

## Wednesday at a Glance

	Hall B	Ballroom 201	Ballroom 202	Ballroom 203	Ballroom 204	A105 - A106	C123 - C124	B113 - B114	B115 - B116
<b>09:00 to 10:30</b>	<b>PANEL</b> Connecting with Kids: What's New?	<b>PAPERS</b> Touch & Such	<b>PAPERS</b> Smart Interaction Techniques 1		<b>PAPERS</b> Interruptions & Attention 1	<b>INTERACTIVITY</b> Can You Hear Me Now? Audio Interfaces	<b>SHORT PAPERS</b> Accessible Design	<b>SHORT PAPERS</b> Social and Legal Issues	<b>SIG</b> Do CHI Papers Work for You?
<b>11:30 to 13:00</b>	<b>INVITED PANEL</b> Early Days of CHI: MIT Lincoln Laboratory	<b>PAPERS</b> Design Thoughts & Methods	<b>PAPERS</b> Smart Interaction Techniques 2	<b>PAPERS</b> Methods & Usability	<b>PAPERS</b> Interactive Information Visualization	<b>alt.chi</b> urban pacman	<b>SHORT PAPERS</b> Cognitive Modeling, Adaptation, and End-user Programming	<b>SHORT PAPERS</b> Ethnography and Design Methodologies	<b>SIG</b> Making an Impact in your Community: HCI and US Public Policy
<b>14:30 to 16:00</b>	<b>PANEL</b> Corporate Re-Orgs: Poison or Catalyst to HCI?	<b>PAPERS/SHORT PAPERS</b> Pen-Based Interfaces	<b>PAPERS</b> Affect and Intimacy	<b>PAPERS</b> Assistive Applications	<b>PAPERS</b> Educational and Help Systems	<b>STUDENT COMPETITION</b> Finalists Presentations	<b>SHORT PAPERS</b> Beyond 2D Interaction	<b>SHORT PAPERS</b> Social Computing and Community	<b>SIG</b> Role of HCI in Next-Generation Control Rooms
<b>16:30 to 18:00</b>	<b>SPOTLIGHT SESSION</b> Safety in a Complex World	<b>PAPERS</b> In-Vehicle Interfaces	<b>PAPERS</b> Physical Interaction	<b>PAPERS</b> Technology in the Home		<b>DESIGN EXPO</b> The Power of Design: Case Studies in Excellence	<b>SHORT PAPERS</b> Visualization Techniques	<b>SHORT PAPERS</b> HCI in the Office	<b>SIG</b> Assessing and Improving Information Usability

THE COMMONS	SPECIAL EVENTS	OTHER ACTIVITIES
<b>POSTER HIGHLIGHT 1</b> 10:30 - 11:30 Doctoral Consortium, Student Competition, Workshops	<b>EXHIBITS OPEN</b> 10:00 - 18:00	<b>ACM SIGCHI Member Meeting</b> 18:10 - 19:00 A105 - A106
		<b>Hospitality Events</b> 18:30 - 20:30 Doubletree Hotel
		<b>INFORMATION BOOTH</b> 08:30 - 18:30
		<b>RECRUITING BOARDS</b> 08:30 - 18:00
		<b>REGISTRATION</b> 08:00 - 17:30

## PANEL

**Connecting with Kids:  
So What's New?**

Hall B

**Organizer:** Lori Scarlatos,  
*CUNY Brooklyn College, USA*Amy S. Bruckman,  
*Georgia Institute of Technology, USA*Allison Druin,  
*University of Maryland, USA*Mike Eisenberg,  
*University of Colorado, USA*Molly Lenoire,  
*American Museum of Natural History,  
USA*Oren Zuckerman,  
*MIT Media Lab, USA*

## PAPERS

**Touch & Such**


Ballroom 201

**Session Chair:** Sidney Fels,  
*University of British Columbia, Canada***tranSticks: Physically  
Manipulatable Virtual Connections**Yuji Ayatsuka, Jun Rekimoto,  
*Sony Computer Science Laboratories,  
Inc., Japan***Discrete Acceleration and  
Personalised Tiling as Brain-Body  
Interface Paradigms for  
Neurorehabilitation**Paul Gnanayutham,  
*University of Portsmouth, UK*  
Chris Bloor, Gilbert Cockton,  
*University of Sunderland, UK***Effectiveness of Directional  
Vibrotactile Cuing on a Building-  
Clearing Task**Robert Lindeman, John Sibert,  
Erick Mendez-Mendez, Sachin Patil,  
Daniel Phifer  
*The George Washington University, USA*

## PAPERS

**Smart Interaction Techniques 1**

Ballroom 202

**Session Chair:** Steven Feiner,  
*Columbia University, USA* **The Bubble Cursor:  
Enhancing Target Acquisition  
by Dynamic Resizing of the  
Cursor's Activation Area**Tovi Grossman, Ravin Balakrishnan,  
*University of Toronto, Canada***Comparing Cursor Orientations for  
Mouse, Pointer, and Pen  
Interaction**Barry A. Po, Brian D. Fisher,  
Kellogg S. Booth,  
*University of British Columbia, Canada* **Snap-and-Go: Helping  
Users Align Objects without  
the Modality of Traditional  
Snapping**Patrick Baudisch, Edward Cutrell,  
Ken Hinckley, Adam Eversole  
*Microsoft Research, USA*

## PAPERS

**Interruptions & Attention 1:  
Take a Number, Stand in Line**

Ballroom 204

**Session Chair:** John C. Thomas,  
*IBM T.J. Watson Research Center, USA* **Towards an Index of  
Opportunity: Understanding  
Changes in Mental Workload  
During Task Execution**Shamsi Iqbal, Piotr Adameczyk,  
Sam Zheng, Brian Bailey  
*University of Illinois, Urbana Champaign,  
USA***No Task Left Behind? Examining  
the Nature of Fragmented Work**Gloria Mark, Victor Gonzalez,  
Justin Harris,  
*University of California, Irvine, USA* **Examining Task  
Engagement in Sensor -  
Based Statistical Models of  
Human Interruptibility**James Fogarty, Andrew J. Ko,  
Htet Htet Aung, Elspeth Golden,  
Karen P. Tang, Scott E. Hudson  
*Carnegie Mellon University, USA*

## INTERACTIVITY

**Can You Hear Me Now?****Audio Interfaces****A105-A106****Session Chair:** Eric Lee,  
*RWTH Aachen University, Germany***SonicTexting**Michal Rinott,  
*Interaction Design Institute Ivrea, Italy***In the Mixxx: Novel Digital DJ Interfaces**Tue Haste Andersen,  
*University of Copenhagen, Denmark*

## SHORT PAPERS

**Accessible Design****C123-C124****Session Chair:** Gilbert Cockton,  
*University of Sunderland, UK***Web Accessibility for People with Cognitive Disabilities**Jeon Small, Pamela Schallau,  
Karen Brown, Richard Appleyard,  
*Oregon Health & Science University, USA***DanceAlong: Supporting Positive Social Exchange and Exercise for the Elderly Through Dance**Pedram Keyani, Gary Hsieh, Bilge Mutlu,  
Mathew Easterday, Jodi Forlizzi,  
*Carnegie Mellon University, USA***Human Computer Interfaces for Autism: Assessing the Influence of Task Assignment and Output Modalities**Ouriel Grynszpan, Jean-Claude Martin,  
Jacqueline Nadel,  
*CNRS, France***Designing Interactive Life Story Multimedia for a Family Affected by Alzheimer's Disease: A Case Study**Tira Cohene, Elsa Marziali,  
Ronald Baecker,  
*University of Toronto/ Baycrest Centre for Geriatric Care, Canada***Blind Learners Programming Through Audio**Jaime Sánchez, Fernando Aguayo,  
*University of Chile, Chile***End User Programming and Context Responsiveness in Handheld Prompting Systems for Persons with Cognitive Disabilities and Caregivers**Stefan Carmien,  
*University of Colorado, Boulder, USA*

## SHORT PAPERS

**Social and Legal Issues****B113-B114****Session Chair:** Clarisse de Souza,  
*PUC-Rio, Brazil***Building Security and Trust in Online Banking**Maria Nilsson, Anne Adams,  
*UCL Interaction Center, UK*  
Simon Herd,  
*Serco Usability services, UK***A Study of Preferences for Privacy and Sharing**Judith Olson,  
*University of Michigan, USA*  
Jonathan Grudin, Eric Horvitz,  
*Microsoft Research, USA***Voting and Political Information Gathering On Paper and Online**Scott P. Robertson, Palakorn Achananuparp, James L. Goldman,  
Sang Joon Park, Nan Zhou,  
Matthew J. Clare,  
*Drexel University, USA***Community Source Development: An Emerging Model with New Opportunities**Dawn Ressel Nidy, Fong Kwok,  
*DePaul University, USA***Proposing New Metrics to Evaluate Web Usability for the Blind**Kentarou Fukuda, Shin Saito,  
Hironobu Takagi, Chieko Asakawa,  
*IBM Tokyo Research Laboratory, Japan***Convergent Usability Evaluation: A Case Study from the EIRS Project**Jeff Johnson,  
*UI Wizards, Inc., USA*  
Catherine R. Marshall,  
*CollabTech, Inc., USA*

## SIG

**Do CHI Papers Work for You? Addressing Concerns of Authors, Audiences and Reviewers****B115-B116**William Newman, *UK*Robin Jeffries,  
*Sun Microsystems, USA*m.c. schraefel,  
*University of Southampton, UK*

## INVITED PANEL

**Early Days of CHI: MIT Lincoln Laboratory**  
Hall B

**Organizer:** Bill Buxton,  
*Microsoft Research, UK*

**Discussant:** Austin Henderson,  
*Pitney Bowes, USA*

Ron Baecker,  
*University of Toronto, Canada*

Wesley Clark,  
*Clark, Rockoff and Associates, USA*

Fontaine Richardson,  
*Private Investor, USA*

Ivan Sutherland,  
*Sun Microsystems, USA*

W.R. "Bert" Sutherland,  
*Sun Microsystems Laboratories, USA*

## PAPERS

**Design Thoughts & Methods**  
Ballroom 201

**Session Chair:** Polle Zellweger, *USA*

**Urban Probes: Encountering Our Emerging Urban Atmospheres**

Eric Paulos,  
*Intel Research, USA*

Tom Jenkins,  
*Royal College of Art, UK*

**DeDe: Design and Evaluation of a Context-Enhanced Mobile Messaging System**

Younghee Jung, Per Persson, Jan Blom,  
*Nokia Corporation, Finland*

## PAPERS

**Smart Interaction Techniques 2**  
Ballroom 202

**Session Chair:** Mary Czerwinski,  
*Microsoft Research, USA*

**The Vacuum: Facilitating the Manipulation of Distant Objects**

Anastasia Bezerianos, Ravin Balakrishnan,  
*University of Toronto, Canada*

**A Comparison of Techniques for Multi-Display Reaching**

Miguel Nacenta, Dzmitry Aliakseyeu, Sriram Subramanian, Carl Gutwin  
*University of Saskatchewan, Canada*

**Extensible Input Handling in the subArctic Toolkit**

Scott Hudson, Jennifer Mankoff,  
*Carnegie Mellon University, USA*  
Ian Smith,  
*Intel Research, USA*

## PAPERS

**Methods & Usability**  
Ballroom 203

**Session Chair:** William Newman, *UK*



**Comparing Usability Problems and Redesign Proposals as Input to Practical Systems Development**

Kasper Hornbæk, Erik Frøkjær,  
*University of Copenhagen, Denmark*

**A Method to Standardize Usability Metrics into a Single Score**

Jeff Sauro,  
*PeopleSoft, USA*  
Erika Kindlund,  
*Intuit, USA*



**Supporting Efficient Development of Cognitive Models at Multiple Skill Levels: Exploring Recent Advances in Constraint-Based Modeling**

Irene Tollinger,  
*NASA Ames Research Center, USA*  
Richard Lewis,  
*University of Michigan, USA*  
Michael McCurdy, Preston Tollinger,  
Alonso Vera  
*NASA Ames Research Center, USA*  
Andrew Howes,  
*Cardiff University, UK*  
Laura Palton,  
*NASA Ames Research Center, USA*

## PAPERS

**Interactive Information  
Visualization  
Ballroom 204**

**Session Chair:** Eser Kandogan,  
*IBM Almaden Research Center,  
USA*

**Prefuse: A Toolkit for Interactive  
Information Visualization**

Jeffrey Heer,  
*University of California, Berkeley, USA*  
Stuart Card,  
*PARC, USA*  
James Landay,  
*University of Washington, USA*

**Visualization of Mappings  
Between Schemas**

George G. Robertson,  
Mary P. Czerwinski,  
John E. Churchill,  
*Microsoft, USA*

**Improving Aviation Safety with  
Information Visualization: A Flight  
Simulation Study**

Cecilia Aragonn,  
*University of California, Berkeley/  
NASA, USA*  
Marti Hearst,  
*University of California, Berkeley, USA*

## alt.chi

**urban pacman  
A105-A106**

**Venue Chairs:** Andrew Duchowski,  
*Clemson University, USA*; Roel  
Vertegaal, *Queens University, Canada*

**Sharing the Square: Collaborative  
Visiting in the City Streets**

Barry Brown, Matthew Chalmers,  
Marek Bell, Ian MacColl, Malcolm  
Hall, *University of Glasgow, UK*; Paul  
Rudman, *University of Queensland,  
Australia*

**"Does Pacman Need a Helper?":  
Analyzing Experience of Physical  
and Social Interactivity in a Mixed  
Reality Entertainment Environment**

Adrian David Cheock, Hui Siang Teo,  
Sze Lee Teo, *National University of  
Singapore, Singapore*

**A Comparison of Situation  
Awareness Techniques for  
Human-Robot Interaction in  
Urban Search and Rescue**

Jean Scholtz, Brian Anotnishek,  
Jeff Young, *NIST, USA*

**Short Papers Madness****Threads of Recognition: Using  
Touch as Input With Directionally  
Conductive Fabric**

Thecla Schiphorst, Norman Jaffe,  
Robb Lovell, *Simon Fraser University,  
Canada*

**Dish Maker: Personal  
Manufacturing Interface**

Leonardo Bonanni, Sam Sarcia,  
Subodh Paudel, Ted Selker, *MIT  
Meida Lab, USA*

## SIG

**Making an Impact in Your  
Community: HCI and US Public  
Policy  
B115-B116**

Jonathan Lazar,  
*Towson University, USA*

Ben Bederson,  
*University of Maryland, College Park, USA*

Harry Hochheiser,  
*National Institute on Aging, USA*

Jeff Johnson,  
*UI Wizards, Inc., USA*

Clare-Marie Karat,  
*IBM T.J. Watson Research, USA*

**The Distant Gardener: What  
Conversations in a Telegarden  
Reveal About the User Experience  
of Telepresence**

Peter H. Kahn, Jr., Batya Friedman,  
Irene S. Alexander, Nathan G. Freier,  
Stephanie L. Collett, *University of  
Washington, USA*

**Estimation of Focus of Attention of  
Multiple People for Video  
Conferencing**

Kentaro Takemura, Yoshio  
Matsumoto, Tsukasa Ogasawara,  
*Nara Institute of Science and  
Technology, Japan*

**Distinguishing Magnitude and  
Frequency of Vibrotactile Effects  
With Tactile Mouse and Trackball**

Jukka Raisamo, Katri Kangas,  
Roope Raisamo, *University of Tampere,  
Finland*

**Attentive Headphones:  
Augmenting Conversational  
Attention with a Real World TiVo**

Roel Vertegaal, *Queens University,  
Canada*

**Drawing in Space Using the 3D  
Tractus**

Ehud Sharlin, Mario Costa Sousa,  
*University of Calgary, Canada*

**Edible Bits: Seamless Interfaces  
between People, Data and Food**

Dan Maynes-Aminzade, *Stanford  
University, USA*

**Designing EyeTap: Digital  
Eyeglasses for Continuous Lifelong  
Capture and Sharing of Personal  
Experiences**

Dan Chen, *University of Toronto,  
Canada*



## PANEL

**Corporate Re-Orgs: Poison or Catalyst to HCI?**  
Hall B**Organizer:** Stephanie Rosenbaum,  
*Tec-Ed, USA*Kelly Braun,  
*eBay, Inc., USA*Klaus Kaasgaard,  
*Yahoo!, USA*Anna Wychansky,  
*Oracle Corporation, USA*PAPERS/  
SHORT PAPERS  
**Pen-Based Interfaces**  
Ballroom 201**Session Chair:** Sharon Oviatt,  
*Oregon Health & Sciences University, USA***Design and Analysis of Delimiters for Selection-Action Pen Gesture Phrases in Scriboli**Ken Hinckley, Patrick Baudisch,  
*Microsoft Research, USA*  
Gonzalo Ramos,  
*Microsoft Research/University of Toronto, USA/Canada*  
Francois Guimbretiere,  
*University of Maryland, USA***Experimental Analysis of Mode Switching Techniques in Pen-Based User Interfaces**Yang Li,  
*University of California, Berkeley, USA*  
Ken Hinckley,  
*Microsoft Research, USA*  
Zhiwei Guan,  
*University of Washington, USA*  
James A. Landay,  
*University of Washington/Intel Research, USA***Evaluation of Multimodal Input for Entering Mathematical Equations on the Computer**Lisa Anthony, Jie Yang,  
Ken Koedinger,  
*Carnegie Mellon University, USA***CoR<sup>2</sup>Ds: Context-Rooted Rotatable Draggables for Tabletop Interaction**Chia Shen, *MERL, USA*  
Mark Hancock,  
*MERL / University of Calgary, Canada*  
Fredric Vernier,  
*University of Paris XI-Paris Sud, France*

## PAPERS

**Assistive Applications**  
Ballroom 203**Session Chair:** Terry Winograd,  
*Stanford University, USA***A Visual Recipe Book for Persons with Language Impairments**Kimberly Tee, Karyn Moffatt,  
Leah Findlater, Eve MacGregor,  
Joanna McGrenere, Barbara Purves,  
Sidney S. Fels,  
*University of British Columbia, Canada* **Participatory Design of an Orientation Aid for Amnesics**Mike Wu, Ron Baecker,  
*University of Toronto, Canada*  
Brian Richards,  
*Baycrest Centre for Geriatric Care, Canada***Digital Family Portrait Field Trial: Support for Aging in Place**Jim Rowan, Elizabeth D. Mynatt,  
*Georgia Institute of Technology, USA*

## PAPERS

**Affect and Intimacy**  
Ballroom 202**Session Chair:** Heidy Maldonado,  
*Stanford University, USA***Mediating Intimacy: Designing Technologies to Support Strong-Tie Relationships**Frank Vetere, Martin Gibbs,  
*University of Melbourne, Australia*  
Jesper Kjeldskov,  
*Aalborg University, Denmark*  
Steve Howard, Florian Mueller,  
Sonja Pedell, Karen Mecoles,  
*University of Melbourne, Australia*  
Marcus Bunyan,  
*Charles Sturt University, Australia***Toward Subtle Intimate Interfaces for Mobile Devices Using an EMG Controller**Enrico Costanza, Samuel A. Inverso,  
Rebecca Allen,  
*Media Lab Europe, Ireland***Emotions and Heart Rate While Sitting on a Chair**Jenni Anttonen,  
*University of Tampere, Finland*  
Veikko Surakka,  
*University of Tampere/Tampere University Hospital, Finland*



## PAPERS

**Educational & Help Systems  
Ballroom 204**

**Session Chair:** Wendy Mackay,  
*INRIA, France*

**Livenotes: A System for  
Cooperative and Augmented Note-  
Taking in Lectures**

Matthew Kam, Jingtao Wang,  
Alastair Iles, Eric Tse, Jane Chiu,  
Daniel Glaser, Orna Tarshish,  
John Canny,  
*University of California, Berkeley, USA*

**Stencils-Based Tutorials:  
Design and Evaluation**

Caitlin Kelleher, Randy Pausch,  
*Carnegie Mellon University, USA*

**StudioBRIDGE: Using Group,  
Location, and Event Information  
to Bridge Online and Offline  
Encounters for Collocated Learning  
Groups**

Susan Yee,  
*Microsoft Research, USA*  
Kat S. Park,  
*MIT, USA*

STUDENT DESIGN  
COMPETITION**Finalist Presentations  
A105-A106**

**Co-Chairs:** Elizabeth Churchill,  
*Palo Alto Research Center, USA;*  
Jon Sykes, *Glasgow Caledonian  
University, UK*

**Teams**

**Project VIRGO: Creation of a  
Surrogate Companion for the  
Elderly**

Farilee Mintz, Timothy Sherwood,  
Miroslava Vomela,  
*George Mason University, USA*

**Supporting Emotional Ties among  
Mexican Elders and Their Families  
Living Abroad**

Pedro Santana, Marcela Rodriguez,  
Luis Castro, Angel Andrade,  
*CICESE, Mexico*  
Victor Gonzalez,  
*University of California, USA*

**ECHOES: Encouraging  
Companionship, Home  
Organization, and Entertainment  
to Seniors**

Sidharth Saxena, Joshua Evnin,  
Justin Donaldson,  
*Indiana University, USA*

**ShareComp: Sharing for  
Companionship**

Chun-Yi Chen, Marina Kobayashi,  
Lui Min Oh,  
*Carnegie Mellon University, USA*

**HOMIE: An Artificial Companion  
for Elderly People**

Simone Kriglstein, Gunter Wallner,  
*Vienna University of Technology, Austria*

**Fridgets: Digital Refrigerator  
Magnets**

Jacqueline Baur, Kristy Streefkerk,  
Ryan Varick,  
*Indiana University, USA*

**Meeteetse: Social Well-Being  
Through Place Attachment**

Kynthia Brunette, Matthew Eisenstadt,  
Erink Pukinskis, William Ryan,  
*Indiana University, USA*

**mPath: Facilitating Human  
Interaction**

Shweta Aneja, Kevin Makice,  
Apurva Pangam, Matt Weldon,  
*Indiana University, USA*

**User-Centered Design of a  
Program Alleviating Loneliness  
(PAL)**

Sara Lennon, Grainne O'Brien,  
Elaine Hollywood,  
*Dun Laoghaire Institute of Art, Design  
and Technology, Ireland*

**Pollen: Promoting the Exchange of  
Meaningful Objects**

Payaal Patel, Stefanie Danhope-Smith,  
*The Savannah College of Art and  
Design, USA*

**Remember When: Development of  
an Interactive Reminiscence Drive**

Nuala Dwyer, Karen Ni Bhrian,  
Niamh Capriani, Kim Harrison,  
*Dun Laoghaire Institute of Art, Design  
and Technology, Ireland*



## SHORT PAPERS

**Beyond 2D Interaction**  
C123-C124

**Session Chair:** Scott Klemmer,  
*Stanford University, USA*

**MusicCube: Making Digital Music Tangible**

Miguel Bruns Alonso,  
David V. Keyson,  
*TU Delft, The Netherlands*

**Resizing Beyond Widgets: Object Resizing Techniques for Immersive Virtual Environments**

John F. Lucas, Ji-Sun Kim,  
Doug A. Bowman,  
*Virginia Tech, USA*

**PINS Push In and POUTS Pop Out: Creating a Tangible Pin-board that Ejects Physical Documents**

Kher Hui Ng, Steve Benford,  
Boriana Koleva,  
*University of Nottingham, UK*

**Annotating 3D Electronic Books**

Lichan Hong, Ed H. Chi,  
Stuart H. Card, *PARC, USA*

**Designing a Generalized 3D Carousel View**

Shuo Wang,  
*Microsoft Research Asia, China*  
Marcin Poturalski,  
*Warsaw University, Poland*  
David Vronay,  
*Microsoft Research Asia, China*

**Flipper: a New Method of Digital Document Navigation**

Liyang Sun, *Georgia Tech, USA*  
François Guimbretière,  
*University of Maryland, College Park, USA*

## SHORT PAPERS

**Social Computing and Community**  
B113-B114

**Session Chair:** Richard Boardman,  
*Google, USA*

**Shared Landmarks in Complex Coordination Environments**

Michael Muller,  
*IBM Research, USA*  
Olga Kuchinskaya,  
*University of California, San Diego, USA*  
Suzanne Minassian, John Tang,  
Catalina Danis, Chen Zhao,  
Beverly Harrison, Thomas Moran,  
*IBM Research, USA*

**Relescope: An Experiment in Accelerating Relationships**

Stephen P. Farrell,  
Christopher S. Campbell,  
*IBM Almaden Research Center, USA*  
Suvda Myagmar,  
*University of Illinois, Urbana-Champaign, USA*

**How Peer Photos Influence Member Participation in Online Communities**

Nishikant Kapoor, Joseph A. Konstan,  
Loren Terveen,  
*University of Minnesota, USA*

**The Uses of Personal Networked Digital Imaging: An Empirical Study of Cameraphone Photos and Sharing**

Nancy Van House, Marc Davis,  
Morgan Ames, Megan Finn,  
Vijay Viswanathan,  
*University of California, Berkeley, USA*

## SIG

**The Role of Human-Computer Interaction in Next-Generation Control Rooms**  
B115-B116

Ronald Boring,  
*Idaho National Laboratory, USA*

Jacques Hugo,  
*Pebble Bed Modular Reactor, South Africa*

Christian Richard,  
*Battelle Human Factors Transportation Center, USA*

Don Dudenhoefter,  
*Idaho National Laboratory, USA*

**I Saw This and Thought of You: Some Social Uses of Camera Phones**

Timothy Kindberg,  
Mirjana Spasojevic,  
*HP Labs, USA*  
Rowanne Fleck, Abigail Sellen,  
*Microsoft Research, USA*

**SNIF: Social Networking In Fur**

Noah Fields, Jonathan Gips,  
Philip Liang, Arnaud Pilpre,  
*MIT Media Laboratory, USA*

## SPOTLIGHT SESSION

**Safety in a Complex World**  
Hall B

**Session Chair:** Gerrit van der Veer,  
*Vrije Universiteit, The Netherlands*

**Paper**

**Applying the Lessons of the Attack on the World Trade Center, 11th September, 2001, to the Design and Use of Interactive Evacuation Simulations**

Christopher W. Johnson,  
*University of Glasgow, UK*

**Interactivity Exhibit**

**Acclairism: Questioning biometric technology through an airport security clearance system**

Luther Thie, Eyal Fried,  
*Interaction Design Institute Ivrea, Italy*

## PAPERS

**In-Vehicle Interfaces**  
Ballroom 201

**Session Chair:** Erika Orrick,  
*Perceptive Sciences, USA*

**Calling While Driving: Effects of Providing Remote Traffic Context**

Mike Schneider, Sara Kiesler,  
*Carnegie Mellon University, USA*

**Studying the Effectiveness of MOVE: A Contextually Optimized In-Vehicle Navigation System**

Joonhwan Lee, Jodi Forlizzi,  
Scott E. Hudson,  
*Carnegie Mellon University, USA*

**Distract-R: Rapid Prototyping and Evaluation of In-Vehicle Interfaces**

Dario Salvucci, Mark Zuber,  
Ekaterina Beregovaia, Daniel Markley,  
*Drexel University, USA*

## PAPERS

**Physical Interaction**  
Ballroom 202

**Session Chair:** Michel Beaudouin Lafon,  
*University of Paris-Sud, France*

**PaperWindows: Interaction Techniques for Digital Paper**

David Holman, Roel Vertegaal,  
Mark Altosaar, Nikolaus Troje,  
Derek Johns,  
*Queen's University, Canada*

**Fluid Integration of Rotation and Translation**

Russell Kruger, Sheelagh Carpendale,  
Stacey D. Scott, Anthony Tang,  
*University of Calgary, Canada*

**A Study on the Manipulation of 2D Objects in a Projector/Camera-Based Augmented Reality Environment**

Stephen Voida,  
*Georgia Institute of Technology, USA*  
Mark Podlaseck, Rick Kjeldsen,  
Claudio Pinhanez,  
*IBM T.J. Watson Research Center, USA*

## PAPERS

**Technology in the Home**  
Ballroom 203

**Session Chair:** Kristina Höök,  
*SICS, Sweden*

**Exploring Technology Adoption and Use Through the Lens of Residential Mobility**

Irina Shklovski,  
*Carnegie Mellon University, USA*  
Scott Mainwaring,  
*Intel Research, USA*

**WaterBot: Exploring Feedback and Persuasive Techniques at the Sink**

Ernesto Arroyo, Leonardo Bonanni,  
Ted Selker,  
*MIT Media Laboratory, USA*

**Artful Systems in the Home**

Alex S. Taylor,  
*Microsoft Research, UK*  
Laurel Swan,  
*Brunel University, UK*

## DESIGN EXPO

**The Power of Design: Case Studies in Excellence**  
A105-A106

**Session Chair:** Boyd de Groot,  
*Satama Interactive, The Netherlands*

**The Stakeholder Forest: Designing a Travel and Expense Application for the Enterprise**

Jonathan Arnowitz,  
*SAP Labs, USA*

Naomi Dorsch, Diana Gray,  
Monica Heidelberg, Michael Arent,  
*PeopleSoft, USA*

**Vista: Interactive Coffee-Corner Display**

Marcin Wichary, Lucy Gunawan,  
Nele Van den Ende,  
*Eindhoven University of Technology,  
The Netherlands*

Qarin Hjortzberg-Nordlund,  
Aga Matysiak, Ruud Janssen,  
*Océ Technologies B.V., The Netherlands*

Xu Sun, Eindhoven  
*University of Technology, The Netherlands*

**Looking Back at Plan AHEAD(tm): Exercising User-Centered Design in Emergency Management**

Leo Frishberg,  
*Tektronix, Inc., USA*

**Capturing and Viewing Medio on the Treo 650 Smartphone and Tungsten T5 Handheld**

Keith Saft, *palmOne, USA*

**Designing the "World as your Palette"**

Kimiko Ryokai, Stefan Marti,  
Hiroshi Ishii,  
*MIT Media Lab, USA*

## SHORT PAPERS

**Visualization Techniques**  
C123-C124

**Session Chair:** George Robertson,  
*Microsoft, USA*

**Effects of Tiled High-Resolution Display on Basic Visualization and Navigation Tasks**

Robert Ball, Chris North,  
*Virginia Tech, USA*

**QueryLines: Approximate Query for Visual Browsing**

Kathy Ryall, Neal Lesh, Tom Lanning,  
Darren Leigh, *MERL, USA*  
Hiroaki Miyashita, Shigeru Makino,  
*Mitsubishi Electric, Japan*

**Using Intimacy, Chronology and Zooming to Visualize Rhythms in Email Experience**

Mirko Mandic, Android Kerne,  
*Texas A&M University, USA*

**Time Quilt: Scaling up Zoomable Photo Browsers for Large, Unstructured Photo Collections**

David Huynh, *MIT CSAIL, USA*  
Steven Drucker, Patrick Baudisch,  
Curtis Wong,

*Microsoft Research, USA*

**Understanding Research Trends in Conferences using PaperLens**

Bongshin Lee,  
*University of Maryland/Microsoft  
Research, USA*

Mary Czerwinski, George Robertson,  
*Microsoft Research, USA*

Benjamin B. Bederson,  
*University of Maryland, USA*

**Dynamic Speedometer: Dashboard Redesign to Discourage Drivers from Speeding**

Manu Kumar, Taemie Kim,  
*Stanford University, USA*

## SHORT PAPERS

**HCI in the Office**  
B113-B114

**Session Chair:** Saila Ovaska,  
*University of Tampere, Finland*

**Don't take my folders away! Organizing personal information to get things done**

William Jones, Ammy Phuwanartnurak,  
Rajdeep Gill, Harry Bruce,  
*University of Washington, USA*

**Sources of Structure in Sensemaking**

Yan Qu, George Furnas,  
*University of Michigan, USA*

**Managers' Email: Beyond Tasks and To-Dos**

Catalina Danis, Wendy Kellogg,  
*IBM T.J. Watson Research Center, USA*

Tessa Lau, Mark Dredze,  
*University of Pennsylvania, USA*

Jeffrey Stylos,  
*Carnegie Mellon University, USA*

Nicholas Kushmerick,  
*University College Dublin, Ireland*

**Beyond "From" and "Received": Exploring the Dynamics of Email Triage**

Carman Neustaedter,  
*University of Calgary, Canada*  
A.J. Bernheim Brush, Marc A. Smith,  
*Microsoft Research, USA*

**Work Coordination, Workflow, and Workarounds in a Medical Context**

Marina Kobayashi, Susan R. Fussell,  
*Carnegie Mellon University, USA*

Yan Xiao, F. Jacob Seagull,  
*University of Maryland School of  
Medicine, USA*

**The Advantages of a Cross-Session Web Workspace**

Natalie Jhaveri, Kari-Jouko Rähkä,  
*University of Tampere, Finland*

## SIG

**Current Issues in Assessing and Improving Information Usability**  
B115-B116

Stephanie Rosenbaum,  
*Tec Ed, Inc., USA*

Judith Ramey,  
*University of Washington, USA*

*Alpha by first author. Other program abstracts can be found on your Conference DVD, or online at [www.chi2005.org](http://www.chi2005.org)*

#### Emotions and Heart Rate While Sitting on a Chair

Jenni Anttonen, Veikko Surakka, *University of Tampere, Finland*

New methods for unobtrusive monitoring of computer users? Emotion psychophysiology are very much needed in human-computer interaction research. The present aim was to study heart rate changes during emotionally provocative stimulation. Six-second long auditory, visual, and audiovisual emotionally negative, neutral, and positive stimuli were presented to 24 participants. Heart rate responses were measured with a regular office chair embedded with electromechanical film (the EMFi chair) and with traditional earlobe photoplethysmography (PPG). Ratings of the stimuli were also collected. The results showed that the two heart rate measurements were significantly correlated,  $r = 0.99$ . In line with other studies the results showed that, in general, heart rate decelerated in response to emotional stimulation and it decelerated the most in response to negative stimuli as compared with responses to positive and neutral stimuli. Especially, emotional stimulation caused significant changes in heart rate at the 6th second from the stimulus onset. We suggest that the EMFi chair could be used in human-computer interaction for unobtrusive measurement of the user's emotional reactions.

#### Improving Aviation Safety with Information Visualization: A Flight Simulation Study

Cecilia Aragonn, *University of California, Berkeley/NASA, USA*; Marti Hearst, *University of California, Berkeley, USA*

Many aircraft accidents each year are caused by encounters with invisible airflow hazards. Recent advances in aviation sensor technology offer the potential for aircraft-based sensors that can gather large amounts of airflow velocity data in real-time. With this influx of data comes the need to study how best to present it to the pilot - a cognitively overloaded user focused on a primary task other than that of information visualization. In this paper, we present the results of a usability study of an airflow hazard visualization system that significantly reduced the crash rate among experienced helicopter pilots flying a high fidelity, aerodynamically realistic fixed-base rotorcraft

flight simulator into hazardous conditions. We focus on one particular aviation application, but the results may be relevant to user interfaces in other operationally stressful environments.

#### WaterBot: Exploring Feedback and Persuasive Techniques at the Sink

Ernesto Arroyo, Leonardo Bonanni, Ted Selker, *MIT Media Laboratory, USA*

This paper presents an exploration of user interfaces, persuasive interfaces and feedback techniques in the domain of the sink. Waterbot is a system to inform and motivate behavior at the sink for the purpose of increasing safety and functionality and ultimately motivating behavior change. Waterbot can be adapted to many current sink scenarios and demonstrates the breadth of interaction possible at the point of use of water. It functions as a platform for experimenting with safety, hygiene and water conservation in a sink. This paper presents the feedback and persuasion techniques of augmented physical interfaces with value-added design, automation, just-in-time prompts, positive and negative reinforcement, social validation and adaptive interfaces. Four design iterations are presented to affect behavior at the increasing cognitive levels of safety, functionality and behavior change.

#### tranSticks: Physically Manipulatable Virtual Connections

Yuji Ayatsuka, Jun Rekimoto, *Sony Computer Science Laboratories, Inc., Japan*

A virtually connected medium called tranStick is described that functions both as a "virtual wire" and as a "memory card" containing a shared space. A user can connect two networked devices by simply placing one of a pair of tranSticks with the same identifier into each device. The tranSticks provide feedback indicating that the devices are connected; the connection to be closed or changed in the same way it would be if the devices were connected by a physical cable. A user can also access to a shared space on a network as if the space were in the tranStick. Since tranSticks contain long secret keys, the process of finding another tranStick with the same identifier can be encrypted. The tranStick approach differs from other approaches in that it provides feedback from the connection as well as serving as a medium for establishing a connection, and it enables disconnection and switchover to be done intuitively because the operations are reversible.



#### Snap-and-Go: Helping Users Align Objects without the Modality of Traditional Snapping

Patrick Baudisch, Edward Cutrell, Ken Hinckley, Adam Eversole, *Microsoft Research, USA*

Snapping is a widely used technique that helps users position graphical objects precisely, e.g., to align them with a grid or other graphical objects. Unfortunately, whenever users want to position a dragged object close to such an aligned location, they first need to deactivate snapping. We propose snap-and-go, a snapping technique that overcomes this limitation. By merely stopping dragged objects at aligned positions, rather than "warping" them there, snap-and-go helps users align objects, yet still allows placing dragged objects anywhere else. While this approach of inserting additional motor space renders snap-and-go slightly slower than traditional snapping, snap-and-go simplifies the user interface by eliminating the need for a deactivation option and thereby allows introducing snapping to application scenarios where traditional snapping is inapplicable. In our user studies, participants were able to align objects up to 138% (1D) and 231% (2D) faster with snap-and-go than without and snap-and-go proved robust against the presence of distracting snap targets.

#### The Vacuum: Facilitating the Manipulation of Distant Objects

Anastasia Bezerianos, Ravin Balakrishnan, *University of Toronto, Canada*

We present the design and evaluation of the vacuum, a new interaction technique that enables quick access to items on areas of a large display that are difficult for a user to reach without significant physical movement. The vacuum is a circular widget with a user controllable arc of influence that is centered at the widget's point of invocation and spans out to the edges of the display. Far away objects residing inside this influence arc are brought

closer to the widget's centre in the form of proxies that can be manipulated in lieu of the original. We conducted two experiments which compare the vacuum to direct picking and an existing technique called drag-and-pick [2]. Results show that the vacuum outperforms existing techniques when selecting multiple targets in a sequence, performs similarly to existing techniques when selecting single targets located moderately far away, and slightly worse with single targets located very far away in the presence of distracter targets along the path.

#### Toward Subtle Intimate Interfaces for Mobile Devices Using an EMG Controller

Enrico Costanza, Samuel A. Inverso, Rebecca Allen, *Media Lab Europe (Ireland)*

Using a mobile device in a social context should not cause embarrassment and disruption to the immediate environment. Interaction with mobile and wearable devices needs to be subtle, discreet and unobtrusive. Therefore, we promote the idea of "intimate interfaces": discrete interfaces that allow control of mobile devices through subtle gestures in order to gain social acceptance. To achieve this goal, we present an electromyogram (EMG) based wearable input device which recognizes isometric muscular activity: activity related to very subtle or no movement at all. In the online experiment reported, the EMG device, worn on an armband around the bicep, was able to reliably recognize a motionless gesture without calibration or training across users with different muscle volumes. Hence, EMG-based input devices can provide an effective solution for designing mobile interfaces that are subtle and intimate and hence socially acceptable.



**Examining Task Engagement in Sensor-Based Statistical Models of Human Interruptibility**

James Fogarty, Andrew J. Ko, Htet Htet Aung, Elspeth Golden, Karen P. Tang, Scott E. Hudson, *Carnegie Mellon University, USA*

The computer and communication systems that office workers currently use tend to interrupt at inappropriate times or unduly demand attention because they have no way to determine when an interruption is appropriate. Sensor based statistical models of human interruptibility offer a potential solution to this problem. Prior work to examine such models has primarily reported results related to social engagement, but it seems that task engagement is also important. Using an approach developed in our prior work on sensor based statistical models of human interruptibility, we examine task engagement by studying programmers working on a realistic programming task. After examining many potential sensors, we implement a system to log low level input events in a development environment. We then automatically extract features from these low level event logs and build a statistical model of interruptibility. By correctly identifying situations in which programmers are non interruptible and minimizing cases where the model incorrectly estimates that a programmer is non interruptible, we can support a reduction in costly interruptions while still allowing systems to convey notifications in a timely manner.

**Discrete Acceleration and Personalised Tiling as Brain-Body Interface Paradigms for Neurorehabilitation**

Paul Gnanayutham, *University of Portsmouth, UK*; Chris Bloor, Gilbert Cockton, *University of Sunderland, UK*

We present two studies that have advanced the design of brain-body interfaces for use in the rehabilitation of individuals with severe neurological impairment due to traumatic brain injury. We first developed and evaluated an adaptive cursor acceleration algorithm based on screen areas. This improved the initial design, but was too inflexible to let users make the most of their highly varied abilities. Only some individuals were well served by this adaptive interface. We therefore developed and evaluated an approach based on personalized tile layouts. The rationales for both designs are

presented, along with details of their implementation. Evaluation studies for each are reported, which show that we have extended the user population who can use our interfaces relative to previous studies. We have also extended the usable functionality for some of our user group. We thus claim that personalized tiling with discrete acceleration has allowed us to extend the usable functionality of brain-body interfaces to a wider population with traumatic brain injury, thus creating new options for Neurorehabilitation.

**The Bubble Cursor: Enhancing Target Acquisition by Dynamic Resizing of the Cursor's Activation Area**

Tovi Grossman, Ravin Balakrishnan, *University of Toronto, Canada*

We present the bubble cursor - a new target acquisition technique based on area cursors. The bubble cursor improves upon area cursors by dynamically resizing its activation area depending on the proximity of surrounding targets, such that only one target is selectable at any time. We also present two controlled experiments that evaluate bubble cursor performance in 1D and 2D target acquisition tasks, in complex situations with multiple targets of varying layout densities. Results show that the bubble cursor significantly outperforms the point cursor and the object pointing technique [7], and that bubble cursor performance can be accurately modeled and predicted using Fitts' law.

**Prefuse: A Toolkit for Interactive Information Visualization**

Jeffrey Heer, *University of California, Berkeley, USA*; Stuart Card, *PARC, USA*; James Landay, *University of Washington, USA*

Although information visualization (infovis) technologies have proven indispensable tools for making sense of complex data, wide-spread deployment has yet to take hold, as successful infovis applications are often difficult to author and require domain-specific customization. To address these issues, we have created *prefuse*, a software framework for creating dynamic visualizations of both structured and unstructured data. *prefuse* provides theoretically-motivated abstractions for the design of a wide range of visualization applications, enabling programmers to string together desired components quickly to create and customize working visualizations. To evaluate *prefuse* we have built both existing and novel visualizations testing the toolkit's flexibility and performance, and have run usability studies and usage surveys finding that programmers find the toolkit usable and effective.

**Design and Analysis of Delimiters for Selection-Action Pen Gesture Phrases in Scriboli**

Ken Hinckley, Patrick Baudisch, *Microsoft Research, USA*; Gonzalo Ramos, *Microsoft Research/University of Toronto, USA/Canada*; Francois Guimbretiere, *University of Maryland, USA*

We present a quantitative analysis of delimiters for pen gestures. A delimiter is "something different" in the input stream that a computer can use to determine the structure of input phrases. We study four techniques for delimiting a selection-action gesture phrase consisting of lasso selection plus marking-menu-based command activation. *Pigtail* is a new technique that uses a small loop to delimit lasso selection from marking. *Handle* adds a box to the end of the lasso, from which the user makes a second stroke for marking. *Timeout* uses dwelling with the pen to delimit the lasso from the mark. *Button* uses a button press to signal when to delimit the gesture. We describe the role of delimiters in our *Scriboli* pen interaction test-bed, and show how *Pigtail* supports scope selection, command activation, and direct manipulation all in a single fluid pen gesture.

**PaperWindows: Interaction Techniques for Digital Paper**

David Holman, Roel Vertegaal, Mark Altonaar, Nikolaus Troje, Derek Johns, *Queen's University, Canada*

In this paper, we present *PaperWindows*, a prototype windowing environment that simulates the use of digital paper displays. By projecting windows on physical paper, *PaperWindows* allows the capturing of physical affordances of paper in a digital world. The system uses paper as an input device by tracking its motion and shape with a Vicon Motion Capturing System. We discuss the design of a number of interaction techniques for manipulating information on paper displays.

**Comparing Usability Problems and Redesign Proposals as Input to Practical Systems Development**

Kasper Hornbæk, Erik Frøkjærk, *University of Copenhagen, Denmark*

Usability problems predicted by evaluation techniques are useful input to systems development; it is uncertain whether redesign proposals aimed at alleviating those problems are likewise useful. We present a study of how developers of a large web application assess usability problems and redesign proposals as input to their systems development. Problems and redesign proposals were generated by 43 evaluators using an inspection technique and think aloud testing. Developers assessed redesign proposals to have higher utility in their work than usability problems. In interviews they explained how redesign proposals gave them new ideas for tackling well known problems. Redesign proposals were also seen as constructive and concrete input. Few usability problems were new to developers, but the problems supported prioritizing ongoing development of the application and taking design decisions. No developers, however, wanted to receive only problems or redesigns. We suggest developing and using redesign proposals as an integral part of usability evaluation.

**Extensible Input Handling in the subArctic Toolkit**  
Scott Hudson, Jennifer Mankoff, *Carnegie Mellon University, USA*; Ian Smith, *Intel Research, USA*

The subArctic user interface toolkit has extensibility as one of its central goals. It seeks not only to supply a powerful library of reusable interactive objects, but also make it easy to create new, unusual, and highly customized interactions tailored to the needs of particular interfaces or task domains. A central part of this extensibility is the input model used by the toolkit. The subArctic input model provides standard reusable components that implement many typical input handling patterns for the programmer, allows inputs to be handled in very flexible ways, and allows the details of how inputs are handled to be modified to meet custom needs. This paper will consider the structure and operation of the subArctic input handling mechanism. It will demonstrate the flexibility of the system through a series of examples, illustrating techniques that it enables - many of which would be very difficult to implement in most toolkits.

 **Towards an Index of Opportunity: Understanding Changes in Mental Workload During Task Execution**

Shamsi Iqbal, Piotr Adamczyk, Sam Zheng, Brian Bailey, *University of Illinois, Urbana-Champaign, USA*

To contribute to systems that reason about human attention, our work empirically demonstrates how a user's mental workload changes during task execution. We conducted a study where users performed interactive, hierarchical tasks while mental workload was measured through the use of pupil size. Results show that (i) different types of subtasks impose different mental workload, (ii) workload decreases at subtask boundaries, (iii) workload decreases more at boundaries higher in a task model and less at boundaries lower in the model, (iv) workload changes among subtask boundaries within the same level of a task model, and (v) effective understanding of why changes in workload occur requires that the measure be tightly coupled to a validated task model. From the results, we show how to map mental workload onto a computational Index of Opportunity that systems can use to better reason about human attention.



**Applying the Lessons of the Attack on the World Trade Center, 11th September, 2001, to the Design and Use of Interactive Evacuation Simulations**

Christopher W. Johnson, *University of Glasgow, UK*

The collapse of buildings, such as terminal 2E at Paris' Charles de Gaulle Airport, and of fires, such as the Rhode Island, Station Night Club tragedy, has focused public attention on the safety of large public buildings. Initiatives in the United States and in Europe have led to the development of interactive simulators that model evacuation from these buildings. The tools avoid some of the ethical and legal problems from simulating evacuations; many people were injured during the 1993 evacuation of the World Trade Center (WTC) complex. They also use many concepts that originate within the CHI communities. For instance, some simulators use simple task models to represent the occupants' goal structures as they search for an available exit. However, the recent release of the report from the National Commission on Terrorist Attacks upon the United States (the "9/11 commission") has posed serious questions about the design and use of this particular class of interactive systems. This paper argues that simulation research needs to draw on insights from the CHI communities in order to meet some of the challenges identified by the 9/11 commission.

**DeDe: Design and Evaluation of a Context-Enhanced Mobile Messaging System**

Younghee Jung, Per Persson, Jan Blom, *Nokia Corporation, Finland*

This paper presents the design, implementation and validation of an enhanced mobile phone messaging system (DeDe), allowing the sender to define the context in which the message will be delivered to the recipient. A field trial among a socially tight group of teenagers showed that the DeDe feature was incorporated as part of the participants' existing messaging culture. 11.4% of their total messaging output made use of the DeDe feature. The most frequently used context parameters were location (based on network cell-ID) and time. Novel message practices emerged, as compared to "normal" messaging, both in terms of timing of message sending, as well as creating content that specifically exploited the DeDe feature. Some use barriers were recognized, the most important being the sender's uncertainty of delivery success. Implications for design are discussed.

**Livenotes: A System for Cooperative and Augmented Note-Taking in Lectures**

Matthew Kam, Jingtao Wang, Alastair Iles, Eric Tse, Jane Chiu, Daniel Glaser, Orna Tarshish, John Canny, *University of California, Berkeley, USA*

We describe Livenotes, a shared whiteboard system and educational practice that uses wireless communication and tablet computing to support real-time conversations within small groups of students during lectures, independent of class size. We present an interface design that enables group members to interact with one another by taking lecture notes cooperatively, as well as to augment student note-taking by providing instructor slides in the background to annotate over. Livenotes was designed to facilitate more efficient, stimulating modes of learning that other collaborative approaches do not. We report how the system impacts cooperative learning in an undergraduate class and how students interacted with background slides in the workspace. We conclude with directions for improving the system and learning practice.

**Stencils-Based Tutorials: Design and Evaluation**

Caitlin Kelleher, Randy Pausch, *Carnegie Mellon University, USA*

Users of traditional tutorials and help systems often have difficulty finding the components described or pictured in the procedural instructions. Users also unintentionally miss steps, and perform actions that the documentation's authors did not intend, moving the application into an unknown state. We introduce Stencils, an interaction technique for presenting tutorials that uses translucent colored stencils containing holes that direct the user's attention to the correct interface component and prevent the user from interacting with other components. Sticky notes on the stencil's surface provide necessary tutorial material in the context of the application. In a user study comparing a Stencils-based and paper-based version of the same tutorial in Alice, a complex software application designed to teach introductory computer programming, we found that users of a Stencils-based tutorial were able to complete the tutorial 26% faster, with fewer errors, and less reliance on human assistance. Users of the Stencils-based and paper-based tutorials attained statistically similar levels of learning.

**Fluid Integration of Rotation and Translation**

Russell Kruger, Sheelagh Carpendale, Stacey D. Scott, Anthony Tang, *University of Calgary, Canada*

Previous research has shown that rotation and orientation of items plays three major roles during collaboration: comprehension, coordination and communication. Based on these roles of orientation and advice from kinesiology research, we have designed the RotateNTranslate (RNT) interaction mechanism, which provides integrated control of rotation and translation using only a single touch-point for input. We present an empirical evaluation comparing RNT to a common rotation mechanism that separates control of rotation and translation. Results of this study indicate RNT is more efficient than the separate mechanism and better supports the comprehension, coordination and communication roles of orientation.

**Studying the Effectiveness of MOVE: A Contextually Optimized In-Vehicle Navigation System**

Joonhwan Lee, Jodi Forlizzi, Scott E. Hudson, *Carnegie Mellon University, USA*

In-vehicle navigation has changed substantially in recent years, due to the advent of computer generated maps and directions. However, these maps are still problematic, due to a mismatch between the complexity of the maps and the attentional demands of driving. In response to this problem, we are developing the MOVE (Maps Optimized for Vehicular Environments) system. This system will provide situationally appropriate map information by presenting information that uses appropriate amounts of the driver's attention. In this paper, we describe our findings of studies to help shape the design of the MOVE system, including studies on map reading and in-vehicle navigation, and studies on the effectiveness of a variety of contextually optimized route map visualizations in a simulated driving context. Results show that contextually optimized displays designed for the MOVE system should significantly reduce perceptual load in the context of driving. In our laboratory experiment there was a six-fold decrease in the total map display fixation time and nearly threefold decrease in the number of glances needed to interpret the contextually optimized display compared to a static display.



### Experimental Analysis of Mode Switching Techniques in Pen-Based User Interfaces

Yang Li, *University of California, Berkeley, USA*;  
Ken Hinckley, *Microsoft Research, USA*;  
Zhiwei Guan, *University of Washington, USA*;  
James A. Landay, *University of Washington/Intel Research, USA*

Inking and gesturing are two central tasks in pen-based user interfaces. Switching between modes for entry of uninterpreted ink and entry of gestures is required by many pen-based user interfaces. Without an appropriate mode switching technique, pen-based interactions in such situations may be inefficient and cumbersome. In this paper, we investigate five techniques for switching between ink and gesture modes in pen interfaces, including a pen-pressure based mode switching technique that allows implicit mode transition. A quantitative experimental study was conducted to evaluate the performance of these techniques. The results suggest that pressing a button with the non-preferred hand offers the fastest performance, while the technique of holding the pen still is significantly slower and more prone to error than the other techniques. Pressure, while promising, did not perform as well as the non-preferred hand button with our current implementation.

### Effectiveness of Directional Vibrotactile Cuing on a Building-Clearing Task

Robert Lindeman, John Sibert, Erick Mendez-Mendez, Sachin Patil, Daniel Phifer, *The George Washington University, USA*

This paper presents empirical results to support the use of vibrotactile cues as a means of improving user performance on a spatial task. In a building-clearing exercise, directional vibrotactile cues were employed to alert subjects to areas of the building that they had not yet cleared, but were currently exposed to. Compared with performing the task without vibrotactile cues, subjects were exposed to uncleared areas a smaller percentage of time, and cleared more of the overall space, when given the added vibrotactile stimulus. The average length of each exposure was also significantly less when vibrotactile cues were present.

### No Task Left Behind? Examining the Nature of Fragmented Work

Gloria Mark, Victor Gonzalez, Justin Harris, *University of California, Irvine, USA*

We present data from detailed observation of 24 information workers that shows that they experience work fragmentation as common practice. We consider that work fragmentation has two components: length of time spent in an activity, and frequency of interruptions. We examined work fragmentation along three dimensions: effect of collocation, type of interruption, and resumption of work. We found work to be highly fragmented: people average little time in working spheres before switching and 57% of their working spheres are interrupted. Collocated people work longer before switching but have more interruptions. Most internal interruptions are due to personal work whereas most external interruptions are due to central work. Though most interrupted work is resumed on the same day, more than two intervening activities occur before it is. We discuss implications for technology design: how our results can be used to support people to maintain continuity within a larger framework of their working spheres.

### A Comparison of Techniques for Multi-Display Reaching

Miguel Nacenta, *University of Saskatchewan, Canada*, Dzmitry Aliakseyeu, *Eindhoven University of Technology, The Netherlands*; Sriram Subramanian, Carl Gutwin, *University of Saskatchewan, Canada*

Recent advances in multi-user collaboration have seen a proliferation of interaction techniques for moving digital objects from one device to another. However, little is known about how these techniques work in realistic situations, or how they compare to one another. We conducted a study to compare the efficiency of six techniques for moving objects from a tablet to a tabletop display. We compared the techniques in four different distance ranges and with three movement directions. We found that techniques like the Radar View and Pick-and-Drop, that have a control-to-display ratio of 1, are significantly faster for object movement than techniques that have smaller control-to-display ratios. We also found that using spatial manipulation of objects was faster than pressure-based manipulation.

### Urban Probes: Encountering Our Emerging Urban Atmospheres

Eric Paulos, *Intel Research, USA*;  
Tom Jenkins, *Royal College of Art, UK*

Urban Atmospheres captures a unique, synergistic moment - expanding urban populations, rapid adoption of Bluetooth mobile devices, tiny ad hoc sensor networks, and the widespread influence of wireless technologies across our growing urban landscapes. The United Nations recently reported that 48 percent of the world's population current live in urban areas and that this number is expected to exceed the 50 percent mark world wide by 2007 [1]. In developed nations the number of urban dwellers is even more dramatic - expected to exceed 75%. Current studies project Bluetooth-enabled devices to reach 5.4 billion units by 2005 - five times the number of mobile phones or Internet connections [2]. Mobile phone penetration already exceeds 80% of the population in places like the European Union (EU) and parts of Asia [3]. WiFi hardware is being deployed at the astonishing rate of one every 4 seconds globally [4]. We argue that now is the time to initiate inspirational research into the very essence of these newly emerging technological urban spaces. We desire to move towards an improved understanding of the emotional experience of urban life. This paper describes Urban Probes - a lightweight, provocative, intervention methodology designed to rapidly deconstruct urban situations, reveal new opportunities for technology in urban spaces, and guide future long term research in urban computing. We also describe a completed Urban Probe exploring urban trash.

### Comparing Cursor Orientations for Mouse, Pointer, and Pen Interaction

Barry A. Po, Brian D. Fisher, Kellogg S. Booth, *University of British Columbia, Canada*

Most graphical user interfaces provide visual cursors to facilitate interaction with input devices such as mice, pointers, and pens. These cursors often include directional cues that could influence the stimulus-response compatibility of user input. We conducted a controlled evaluation of four cursor orientations and an orientation-neutral cursor in a circular menu selection task. Mouse interaction on a desktop, pointer (i.e. wand) interaction on a large screen, and pen interaction on a Tablet PC were evaluated. Our results suggest that choosing appropriate cursors is especially important for pointer interaction, but may be less important for mice or pens. Cursors oriented toward the lower-right corner of a display yielded the poorest performance overall while orientation-neutral cursors were generally the best. Advantages were found for orientations aligned with the direction of movement. We discuss these results and suggest guidelines for the appropriate use of cursors in various input and display configurations.

### Visualization of Mappings Between Schemas

George G. Robertson, Mary P. Czerwinski, John E. Churchill, *Microsoft, USA*

In this paper we describe a novel approach to the visualization of the mapping between two schemas. Current approaches to visually defining such a mapping fail when the schemas or maps become large. The new approach uses various information visualization techniques to simplify the view, making it possible for users to effectively deal with much larger schemas and maps. A user study verifies that the new approach is useful, usable, and effective. The primary contribution is a demonstration of novel ways to effectively present highly complex information.

**Digital Family Portrait Field Trial: Support for Aging in Place**

Jim Rowan, Elizabeth D. Mynatt,  
*Georgia Institute of Technology, USA*

A growing social problem in the U.S., and elsewhere, is enabling older adults to continue living independently, as opposed to moving to an institutional care setting. One key part of this complex problem is providing awareness of senior adults' day-to-day activities, promoting "peace of mind" for extended family members. The Digital Family Portrait (DFP) is one approach to providing peace of mind that has shown promise. To date, research on the DFP has been limited to wizard-of-oz based experiments over short periods of time. This paper describes a DFP field trial in which a private home was instrumented with sensors rather than relying on input from wizard-of-oz technology. This field trial was conducted over a period of one year between an aging parent living alone in her own home and her adult child living 50 miles distant. From this field trial we find that even though there was no critical reason for the adult child to be concerned about his mother, all involved parties found utility in the presence of the DFP, even those family members who were not directly involved in the field trial itself.

**Distract-R: Rapid Prototyping and Evaluation of In-Vehicle Interfaces**

Dario Salvucci, Mark Zuber, Ekaterina Beregovaia, Daniel Markley,  
*Drexel University, USA*

As driver distraction from in-vehicle devices increasingly becomes a concern on our roadways, researchers have searched for better scientific understanding of distraction along with better engineering tools to build less distracting devices. This paper presents a new system, Distract-R, that allows designers to rapidly prototype and evaluate new in-vehicle interfaces. The core engine of the system relies on a rigorous cognitive model of driver performance, which the system integrates with models of behavior on the prototyped interfaces to generate predictions of distraction. Distract-R allows a designer to prototype basic interfaces, demonstrate possible tasks on these interfaces, specify relevant driver characteristics and driving scenarios, and finally simulate, visualize, and analyze the resulting behavior as generated by the cognitive model. The paper includes two sample studies that demonstrate the system's ability to account for effects of input modality and driver age on performance.

**A Method to Standardize Usability Metrics into a Single Score**

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Current methods to represent system or task usability in a single metric do not include all the ANSI and ISO defined usability aspects: effectiveness, efficiency & satisfaction. We propose a method to simplify all the ANSI and ISO aspects of usability into a single, standardized and summated usability metric (SUM). In four data sets, totaling 1860 task observations, we show that these aspects of usability are correlated and equally weighted and present a quantitative model for usability. Using standardization techniques from Six Sigma, we propose a scalable process for standardizing disparate usability metrics and show how Principal Components Analysis can be used to establish appropriate weighting for a summated model. SUM provides one continuous variable for summative usability evaluations that can be used in regression analysis, hypothesis testing and usability reporting.

**Calling While Driving: Effects of Providing Remote Traffic Context**

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Cell phone conversations distract drivers. This research explores the possibility of reducing distracting by providing callers with remote information about the driver's traffic. We asked whether providing such contextual information would change the caller's conversation such that drivers would be less distracted. In Experiment 1 we examined this question in a low-fidelity driving simulator; in Experiment 2 we examined this question in a higher fidelity simulator. In both experiments, remote callers and passengers were distracting. Providing traffic information to the remote caller significantly reduced crashes in the low fidelity tests and significantly reduced passing in the high fidelity tests, compared with the control conditions. We consider the implications for development of remote displays or signals to promote driving safety.

**Exploring Technology Adoption and Use Through the Lens of Residential Mobility**

Irina Shklovski, *Carnegie Mellon University, USA*; Scott Mainwaring, *Intel Research, USA*

One of the outcomes of massive adoption of technology is that much of daily technology use and consumption is embedded into "unremarkable" daily life routines. Occasionally, these routines undergo major shifts, often in conjunction with major life events such as marriage, birth of a child, or a residential move. We propose a model of settling into a new location as a function of balance between the pull of the things left behind and the demands of the new and unknown. It is through this experience of being unsettled that we explore the processes of behavior adjustment and re-evaluation of old patterns of technology use as it relates to the old location and the demands of the new location.

**Artful Systems in the Home**

Alex S. Taylor, *Microsoft Research, UK*  
Laurel Swan, *Brunel University, UK*

In this paper we introduce the idea of organizing systems. Through a number of examples from an ongoing ethnographic study of family life, we suggest that organizing systems come about through the artful design and use of informational artifacts in the home, such as calendars, paper notes, to-do lists, etc. These systems are not only seen to organize household routines and schedules, but also, crucially, to shape the social relations between family members. Drawing attention to the material properties of informational artifacts and how assemblies of these artifacts come to make up organizing systems, we discuss some general implications for designing information technology for the home. Most importantly, we suggest that technologies must be designed to accommodate the rich and diverse ways in which people organize their homes, providing them with the resources to artfully construct their own systems rather than enforcing ones that are removed from their own experiences.

### A Visual Recipe Book for Persons with Language Impairments

Kimberly Tee, Karyn Moffatt, Leah Findlater, Eve MacGregor, Joanna McGrenere, Barbara Purves, Sidney S. Fels, *University of British Columbia, Canada*

Cooking is a daily activity for many people. However, traditional text recipes are often prohibitively difficult to follow for people with language disorders, such as aphasia. We have developed a multi-modal application that leverages the retained ability of aphasic individuals to recognize image-based representations of objects, providing a presentation format that can be more easily followed than a traditional text recipe. Through a systematic approach to developing a visual language for cooking, and the subsequent case study evaluation of a prototype developed according to this language, we show that a combination of visual instructions and navigational structure can help individuals with relatively large language deficits to cook more independently.



### Supporting Efficient Development of Cognitive Models at Multiple Skill Levels: Exploring Recent Advances in Constraint-Based Modeling

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This paper presents X-PRT, a new cognitive modeling tool supporting activities ranging from interface design to basic cognitive research. X-PRT provides a graphical model development environment for the CORE constraint-based cognitive modeling engine [7,13,21]. X-PRT comprises a novel feature set: (a) it supports the automatic generation of predictive models at multiple skill levels from a single task-specification, (b) it supports a comprehensive set of modeling activities, and (c) it supports compositional reuse of existing cognitive/perceptual/ motor skills by transforming high-level, hierarchical task descriptions into detailed performance predictions. Task hierarchies play a central role in X-PRT, serving as the organizing construct for task knowledge, the locus for compositionality, and the cognitive structures

over which the learning theory is predicated. Empirical evidence supports the role of task hierarchies in routine skill acquisition.

### Mediating Intimacy: Designing Technologies to Support Strong-Tie Relationships

Frank Vetere, Martin Gibbs, *University of Melbourne, Australia*; Jesper Kjeldskov, *Aalborg University, Denmark*; Steve Howard, Florian Mueller, Sonja Pedell, Karen Mecoles, *University of Melbourne, Australia*; Marcus Bunyan, *Charles Sturt University, Australia*

Intimacy is a crucial element of domestic life, and many interactive technologies designed for other purposes have been appropriated for use within intimate relationships. However, there is a deficit in current understandings of how technologies are used within intimate relationships, and how to design technologies to support intimate acts. In this paper we report on work that has addressed these deficits. We used cultural probes and contextual interviews and other ethnographically informed techniques to investigate how interactive technologies are used within intimate relationships. From this empirical work we generated a thematic understanding of intimacy and the use of interactional technologies to support intimate acts. We used this understanding to inform the design of intimate technologies. A selection of our design concepts is also presented.

### A Study on the Manipulation of 2D Objects in a Projector/Camera-Based Augmented Reality Environment

Stephen Volda, *Georgia Institute of Technology, USA*; Mark Podlaseck, Rick Kjeldsen, Claudio Pinhanez, *IBM T.J. Watson Research Center, USA*

Are the object manipulation techniques traditionally used in head-mounted displays (HMDs) applicable to augmented reality based projection systems? This paper examines the differences between HMD? And projector/camera-based AR interfaces in the light of a manipulation task involving documents and applications projected on common office surfaces such as tables, walls, cabinets, and floor. We report a Wizard of Oz study where subjects were first asked to create gesture/voice commands to move 2D objects on those surfaces and then exposed to gestures created by the authors. Among the options, subjects could select the object to be manipulated using voice command; touching, pointing, and grabbing gesture; or a virtual mouse. The results show a strong preference for a manipulation interface based on pointing gestures using small hand movements and involving minimal body movement. Direct touching of the object was also common when the object being manipulated was within the subject's arm reach. Based on these results, we expect that the preferred interface resembles, in many ways, the egocentric model traditionally used in AR.



### Participatory Design of an Orientation Aid for Amnesics

Mike Wu, Ron Baecker, *University of Toronto, Canada*; Brian Richards, *Baycrest Centre for Geriatric Care, Canada*

We present the participatory design and evaluation of an orientation aid for individuals who have anterograde amnesia. Our design team included six amnesics who have extreme difficulty storing new memories. We describe the methods we used to enable the participation of individuals with

such severe cognitive impairments. Through this process, we have conceived, designed, and developed the OrientingTool, a software application for Personal Digital Assistants that can be used by amnesics to orient themselves when feeling lost or disoriented. Two complementary studies were conducted to evaluate the effectiveness of this tool in ecologically valid contexts. Our findings suggest that the OrientingTool can improve an amnesic's independence and confidence in managing situations when disoriented, and that participatory design may be productively used with participants who have significant cognitive disabilities.

### StudioBRIDGE: Using Group, Location, and Event Information to Bridge Online and Offline Encounters for Collocated Learning Groups

Susan Yee, *Microsoft Research, USA*; Kat S. Park, *MIT, USA*

StudioBRIDGE is an awareness system, based on instant messaging (IM), developed for students working in open studio spaces in the Architecture Department at the Massachusetts Institute of Technology (MIT). The goal of StudioBRIDGE is to help students initiate online and offline interactions by giving them an awareness of nearby people, groups, locations, and events of the community. Even when students are working in close proximity to each other, they are often not aware of the activities and expertise of their colleagues nearby. We believe that this integrated awareness could lead to increased peer learning and expertise sharing by encouraging informal social communication, particularly in groups whose members have existing social and physical ties. In this paper, we describe the user community and the motivation, design, and initial pilot deployment of StudioBRIDGE.