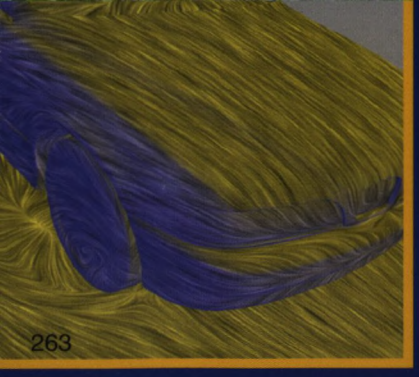
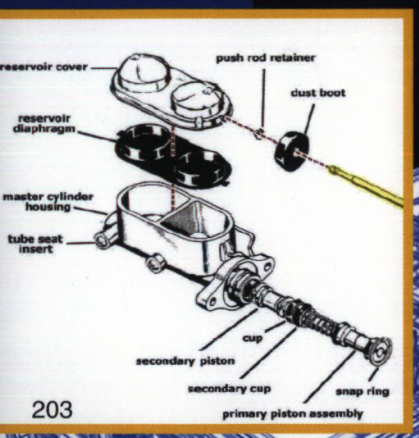
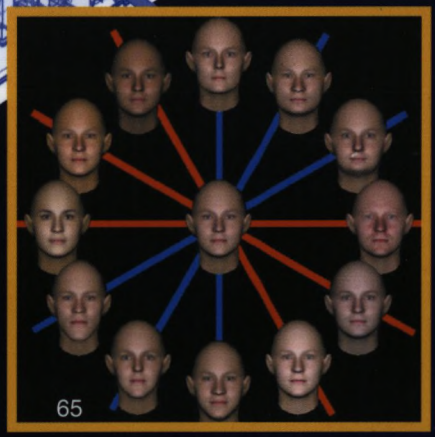




Proceedings

Graphics **Interface** 2004

17-19 May 2004
London, Ontario
Canadian Human-Computer
Communications Society



Proceedings

Graphics **Interface** 2004

Wolfgang Heidrich and Ravin Balakrishnan
Program Co-Chairs

www.graphicsinterface.org

London, Ontario
17–19 May 2004

Copyright © 2004 by the Canadian Information Processing Society

All rights reserved. No part of the material protected by this copyright notice may be reproduced or utilized in any form, electronic or mechanical, including photocopying, recording, or by any information storage and retreival system, without written permission from the copyright owner.

Papers are reproduced here from electronic files prepared by the authors.

ISSN 0713-5424
ISBN 1-56881-227-2

Proceedings Graphics Interface 2004, Wolfgang Heidrich and Ravin Balakrishnan (Program Co-Chairs), London, Ontario, 17–19 May 2004. Published by the Canadian Human-Computer Communications Society and A K Peters Ltd.

Graphics Interface is sponsored by:
The Canadian Human-Computer Communications Society (CHCCS)

Membership Information for CHCCS is available from:
Canadian Information Processing Society (CIPS)
2800 Skymark Avenue, Suite 402
Mississauga, Ontario L4W 5A6
Canada
Telephone: (905) 602-1370
Fax: (905) 602-7884
Web: `http://www.cips.ca/`

Additional copies of the proceedings are available from:
A K Peters Ltd.
63 South Avenue
Natick, MA 01760
Web: `http://www.akpeters.com/`

Published by the Canadian Human-Computer Communications Society and A K Peters Ltd.
Distributed by A K Peters Ltd.
Printed in Canada by Graphics Services at the University of Waterloo, Waterloo, Ontario.

Cover Credits

Wireframes: Marc Nienhaus and Jürgen Döllner (49). Computer Program: Craig S. Kaplan and David H. Salesin (255). Colour images: Left to right (starting on back left): Matthias Zwicker, Jussi Räsänen, Mario Botsch, Carsten Dachsbacher, and Mark Pauly (247); Simeon Potts and Torsten Möller (57); Philippe Beaudoin and Pierre Poulin (169); Craig S. Kaplan and David H. Salesin (255); Graeme Sweet and Colin Ware (97); Tzu-Pei Grace Chen and Sidney Fels (65); Johannes Hirche, Alexander Ehlert, Michael Doggett, and Stefan Guthe (153); Greg Coombe, Mark J. Harris, and Anselmo Lastra (161). Top to bottom (skipping joint): Daniel Weiskopf and Thomas Ertl (263); Jan Kautz, Mirko Sattler, Ralf Sarlette, Reinhard Klein, and Hans-Peter Seidel (177); Wilmot Li, Maneesh Agrawala, and David Salesin (203); Matthias Müller and Markus Gross (239). Design: Abby Van Dongen.

Preface

Ravin Balakrishnan
Dynamic Graphics Project
Department of Computer Science
University of Toronto

Wolfgang Heidrich
IMAGER Lab
Department of Computer Science
The University of British Columbia

Welcome to the 30^{th} anniversary of Graphics Interface, the Canadian annual conference devoted to computer graphics, interactive systems, and human-computer interaction. It is the oldest regularly-scheduled computer graphics and human-computer interaction conference. The conference was initially held every other year as the "Canadian Man-Computer Communications Seminar" (CMCCS), with the first conference taking place in 1969. In 1982, the conference was renamed to its current name, Graphics Interface. At the same time, the conference was changed to an annual format. This year, Graphics Interface was held May 17–19, 2004 in London, Ontario.

Strengthening the HCI side of the conference has been an ongoing concern over the past few years. We have continued these efforts this year, and are happy to report that we received a number of very strong HCI submissions, so that the program is very much balanced this year: of 32 accepted papers, 14 are graphics, 15 are HCI, and 3 span both areas. The total number of submissions was 84.

The program committee consisted of 25 experts from around the world. In general, the papers received 5 reviews, two from the program committee and 3 from external reviewers. We also introduced an additional shepherding phase for some of the papers that were considered strong contributions, but had minor flaws in the initial submission. The reviewing process was double-blind, meaning that the identity of the authors was known only to the program co-chairs and the program committee member responsible for choosing external reviewers for each submission. A total of 214 external reviewers – all of them experts in the field – contributed to the reviewing process. We greatly appreciate the effort of both the external reviewers and the members of the program committee. Our thanks especially go to James Stewart whose excellent conference management site made the job of managing the review process much easier than it would have otherwise been. Only through this sustained service from the community can Graphics Interface maintain its high standards.

We would also like to extend our appreciation to the four invited speakers of this year, all of them outstanding leaders in their respective fields: Gregory Abowd, Associate Professor, Georgia Tech; Mary Czerwinski, Senior Researcher, Microsoft Research; Dinesh Manocha, Professor, University of North Carolina at Chapel Hill; and Harry Shum, Managing Director, Microsoft Research Asia. The abstracts of the talks and the biographies of the speakers can be found at the end of these proceedings.

Special thanks go to Kelly Booth for handling the liaison with AI and CVR (formerly VI) conference organizers, and for being available as a source of advice for pretty much every aspect of this conference. We further thank Pourang Irani for handling the posters, Fred Peet, treasurer of the Canadian Human-Computer Communication Society, for taking car of the finances, and Graphics Services at the University of Waterloo and Michael McCool for doing such an excellent job on the proceedings. Last but not least, we send a very big thanks to Bob Mercer and Kamran Sedig from the University of Western Ontario for the local organization of the joint conferences. Without their work, this conference would not have been possible.

For further information about the conference series we invite you to visit the web site:

`http://www.graphicsinterface.org/`

Organization

Conference and Program Chairs

Ravin Balakrishnan, HCI Co-chair, University of Toronto
Wolfgang Heidrich, Graphics Co-chair, The University of British Columbia

Local Organizers

Bob Mercer, The University of Western Ontario
Kamran Sedig, The University of Western Ontario

Posters and Demos Chair

Pourang Irani, University of Manitoba

Intersociety Liason and Advisor

Kellogg Booth, University of British Columbia

Online Services

James Stewart, Queen's University

Proceedings Editor

Michael McCool, University of Waterloo

Program Committee

Robert Bridson, The University of British Columbia
George Drettakis, INRIA Sophia Antipolis
Xavier Granier, INRIA Bordeaux
Carl Gutwin, University of Sasketchewan
Aaron Hertzmann, University of Toronto
Ken Hinckley, Microsoft Research
Robert Jacob, Tufts University
Jan Kautz, MIT
Allison Klein, McGill University
Leif Kobbelt, RWTH Aachen
Scott MacKenzie, York University
Joanna McGrenere, The University of British Columbia
Torsten Moeller, Simon Fraser University
Tamara Munzner, The University of British Columbia
Dinesh Pai, Rutgers University
Jeff Pierce, Georgia Institute of Technology
Pierre Poulin, University of Montreal
Holly Rushmeier, Yale University
Chia Shen, MERL
Karan Singh, University of Toronto
Peter-Pike Sloan, Microsoft
Marc Stamminger, University of Erlangen-Nürnberg
Roel Vertegaal, Queens University
Oleg Veryovka, Electronic Arts Canada
Michiel van de Panne, The University of British Columbia

CHCCS Treasurer

Fred G. Peet, Canadian Forest Service

Reviewers

Maneesh Agrawala
Tomas Akenine-Moller
Marc Alexa
Michael Ashikhmin
Dan Baker
Kavita Bala
Barbara Balents
Bill Barnert
Bill Barrett
Lyn Bartram
Patrick Baudisch
Michel Beaudouin-Lafon
Scott Bell
Alexander Belyaev
Mark Billinghurst
Stephan Bischoff
Jules Bloomenthal
David Blythe
Kellogg Booth
Kadi Bouatouch
Carol Broverman
Barry Brown
Sheelagh Carpendale
Hamish Carr
Nathan Carr
Eric Chan
Daniel Cheng
Erika Chuang
Patrick Coleman
Jeremy Cooperstock
Mario Costa Sousa
Roger Crawfis
Barbara Cutler
Carsten Dachsbacher
Sriram Dayanand
Xavier Decoret
Olaf Delgado Friedrichs
Mathieu Desbrun
Oliver Deussen
Anind Dey
John Dill
Jean-Michel Dischler
Iddo Drori
Fredo Durand
Philip Dutré
David Ebert
Hal Eden
Timothy Edmunds
Keith Edwards
Douglas Enright
Thomas Ertl
Tony Ezzat
Ron Fedkiw
Steve Feiner

Jean-Daniel Fekete
Sidney Fels
Clifton Forlines
Tom Forsyth
Bert Freudenberg
Sarah Frisken
Henry Fuchs
Joe Gabbard
Simon Gibson
Andy Golding
Bruce Gooch
Lance Good
Steven Gortler
Ambarish Goswami
Mark Green
Eitan Grinspun
Eduard Groeller
Jonathan Grudin
Eran Guendelman
Yves Guiard
Francois Guimbretiere
Pascal Guitton
Eric Haines
Jesse Hall
Jan Hardenbergh
Antonio Haro
Mark Harris
Alejo Hausner
Christopher Healey
Daryl Hepting
Jeff Hightower
Jesse Hoey
Ralph Hollis
David Holman
Jian Huang
Greg Humphreys
Takeo Igarashi
Milan Ikits
Kori Inkpen
Victoria Interrante
Pourang Irani
Geoffrey Irving
Tobias Isenberg
Poika Isokoski
Shahram Izadi
Doug James
Chad Jenkins
Brad Johanson
Dill John
Susanne Jul
Kazufumi Kaneda
Hirokazu Kato
Daniel Keefe

Junhwan Kim
Tae-Yong Kim
Ted Kirkpatrick
David Knott
Joseph Konstan
Lucas Kovar
John Krumm
Paul Kry
Gord Kurtenbach
Hendrik Lensch
Robert Lewis
Ming Lin
Etienne Lyard
Kwan-Liu Ma
Blair MacIntyre
Raghu Machiraju
Paul Maglio
Markus Magnor
Jennifer Mankoff
Lee Markosian
Steve Marschner
Wojciech Matusik
David McAllister
Michael McGuffin
Bill McNeely
Tom Mertens
Alexandre Meyer
Rob Miller
Darius Miniotas
Tom Moher
Steve Molnar
Kevin Moule
Stefan Mueller
Brad Myers
Elizabeth Mynatt
Addy Ngan
Anton Nijholt
Erik Nilsen
James O'Brien
Victor Ostromoukhov
Hans-Georg Pagendarm
Mark Pauly
Andriy Pavlovych
Hans Pedersen
Ivan Poupyrev
Tim Purcell
Paul Rademacher
Rich Radke
Roope Raisamo
Ramesh Raskar
Anshuman Razdan
Patrick Reuter
Penny Rheingans

Meredith Ringel
Felix Ritter
Yvonne Rogers
Szymon Rusinkiewicz
Daniel Russell
Kathy Ryall
Kenneth Salisbury
Mateu Sbert
Christophe Schilck
Andreas Schilling
Steven Schkolne
Stacey Scott
Pradeep Sen
Robin Senior
Jeffrey Shell
Hyun Shin
Garth Shoemaker
Eftychios Sifakis
Miika Silfverberg
Barton Smith
William Soukoreff
Jos Stam
John Stasko
Andrei State
Eckehard Steinbach
James Stewart
Gordon Stoll
Maureen Stone
Lisa Streit
Wolfgang Stuerzlinger
Sriram Subramanian
Desney Tan
Russ Taylor
Joseph Teran
Jacques Terken
Xavier Tricoche
Nikolaus Troje
Norimichi Tsumura
Christian Vogelgsang
Henrik Wann Jensen
Colin Ware
Li-Yi Wei
Rüdiger Westermann
Steven Westin
Marv Westrom
Ross Whitaker
Alexander Wilkie
Daniel Wood
KangKang Yin
Polle Zellweger
Richard Zhang
Song-Chun Zhu
Matthias Zwicker

Table of Contents

Input

Writing with a Joystick: A Comparison of Date Stamp, Selection Keyboard, and EdgeWrite 1
Jacob O. Wobbrock, Brad A. Myers, and Htet Htet Aung

Object Pointing: A Complement to Bitmap Pointing in GUIs 9
Yves Guiard, Renaud Blanch and Michel Beaudouin-Lafon

Toolglasses, Marking Menus, and Hotkeys: A Comparison of One and Two-Handed Command Selection Techniques 17
Daniel L. Odell, Richard C. Davis, Andrew Smith, and Paul K. Wright

The Effects of Feedback on Targeting with Multiple Moving Targets 25
David Mould and Carl Gutwin

Rendering

Object Representation using 1D Displacement Mapping 33
Yi Xu and Yee-Hong Yang

A Hybrid Hardware-Accelerated Algorithm for High Quality Rendering of Visual Hulls 41
Ming Li, Marcus Magnor, and Hans-Peter Seidel

Blueprints — Illustrating Architecture and Technical Parts using Hardware-Accelerated Non-Photorealistic Rendering 49
Marc Nienhaus and Jürgen Döllner

Transfer Functions on a Logarithmic Scale for Volume Rendering 57
Simeon Potts and Torsten Möller

Next Generation Interfaces

Exploring Gradient-Based Face Navigation Interfaces 65
Tzu-Pei Grace Chen and Sidney Fels

Towards the Next Generation of Tabletop Gaming Experiences 73
Carsten Magerkurth, Maral Memisoglu, Timo Engelke, and Norbert Streitz

Haptic Interaction with Fluid Media 81
William Baxter and Ming C. Lin

Perception, Awareness, Collaboration, and Information Management

Remote Collaboration Using Augmented Reality Videoconferencing 89
Istvan Barakonyi, Tamer Fahmy, and Dieter Schmalstieg

View Direction, Surface Orientation and Texture Orientation for Perception of Surface Shape 97
Graeme Sweet and Colin Ware

ARIS: An Interface for Application Relocation in an Interactive Space 107
Jacob T. Biehl and Brian P. Bailey

Is a Picture Worth a Thousand Words? An Evaluation of Information Awareness Displays 117
Christopher Plaue, Todd Miller, and John Stasko

Displays

Revisiting Display Space Management: Understanding Current Practice to Inform Next-generation Design 127
Dugald Ralph Hutchings and John Stasko

An Evaluation of Techniques for Controlling Focus+Context Screens 135
Mark J. Flider and Brian P. Bailey

Interacting with Big Interfaces on Small Screens: a Comparison of Fisheye, Zoom, and Panning Techniques ... 145
Carl Gutwin and Chris Fedak

Hardware
Hardware Accelerated Per-Pixel Displacement Mapping 153
Johannes Hirche, Alexander Ehlert, Michael Doggett, and Stefan Guthe
Radiosity on Graphics Hardware 161
Greg Coombe, Mark J. Harris, and Anselmo Lastra
Compressed Multisampling for Efficient Hardware Edge Antialiasing 169
Philippe Beaudoin and Pierre Poulin

Sampling
Decoupling BRDFs from Surface Mesostructures 177
Jan Kautz, Mirko Sattler, Ralf Sarlette, Reinhard Klein, and Hans-Peter Seidel
Segmenting Motion Capture Data into Distinct Behaviors 185
Jernej Barbič, Alla Safonova, Jia-Yu Pan, Christos Faloutsos, Jessica K. Hodgins, and Nancy S. Pollard
Image-space Silhouettes for Unprocessed Models 195
Michael Ashikhmin

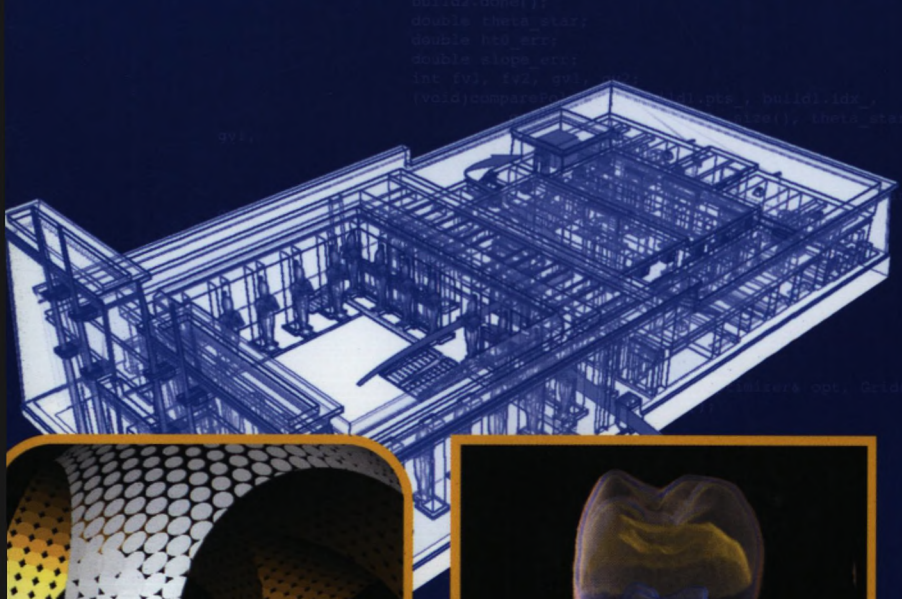
Layout and Visualization
Interactive Image-Based Exploded View Diagrams 203
Wilmot Li, Maneesh Agrawala, and David Salesin
A Comparison of Fisheye Lenses for Interactive Layout Tasks 213
Carl Gutwin and Chris Fedak
Improving Menu Placement Strategies for Pen Input 221
Mark S. Hancock, and Kellogg S. Booth
Map Morphing: Making Sense of Incongruent Maps 231
Derek F. Reilly and Kori M. Inkpen

Textures and Materials
Interactive Virtual Materials 239
Matthias Müller and Markus Gross
Perspective Accurate Splatting 247
Matthias Zwicker, Jussi Räsänen, Mario Botsch, Carsten Dachsbacher, and Mark Pauly
Dihedral Escherization 255
Craig S. Kaplan and David H. Salesin
A Hybrid Physical/Device-Space Approach for Spatio-Temporally Coherent Interactive Texture Advection on Curved Surfaces 263
Daniel Weiskopf and Thomas Ertl

Invited Speakers
Designing Novel Visualization and Interaction Techniques that Scale from Small to Jumbo Displays 271
Mary Czerwinski
Interactive Display and Walkthroughs of Complex Environments 273
Dinesh Manocha
Realizing the Dreams of Ubiquitous Computing: It's All in the Family 275
Gregory D. Abowd
In Search of Textons 277
Harry Shum

Author Index

Abowd, Gregory D. 275
Agrawala, Maneesh 203
Ashikhmin, Michael 195
Aung, Htet Htet 1
Bailey, Brian P. 107, 135
Barakonyi, Istvan 89
Barbič, Jernej 185
Baxter, William 81
Beaudoin, Philippe 169
Beaudouin-Lafon, Michel 9
Biehl, Jacob T. 107
Blanch, Renaud 9
Booth, Kellogg S. 221
Botsch, Mario 247
Chen, Tzu-Pei Grace 65
Coombe, Greg 161
Czerwinski, Mary 271
Dachsbacher, Carsten 247
Davis, Richard C. 17
Döllner, Jürgen 49
Doggett, Michael 153
Ehlert, Alexander 153
Engelke, Timo 73
Ertl, Thomas 263
Fahmy, Tamer 89
Faloutsos, Christos 185
Fedak, Chris 145, 213
Fels, Sidney 65
Flider, Mark J. 135
Gross, Markus 239
Guiard, Yves 9
Guthe, Stefan 153
Gutwin, Carl 25, 145, 213
Hancock, Mark S. 221
Harris, Mark J. 161
Hirche, Johannes 153
Hodgins, Jessica K. 185
Hutchings, Dugald Ralph 127
Inkpen, Kori M. 231
Kaplan, Craig S. 255
Kautz, Jan 177
Klein, Reinhard 177
Lastra, Anselmo 161
Li, Ming 41
Li, Wilmot 203
Lin, Ming C. 81
Magerkurth, Carsten 73
Magnor, Marcus 41
Manocha, Dinesh 273
Memisoglu, Maral 73
Miller, Todd 117
Möller, Torsten 57
Mould, David 25
Müller, Matthias 239
Myers, Brad A. 1
Nienhaus, Marc 49
Odell, Daniel L. 17
Pan, Jia-Yu 185
Pauly, Mark 247
Plaue, Christopher 117
Pollard, Nancy S. 185
Potts, Simeon 57
Poulin, Pierre 169
Räsänen, Jussi 247
Reilly, Derek F. 231
Safonova, Alla 185
Salesin, David 203, 255
Sarlette, Ralf 177
Sattler, Mirko 177
Schmalstieg, Dieter 89
Seidel, Hans-Peter 41, 177
Shum, Harry 277
Smith, Andrew 17
Stasko, John 117, 127
Streitz, Norbert 73
Sweet, Graeme 97
Ware, Colin 97
Weiskopf, Daniel 263
Wobbrock, Jacob O. 1
Wright, Paul K. 17
Xu, Yi 33
Yang, Yee-Hong 33
Zwicker, Matthias 247



A K PETERS LTD.

www.graphicsinterface.org

www.akpeters.com

ISSN 0713-5424

ISBN 1-56881-227-2