Designing the User Interface: Strategies for Effective Human-Computer Interaction" (5th ed. March 2009). The work presented in this talk has been conducted jointly with Professor Ben Shneiderman and graduate students David Wang and Krist Wongsuphasawat.

# Invited Speaker

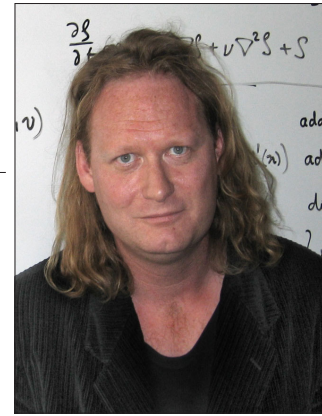
## Nucleus: A Framework for a Unified Dynamics Solver

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### Jos Stam

Senior Research Scientist

Autodesk, Inc.



### ABSTRACT

The convincing simulation of interacting deformable objects is hard to achieve using traditional animation techniques such as key-framing alone. Therefore, there is a need in computer graphics to rely on physics-based dynamics solvers. Instead of specifying exact poses through key frames an animator specifies material properties of the objects and external forces. Given this information the dynamics solver then ideally computes snapshots of the states of all the objects over fixed time-steps. Most current solvers are fine tuned for a specific effect such as rigid bodies and cloth. Resolving interactions between such solvers can become problematic. For example, imagine a rigid body like a soccer ball being kicked in a goal. There will be a two way interaction between the ball and the net. Achieving this effect by connecting a rigid body solver to a curve-based solver for the goal net can be problematic. In this paper we present a solver that tries to resolve these interactions simultaneously.

We describe both how we model different shapes of matter and how we simulate them. We decided to use a simplicial complex for our shape model as it includes points, curves, surfaces and solids in a unified framework. For the simulation part we use a space-time based approach for the collisions and a constraint based approach to account for deformations. This approach results in simulations that are stable for stiff materials such as cloth.

By allowing various elements of matter to interact in this manner we get interesting emergent behaviors. Even though each interaction is simple more complex behaviors emerge. For example a flapping flag can be simulated using a simple directional wind field and an inextensible piece of cloth. The flapping behavior emerges from the drag and lift constraints battling the stretch constraint. The behavior emerges without the need for a complicated air flow model. Throughout our research we emphasize simplicity as it vastly reduces the amount of code and consequently the amount of potential bugs. This is not just an aesthetic

bias on our part rooted in a desire to achieve mathematical elegance. In practice adhering to this principle results in more robust and stable commercial products.

### Reference:

Jos Stam, “Nucleus: Towards a Unified Dynamics Solver for Computer Graphics”, Proceedings of the 11th IEEE International Conference on Computer-Aided Design and Computer Graphics, August 19-21, 2009, Yellow Mountain, China, pp. 1-11.

### BIOGRAPHY

Jos Stam was born in the Netherlands and educated in Geneva, Switzerland, where he received dual Bachelor degrees in computer science and pure mathematics. In 1989, Stam moved to Toronto where he completed his Masters and Ph.D. degrees in computer science. After that he pursued postdoctoral studies as a ERCIM fellow at INRIA in France and at VTT in Finland. In 1997 Stam joined the Alias Seattle office as a researcher and stayed there until 2003 when relocated to Alias’ main office in Toronto. Stam was employed by Autodesk as a Senior Research Scientist as part of Autodesk’s acquisition of Alias in 2006.

Stam’s research spans several areas of computer graphics: natural phenomena, physics-based simulation, rendering and surface modeling, especially subdivision surfaces. He has published papers in all of these areas in journals and at conferences, most notably at the annual SIGGRAPH conference. In 2005 Stam was awarded one of the most prestigious awards in computer graphics: the SIGGRAPH Computer Graphics Achievement Award. Stam also won two Technical Achievement Awards from the Academy of Motion Picture Arts and Sciences: in 2005 for his work on subdivision surfaces and in 2007 for his work on fluid dynamics. He was also featured in a January 2008 Wired magazine article.