Tuesday at a Glance

	Hall B	Ballroom 201	Ballroom 202	Ballroom 203	Ballroom 204	A105-A106	C123-C124	B113-B114	B115-B116
09:00 to 10:30	**Opening Plenary — Hall B** A Technologist's Comments on Psychologists, Artists, Designers, and other Creatures Strange to Me **Randy Pausch**								
11:30 to 13:00	**INVITED PANEL** Meeting the Needs of the "User Experience" Professional	**PAPERS** Large Communities	**PAPERS** Web Interactions	**PAPERS/SHORT PAPERS** Basic Level Interaction Techniques	**INVITED SIG** Design and Evaluation of Serious Games	**INTERACTIVITY** Touchy: Tangible Interfaces	**SHORT PAPERS** Audio	**SHORT PAPERS** Search, Navigation & Discovery	**SIG** Design for Home Life
14:30 to 16:00	**PANEL** Outsourcing & Offshoring: Impact on the User Experience		**PAPERS** Privacy 1	**PAPERS** Document Interaction	**PAPERS** Eyes on Interaction	**INTERACTIVITY** Spaced Out: 3D Interaction Techniques	**SHORT PAPERS** Affective Computing and Emotion	**SHORT PAPERS** Input Techniques for Mobile Interaction	**SIG** eLearning and Fun
16:30 to 18:00	**PANEL** ROI and the Value of User-Centered Design	**PAPERS** Personal Technologies	**PAPERS** Small Devices 1	**PAPERS** Eye Gaze and Multimodal Integration Patterns	**alt.chi** konstrukt	**INTERACTIVITY** Light & Easy: Future Interfaces	**SHORT PAPERS** Augmented Reality	**SHORT PAPERS** Multimedia Interaction	**SIG** Tangible User Interfaces for Children

THE COMMONS

HIGHLIGHT ON EXHIBITS
10:30 – 11:30

EXHIBITS OPEN
10:30 – 18:00

SPECIAL EVENTS

NEWCOMERS' ORIENTATION
10:30 – 11:15
D139 – D140

CONFERENCE RECEPTION
20:00 – 23:00
Crystal Ballroom

OTHER ACTIVITIES

INFORMATION BOOTH
08:30 – 18:30

RECRUITING BOARDS
10:30 – 18:00

REGISTRATION
08:00 – 17:30

09:30 - 10:30

OPENING PLENARY

Hall B

A Technologist's Comments on Psychologists, Artists, Designers, and other Creatures Strange to Me

Randy Pausch

Cross-disciplinary collaboration is hard. I'm a computer scientist who has worked in areas like Virtual Reality, which made it both easier (and necessary!) for me to work across disciplines. But it was still really, really hard. In this talk, I will cover successful collaborations I've been part of:

- Working with psychologists to evaluate effectiveness of various kinds of virtual environments.
- Working with neurosurgeons to build user interfaces for neurosurgical planning.
- Working with designers, artists, and engineers at Walt Disney Imagineering to build theme park attractions.
- Working with artists at CMU's Entertainment Technology Center, which I co-direct with Don Marinelli, a professor of Drama and Arts Management.
- Creating the "Building Virtual Worlds" course, which unites students from all disciplines in order to build Virtual Reality worlds, and teaches them how to get along with each other.

Some highlights from the talk regarding Cross-Disciplinary Collaboration:

- Shotgun marriages don't work
- Neither side can be there "in service of" the other
- It takes time, patience, and courage
- A goal that is "above" either discipline really helps
- Different disciplines have different values, moral and otherwise

Randy Pausch is a Professor of Computer Science, Human-Computer Interaction, and Design at Carnegie Mellon, where he is the co-director of CMU's Entertainment Technology Center (ETC). He was a National Science Foundation Presidential Young Investigator and a Lilly Foundation Teaching Fellow. He has done Sabbaticals at Walt Disney Imagineering (WDI) and Electronic Arts (EA), and has consulted with Disney on user interfaces for interactive theme park attractions and with Google on user interface design and testing. He is the director of the Alice project, once delighted his mother by appearing in Reader's Digest magazine, and has been in zero gravity.

11:30 - 13:00

INVITED PANEL

Meeting the Needs of the "User Experience" Professional

Hall B

Moderator: Richard Anderson,
Riander, UXnet, USA

Barbara Helfer,
Capital University,
ACM SIGGRAPH, USA

Keith Instone,
IBM, Uxnet, USA

John Zapolski,
AIGA, USA

Jonathan Grudin,
Microsoft Research, USA

Whitney Quesenbery,
Whitney Interactive Design,
UXnet, UPA, USA

= **Best Paper Award Nominee**

PAPERS

Large Communities

Ballroom 201

Session Chair: Gary Olson,
University of Michigan, USA

Collective Efficacy as a Measure of Community

John Carroll, Mary Beth Rosson, Jingying Zhou,
The Pennsylvania State University, USA

How Oversight Improves Member-Maintained Communities

Dan Cosley, Dan Frankowski,
University of Minnesota, USA
Sara Kiesler,
Carnegie Mellon University, USA
Loren G. Terveen, John Riedl,
University of Minnesota, USA

Grounding Needs: Achieving Common Ground via Lightweight Text Chat in Large, Distributed, Ad-Hoc Groups

Jeremy P. Birnholtz,
Thomas A. Finholt,
University of Michigan, USA
Daniel B. Horn,
US Army Research Institute, USA
Sung Joo Bae,
Massachusetts Institute of Technology, USA

PAPERS
Web Interactions
Ballroom 202

Session Chair: Ed Chi,
PARC, USA

Tool for Accurately Predicting Website Navigation Problems, Non-Problems, Problem Severity , and Effectiveness of Repairs
Marilyn Hughes Blackmon,
University of Colorado at Boulder, USA
Muneo Kitajima,
National Institute of Advanced Industrial Science and Technology, Japan
Peter G. Polson,
University of Colorado at Boulder, USA

Is Your Web Page Accessible? A Comparative Study of Methods for Assessing Web Page Accessibility for the Blind
Jennifer Mankoff,
Carnegie Mellon University, USA
Holly Fait,
The Exploratorium, USA
Tu Tran,
University of California, Berkeley, USA

A Comparison of LSA, WordNet, and PMI-IR for Predicting User Click Behavior
Ishwinder Kaur, Anthony J. Hornof,
University of Oregon, USA

PAPERS/ SHORT PAPERS
Basic Level Interaction Techniques
Ballroom 203

Session Chair: Yves Guiard,
CNRS, France

Modeling and Improving Selection in Cascading Pull-Down Menus Using Fitts' Law, the Steering Law and Force Fields
David Ahlstroem,
University of Klagenfurt, Austria

Tuning and Testing Scrolling Interfaces that Automatically Zoom
Andy Cockburn,
University of Canterbury, New Zealand
Joshua Savage,
Leftclick Ltd, New Zealand
Andrew Wallace,
University of Canterbury, New Zealand

A Simple Movement Time Model for Scrolling
Tue Andersen,
University *of Copenhagen, Denmark*

Maximizing the Guessability of Symbolic Input
Jacob Wobbrock, Htet Htet Aung,
Brandon Rothrock, Brad A. Myers,
Carnegie Mellon University, USA

INVITED SIG
Design and Evaluation Challenges of Serious Games
Ballroom 204

Elaine Raybourn,
Sandia National Laboratories, USA

Nathan Bos,
University of Michigan, USA

INTERACTIVITY
Touchy: Tangible Interfaces
A105-A106

Session Chair: Barry Brown,
University of Glasgow, UK

The Virtual Raft Project: A Mobile Interface for Interacting with Communities of Autonomous Characters
Bill Tomlinson, Man Lok Yau, Jessica O'Connell, Ksatria Williams, So Yamaoka,
University of California, Irvine, USA

GelForce: A Vision-Based Traction Field Computer Interface
Kevin Vlack, Terukazu Mizota, Naoki Kawakami, Kazuto Kamiyama, Hiroyuki Kajimoto, Susumu Tachi,
University of Tokyo, Japan

Magic Cubes for Social and Physical Family Entertainment
ZhiYing Zhou, Adrian David Cheok, Yu Li,
National University of Singapore, Singapore
Hirokazu Kato,
Osaka University, Japan

SHORT PAPERS

Audio

C123-C124

Session Chair: Matt Jones,
University of Waikato, New Zealand

Private Communications in Public Meetings

Nicole Yankelovich, Jennifer McGinn,
Mike Wessler, Jonathan Kaplan,
Joe Provino,
Sun Microsystems, USA
Harold Fox, *MIT, USA*

Thank You, I did not see that: In-car Speech Based Information Systems for Older Adults

Ing-Marie Jonsson,
Stanford University/Toyota ITC, USA
Mary Zajicek,
Oxford Brookes University, UK
Helen Harris,
Toyota ITC, USA
Clifford Nass,
Stanford University, USA

Improving Automotive Safety by Pairing Driver Emotion and Car Voice Emotion

Clifford Nass,
Stanford University, USA
Ing-Marie Jonsson, Helen Harris,
Ben Reaves, Jack Endo,
Toyota Motor Corporation, USA
Scott Brave, Leila Takayama,
Stanford University, USA

Compensating for Low Frame Rates

Hendrik Knoche,
University College London, UK
Hermann de Meer,
University of Passau, Germany
David Kirsh,
University California, San Diego, USA

Dealing with System Response Times in Interactive Speech Applications

Peter Fröhlich,
Telecommunications Research Center Vienna, Austria

Effects of Reproduction Equipment on Interaction with a Spatial Audio Display

Georgios Marentakis,
Stephen Brewster,
University of Glasgow, UK

SHORT PAPERS

Search, Navigation, & Discover y

B113-B114

Session Chair: Susan Dumais,
Microsoft Research, USA

Information Search: The Intersection of Visual and Semantic Space

Franklin Tamborello, Michael Byrne,
Rice University, USA

An Evaluation of Landmarks for Re-finding Information on the Web

Bonnie MacKay, Melanie Kellar,
Carolyn Watters,
Dalhousie University, Canada

Indirect Assessment of Web Navigation Success

Jacek Gwizdka, Ian Spence,
University of Toronto, Canada

A Picture is Worth a Thousand Keywords: Image-Based Object Search on a Mobile Platfor m

Tom Yeh, Kristen Grauman,
MIT, USA
Konrad Tollmar,
Lund University, Sweden
Trevor Darrell, *MIT, USA*

Optimizing the Number of Search Result Categories

Mika Käki,
University of Tampere, Finland

Interaction Design for Literature-based Discover y

Meredith Skeels, Kiera Henning,
Meliha Yetisgen-Yildiz, Wanda Pratt,
University of Washington, USA

SIG

Design for Home Life

B115-B116

A. J. Brush,
Microsoft Research, USA

Leysia Palen,
University of Colorado, USA

Laurel Swan,
Brunel University, UK

Alex S. Taylor,
Microsoft Research, UK

14:30 - 16:00

PANEL
Outsourcing & Offshoring: Impact on the User Experience
Hall B

Chair: Richard Anderson, *Riander, USA*

Liam Friedland,
Snap Design, USA

Jon Innes,
SAP Labs LLC, USA

Roman Longoria,
Computer Associates, USA

Pradeep Henry,
Cognizant, India

Wayne Hom,
Augmentum, USA

PAPERS
Privacy 1
Ballroom 202

Session Chair: Jason Hong,
Carnegie Mellon University, USA

Location Disclosure to Social Relations: Why, When, & What People Want to Share
Sunny Consolvo, Ian E. Smith,
Tara Matthews, Anthony LaMarca,
Jason Tabert, Pauline Powledge,
Intel Research Seattle, USA

Privacy and Proportionality: Adapting Legal Evaluation Techniques to Inform Design in Ubiquitous Computing
Giovanni Iachello, Gregory D. Abowd,
Georgia Institute of Technology, USA

Who Gets to Know What When: Configuring Privacy Permissions in an Awareness Application
Sameer Patil,
University of California, Irvine, USA
Jennifer Lai,
IBM T.J. Watson Research Center, USA

14:30 - 16:00

PAPERS
Document Interaction
Ballroom 203

Session Chair: Kumiyo Nakakoji,
University of Tokyo, Japan

Saving and Using Encountered Information: Implications for Electronic Periodicals
Catherine C. Marshall,
Microsoft, USA
Sara Bly,
Sara Bly Consulting, USA

"Documents at Hand:" Learning from Paper to Improve Digital Technologies
Olha Bondarenko,
Eindhoven University of Technology, The Netherlands
Ruud Janssen,
Océ Technologies B.V., The Netherlands

Findex: Search Result Categories Help Users When Document Ranking Fails
Mika Käki,
University of Tampere, Finland

PAPERS
Eyes on Interaction
Ballroom 204

Session Chair: Kari-Jouko Räihä,
University of Tampere, Finland

Use of Eye Movements as Feedforward Training for a Synthetic Aircraft Inspection Task
Sajay Sadasivan, Joel Greenstein,
Andrew Duchowski, Anand
Gramopadhye,
Clemson University, USA

EyeWindows: Evaluation of Eye-Controlled Zooming Windows for Focus Selection
David Fono, Roel Vertegaal,
Queen's University, Canada

EyeDraw: Enabling Children with Severe Motor Impairments to Draw with Their Eyes
Anthony J. Hornof,
University of Oregon, USA
Anna Cavender,
University of Washington, USA

INTERACTIVITY

Spaced Out: 3D Interaction Techniques

A105-A106

Session Chair: Jan Borchers, *RWTH Aachen University, Germany*

Smart Laser-Scanner for 3D Human-Machine Interface
Alvaro Cassinelli, Stephane Perrin, Masatoshi Ishikawa, *University of Tokyo, Japan*

TRIBA: A Cable Television Retrieval & Awareness System
Michael Tseng, Jon Kolko, *Savannah College of Art and Design, USA*

Magic Land: Live 3D Human Capture Mixed Reality Interactive System
Tran Cong Thien Qui, Ta Huynh Duy Nguyen, Asitha Mallawaarachchi, Ke Xu, Wei Liu, Shang Ping Lee, ZhiYing Zhou, Sze Lee Teo, Hui Siang Teo, Le Nam Thang, Yu Li, Adrian David Cheok, *National University of Singapore, Singapore*
Hirokazu Kato, *Osaka University, Japan*

SHORT PAPERS

Affective Computing & Emotion

C123-C124

Session Chair: Francesca Rosella, *Interaction Design Institute Ivrea, Italy*

StressCam: Non-contact Measurement of Users' Emotional States through Thermal Imaging
Colin Puri, Ioannis Pavlidis, *University of Houston, USA*
Leslie Olson, Ames Levine, *Mayo Clinic, USA*
Justin Starren, *Columbia University, USA*

E-motional Advantage: Performance and Satisfaction Gains with Affective Computing
Lesley Axelrod, Kate Hone, *Brunel University, USA*

NEmESys – Neural Emotion Eliciting System
Manfred Eckschlager, *University of Salzburg, Austria*

eMoto – Affectively Involving both Body and Mind
Petra Sundström, *Stockholm University/KTH, Sweden*
Anna Ståhl, *SICS, Sweden*
Kristina Höök, *Stockholm University/KTH, Sweden*

Acceptance and Usability of a Relational Agent Interface by Urban Older Adults
Timothy Bickmore, Lisa Caruso, Kerri Clough-Gorr, *Boston University, USA*

Influence of Colearner Agent Behavior on Learner Performance and Attitudes
Wendy Ju, Seth Nickell, Katherine Eng, Clifford Nass, *Stanford University, USA*

SHORT PAPERS

Input Techniques for Mobile Interaction

B113-B114

Session Chair: Brad Myers, *Carnegie Mellon University, USA*

Glimpse: a Novel Input Model for Multi-level Devices
Clifton Forlines, Chia Shen, *MERL, USA;* Bill Buxton, *Buxton Design, Canada*

An Empirical Study of Typing Rates on mini-QWERTY Keyboards
Edward Clarkson, James Clawson, Kent Lyons, Thad Starner, *Georgia Tech, USA*

An Enhanced Multitap Text Entr y Method with Predictive Next-Letter Highlighting
Jun Gong, Bryan Haggerty, Peter Tarasewich, *Northeastern University, USA*

Making an Impression: Force-Controlled Pen Input for Handheld Devices
Sachi Mizobuchi, Shinya Terasaki, Nokia, Japan; Turo Keski-Jaskari, Jari Nousiainen, Matti Ryynanen, Miika Silfverberg, *Nokia, Finland*

Graphics Matter: A Case Study of Mobile Phone Keypad Design for Chinese Input
Min Lin, Andrew Sears, *UMBC, USA*

FeelTip: Tactile Input Device for Small Wearable Information Appliances

Sunyu Hwang, *Information and Communications University, Korea;* Buyong Jeong, *Korea Advanced Institute of Science and Technology, Korea;* Geehyuk Lee, Woohun Lee, Ilyeon Cho, *Electronics and Telecommuncations Research Institute, Korea*

SIG

eLearning and Fun

B115-B116

Lisa Neal, *eLearn Magazine, USA*

Ray Perez, *Office of Naval Research, USA*

Diane Miller, *Aptima, USA*

16:30 - 18:00

PANEL

Is ROI an Effective Approach for Persuading Decision-makers of the Value of User-Centered Design?

Hall B

Organizer: Susan Dray,
Dray and Associates, USA

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

Daniel Rosenberg,
Oracle Corporation, USA

David Siegel,
Dray and Associates, USA

Dennis Wixon,
Microsoft, USA

PAPERS

Personal Technologies

Ballroom 201

Session Chair: Joseph Konstan,
University of Minnesota, USA

Six Themes of the Communicative Appropriation of Photographic Images
Amy Voida, Elizabeth D. Mynatt,
Georgia Institute of Technology, USA

Making Space for Stories: Ambiguity in the Design of Personal Communication Systems
Paul M. Aoki,
PARC, USA
Allison Woodruff,
Intel Research, USA

Listening In: Practices Surrounding iTunes Music Sharing
Amy Voida, Rebecca E. Grinter,
Georgia Institute of Technology, USA
Nicolas Ducheneaut,
Palo Alto Research Center, USA
W. Keith Edwards,
Georgia Institute of Technology, USA
Mark W. Newman,
Palo Alto Research Center, USA

16:30 - 18:00

PAPERS

Small Devices 1

Ballroom 202

Session Chair: Gene Golovchinsky,
FXPAL, USA

AppLens and LaunchTile: Two Designs for One-Handed Thumb Use on Small Devices
Amy K. Karlson,
Benjamin B. Bederson,
University of Maryland, USA
John SanGiovanni,
Microsoft Research, USA

Alphabetically Constrained Keypad Designs for Text Entry on Mobile Devices
Jun Gong, Peter Tarasewich,
Northeastern University, USA

PAPERS

Eye Gaze and Multimodal Integration Patterns

Ballroom 203

Session Chair: Robert Jacob,
Tufts University, USA

Conversing with the User Based on Eye-Gaze Patterns
Pernilla Qvarfordt,
Linköping University, Sweden
Shumin Zhai,
IBM Almaden Research Center, USA

Effects of Task Properties, Partner Actions, and Message Content on Eye Gaze Patterns in a Collaborative Task
Jiazhi Ou, Lui Min Oh, Jie Yang,
Susan R. Fussell,
Carnegie Mellon University, USA

Individual Differences in Multimodal Integration Patterns: What Are They and Why Do They Exist?
Sharon Oviatt, Rebecca Lunsford,
Rachel Coulston,
Oregon Health & Science University, USA

alt.chi
konstrukt
Ballroom 204

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

Cheap Tricks Revealing Profound Truths: How to sell your soul and keep it, too.
W. Bradford Paley,
Digital Image Design, USA

Experiences with a Virtual Swimming Interface Exhibit
Sidney Fels, Steve Yohanan,
Sachiyo Takahashi, Yuichiro Kinoshita,
Kenji Funahashi, Yasufumi Takama,
Grace Tzu-Pei Chen,
University of British Columbia, Canada

Personalization, Expressivity, and Learnability of an Implicit Mapping Strategy for Physical Interfaces
David Merrill, Joseph A. Paradiso,
MIT Media Lab, USA

3D Modeling Interface with Air Spray: Field Study of 3D Model Making and Prototype Development
Hee-kyoung Jung, Tek-jin Nam,
Ho-sung Lee,
Korea Advanced Institute of Science and Technology, Korea

INTERACTIVITY
Light & Easy: Future Interfaces
A105-A106

Session Chair: Mitchell Gass,
uLab | PDA, USA

Curvature Dial: Eyes-Free Parameter Entry for GUIs
m.c. schraefel, Graham Smith,
University of Southampton, UK
Patrick Baudisch,
Microsoft Research, USA

Intelligent Lighting for a better gaming experience
Magy Seif El-Nasr, Joseph Zupko,
Penn State University, USA
Keith Miron,
University of Southern California, USA

SHORT PAPERS
Augmented Reality
C123-C124

Session Chair: Maribeth Back, *USA*

Wizard of Oz Interfaces For Mixed Reality Applications
Steven Dow, Jaemin Lee, Christopher Oezbek, Blair MacIntyre, Jay Bolter,
Georgia Institute of Technology, USA

Floor Interaction - HCI reaching new ground
Marianne Graves Petersen,
University of Aarhus, Denmark
Peter Gall Krogh, Martin Ludvigsen,
Andreas Lykke-Olesen,
Aarhus School of Architecture, Denmark

Attention-Based Design of Augmented Reality Interfaces
Leonardo Bonanni, Chia-Hsun Lee,
Ted Selker,
MIT Media Laboratory, USA

Behaviour, Realism and Immersion
Kevin Cheng, Paul Cairns,
University College London, UK

Roomquake: Embedding Dynamic Phenomena within the Physical Space of an Elementary School Classroom
Tom Moher, Syeda Hussain,
University of Illinois, Chicago, USA
Tim Halter,
Abraham Lincoln Elementary School, USA
Debi Kilb,
Scripps Institution of Oceanography, USA

Artificial Window View of Nature
Adrijan S. Radikovic, John J. Leggett,
Roger S. Ulrich, John Keyser,
Texas A&M University, USA

16:30 - 18:00

SHORT PAPERS

Multimedia Interaction

B113-B114

Session Chair: Steven Wall, *University of Glasgow, UK*

Interactive Search in Large Video Collections

Andreas Girgensohn, John Adcock, Matthew Cooper, Lynn Wilcox, *FXPAL, USA*

Deciphering Visual Gist and Its Implications for Video Retrieval and Interface Design

Meng Yang, Gary Marchionini, *University of North Carolina, Chapel Hill, USA*

User Strategies for Handling Information Tasks in Webcasts

Christine Dufour, *Université de Montréal, Canada;* Elaine G. Toms, Jonathan Lewis, *Dalhousie University, Canada;* Ron Baecker, *University of Toronto, Canada*

Children's and Adults' Multimodal Interaction with 2D Conversational Agents

Stephanie Buisine, *LIMSI-CNRS / LCPI-ENSAM, France*
Jean-Claude Martin, *LIMSI-CNRS / University of Paris, France*

Preliminary Evaluation of the Interactive Drama Façade

Rachel Knickmeyer, Michael Mateas, *Georgia Institute of Technology, USA*

Designing Systems that Direct Human Action

Ana Chang, Marc Davis, *University of California, Berkeley, USA*

SIG

Tangible User Interfaces for Children

B115-B116

Glenda Revelle, *Sesame Workshop, USA*

Oren Zuckerman, *MIT Media Lab, USA*

Allison Druin, *University of Maryland, USA*

Mark Bolas, *USC School of Cinema-Television, USA*

Alpha by first author. Other program abstracts can be found on your Conference DVD, or online at www.chi2005.org

Modeling and Improving Selection in Cascading Pull-Down Menus Using Fitts' Law, the Steering Law and Force Fields

David Ahlstroem, *University of Klagenfurt, Austria*

Selecting a menu item in a cascading pull-down menu is a frequent but Time consuming and complex GUI task. This paper describes an approach aimed to support the user during selection in cascading pull-down menus when using an indirect pointing device. By enhancing such a cascading pull-down menu with "force fields", the cursor is attracted toward a certain direction, e.g. toward the right hand side within a menu item, which opens up a sub-menu, making the cursor steering task easier and faster. The experiment described here shows that the force fields can decrease selection times, on average by 18%, when a mouse, a track point, or touch pad is used as input device. The results also suggest that selection times in cascading pull-down menus can be modeled using a combination of Fitts' law and the steering law. The proposed model proved to hold for all three devices, in both standard and in enhanced cascading pull-down menus, with correlations better than r^2=0.90.

Making Space for Stories: Ambiguity in the Design of Personal Communication Systems

Paul M. Aoki, *PARC, USA;*
Allison Woodruff, *Intel Research, USA*

Pervasive personal communication technologies offer the potential for important social benefits for individual users, but also the potential for significant social difficulties and costs. In research on face-to-face social interaction, ambiguity is often identified as an important resource for resolving social difficulties. In this paper, we discuss two design cases of personal communication systems, one based on fieldwork of a commercial system and another based on an unrealized design concept. The cases illustrate how user behavior concerning a particular social difficulty, unexplained unresponsiveness, can be influenced by technological issues that result in interactional ambiguity. The cases also highlight the need to balance the utility of ambiguity against the utility of usability and communicative clarity.

Tool for Accurately Predicting Website Navigation Problems, Non-Problems, Problem Severity, and Effectiveness of Repairs

Marilyn Hughes Blackmon, *University of Colorado at Boulder, USA;* Muneo Kitajima, *National Institute of Advanced Industrial Science and Technology, Japan;* Peter G. Polson, *University of Colorado at Boulder, USA*

The Cognitive Walkthrough for the Web (CWW) is a partially automated usability evaluation method for identifying and repairing website navigation problems. Building on five earlier experiments [3,4], we first conducted two new experiments to create a sufficiently large dataset for multiple regression analysis. Then we devised automatable problem-identification rules and used multiple regression analysis on that large dataset to develop a new CWW formula for accurately predicting problem severity. We then conducted a third experiment to test the prediction formula and refined CWW against an independent dataset, resulting in full cross-validation of the formula. We conclude that CWW has high psychological validity, because CWW gives us (a) accurate measures of problem severity, (b) high success rates for repairs of identified problems (c) high hit rates and low false alarms for identifying problems, and (d) high rates of correct rejections and low rates of misses for identifying non-problems.

Grounding Needs: Achieving Common Ground via Lightweight Text Chat in Large, Distributed, Ad-Hoc Groups

Jeremy P. Birnholtz, Thomas A. Finholt, *University of Michigan, USA;* Daniel B. Horn, *US Army Research Institute, USA;* Sung Joo Bae, *MIT, USA*

This paper reports on the emergent use of lightweight text chat to provide important grounding and facilitation information in a large, distributed, ad-hoc group of researchers participating in a live experiment. The success of chat in this setting suggests a critical re-examination and extension of Clark and Brennan?s work on grounding in communication. Specifically, it is argued that there are some settings characterized by reduced information and clarification needs, where the use of extremely lightweight tools (such as basic text chat) can be sufficient for achieving common ground - even when conversational participants are unknown to each other. Theoretical and design implications are then presented.

"Documents at Hand:" Learning from Paper to Improve Digital Technologies

Olha Bondarenko, *Eindhoven University of Technology, The Netherlands;* Ruud Janssen, *Océ Technologies B.V., The Netherlands*

In this paper, the results of a two-year ethnographic study of the personal document management of 28 information workers is described. Both the paper and digital domain were taken into account during the study. The results reaffirmed that document management is strongly related totask management. Digital tools do not adequately support two important user needs related to task management, namely that documents should be embedded within meaningful (task-related) context information, and that they should be easily accessible for regrouping as the task goes on. In contrast, paper supports these needs very well. Following a discussion of personal document management using paper, email, and digital file folder structures, six implications are outlined for the design of digital document management systems that combine the advantages of both domains.

Collective Efficacy as a Measure of Community

John Carroll, Mary Beth Rosson, Jingying Zhou, *Pennsylvania State University, USA*

As human-computer interaction increasingly focuses on mediated interactions among groups of individuals, there is a need to develop techniques for measurement and analysis of groups that have been scoped at the level of the group. Bandura's construct of perceived self-efficacy has been used to understand individual behavior as a function of domain-specific beliefs about personal capacities. The construct of *collective efficacy* extends self-efficacy to organizations and groups, referring to beliefs about collective capacities in specific domains. We describe the development and refinement of a collective efficacy scale, the factor analysis of the construct, and its external validation in path models of community-oriented attitudes, beliefs, and behaviors.

Tuning and Testing Scrolling Interfaces that Automatically Zoom

Andy Cockburn, *University of Canterbury, New Zealand;* Joshua Savage, *Leftclick Ltd, New Zealand;* Andrew Wallace, *University of Canterbury, New Zealand*

Speed dependent automatic zooming (SDAZ) is a promising refinement to scrolling in which documents are automatically zoomed-out as the scroll rate increases. By automatically zooming, the visual flow rate is reduced enabling rapid scrolling without motion blur. In order to aid SDAZ calibration we theoretically and empirically scrutinise human factors of the speed/zoom relationship. We then compare user performance with four alternative text-document scrolling systems, two of which employ automatic zooming. One of these systems, which we term 'DDAZ', is based on van Wijk and Nuij's recent and important theory that calculates optimal pan/zoom paths between known locations in 2D space. van Wijk and Nuij suggested that their theory could be applied to scrolling, but did not implement or test their formulaic suggestions. Participants in our evaluation (n=27) completed scrolling tasks most rapidly when using SDAZ, followed by DDAZ, normal scrollbars, and traditional rate-based scrolling. Workload assessments and preferences strongly favoured SDAZ. We finish by examining issues for consideration in commercial deployments.

Location Disclosure to Social Relations: Why, When, & What People Want to Share

Sunny Consolvo, Ian E. Smith, Tara Matthews, Anthony LaMarca, Jason Tabert, Pauline Powledge, *Intel Research Seattle, USA*

Advances in location-enhanced technology are making it easier for us to be located by others. These new technologies present a difficult privacy tradeoff, as disclosing one's location to another person or service could be risky, yet valuable. To explore whether and what users are willing to disclose about their location to social relations, we conducted a three-phased formative study. Our results show that the most important factors were who was requesting, why the requester wanted the participant's location, and what level of detail would be most useful to the requester. After determining these, participants were typically willing to disclose either the most useful detail or nothing about their location. From our findings, we reflect on the decision process for location disclosure. With these results, we hope to influence the design of future location-enhanced applications and services.

How Oversight Improves Member-Maintained Communities

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Online communities need regular maintenance activities such as moderation and data input, tasks that typically fall to community owners. Communities that allow all members to participate in maintenance tasks have the potential to be more robust and valuable. A key challenge in creating member-maintained communities is building interfaces, algorithms, and social structures that encourage people to provide high-quality contributions. We use Karau and Williams' collective effort model to predict how peer and expert editorial oversight affect members' contributions to a movie recommendation website and test these predictions in a field experiment with 87 contributors. Oversight increased both the quantity and quality of contributions while reducing antisocial behavior, and peers were as effective at oversight as experts. We draw design guidelines and suggest avenues for future work from our results.

EyeWindows: Evaluation of Eye-Controlled Zooming Windows for Focus Selection

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In this paper, we present an attentive windowing technique that uses eye tracking, rather than manual pointing, for focus window selection. We evaluated the performance of 4 focus selection techniques: eye tracking with key activation, eye tracking with automatic activation, mouse and hotkeys in a typing task with many open windows. We also evaluated a zooming windowing technique designed specifically for eye-based control, comparing its performance to that of a standard tiled windowing environment. Results indicated that eye tracking with automatic activation was, on average, about twice as fast as mouse and hotkeys. Eye tracking with key activation was about 72% faster than manual conditions, and preferred by most participants. We believe eye input performed well because it allows manual input to be provided in parallel to focus selection tasks. Results also suggested that zooming windows outperform static tiled windows by about 30%. Furthermore, this performance gain scaled with the number of windows used. We conclude that eye-controlled zooming windows with key activation provides an efficient and effective alternative to current focus window selection techniques.

Alphabetically Constrained Keypad Designs for Text Entry on Mobile Devices

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The creation of text will remain a necessary part of human-computer interaction with mobile devices, even as they continue to shrink in size. On mobile phones, text is often entered using keypads and predictive text entry techniques, which attempt to minimize the effort (e.g., number of key presses) needed to enter words. This research presents results from the design and testing of alphabetically-constrained keypads, optimized on various word lists, for predictive text entry on mobile devices. Complete enumeration and Genetic Algorithm-based heuristics were used to find keypad designs based on different numbers of keys. Results show that alphabetically-constrained designs can be found that are close to unconstrained designs in terms of performance. User testing supports the hypothesis that novice ease of learning, usability, and performance is greater for constrained designs when compared to unconstrained designs. The effect of different word lists on keypad design and performance is also discussed.

EyeDraw: Enabling Children with Severe Motor Impairments to Draw with Their Eyes

Anthony J. Hornof, *University of Oregon, USA;* Anna Cavender, *University of Washington, USA*

EyeDraw is a software program that, when run on a computer with an eye tracking device, enables children with severe motor disabilities to draw pictures by just moving their eyes. This paper discusses the motivation for building the software, how the program works, the iterative development of two versions of the software, user testing of the two versions by people with and without disabilities, and modifications to the software based on user testing. Feedback from both children and adults with disabilities, and from their caregivers, was especially helpful in the design process. The project identifies challenges that are unique to controlling a computer with the eyes, and unique to writing software for children with severe motor impairments.

Privacy and Proportionality: Adapting Legal Evaluation Techniques to Inform Design in Ubiquitous Computing

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We argue that an analytic proportionality assessment balancing usefulness and burden on individual or group privacy must be conducted throughout the design process to create acceptable ubiquitous computing (ubicomp) applications and services. We introduce the principle of proportionality, which originates within the legal and data protection communities. Inspired by this principle, we develop a design method for ubicomp applications, based on our own experience, and aimed at HCI practitioners and designers. We discuss the method in relation to real-world examples, user inquiry techniques and requirements engineering models. Finally, we report a sample application of the method, involving a ubiquitous, personal memory aid tool.

AppLens and LaunchTile: Two Designs for One-Handed Thumb Use on Small Devices

Amy K. Karlson, Benjamin B. Bederson, *University of Maryland, USA*; John SanGiovanni, *Microsoft Research, USA*

We present two interfaces to support one-handed thumb use for PDAs and cell phones. Both use Scalable User Interface (ScUI) techniques to support multiple devices with different resolutions and aspect ratios. The designs use variations of zooming interface techniques to provide multiple views of application data: AppLens uses tabular fisheye to access nine applications, while LaunchTile uses pure zoom to access thirty-six applications. We introduce two sets of thumb gestures, each representing different philosophies for one-handed interaction. We conducted two studies to evaluate our designs. In the first study, we explored whether users could learn and execute the AppLens gesture set with minimal training. Participants performed more accurately and efficiently using gestures for directional navigation than using gestures for object interaction. In the second study, we gathered user reactions to each interface, as well as comparative preferences. With minimal exposure to each design, most users favored AppLens?s tabular fisheye interface.

A Comparison of LSA, WordNet, and PMI-IR for Predicting User Click Behavior

Ishwinder Kaur, Anthony J. Hornof, *University of Oregon, USA*

A predictive tool to simulate human visual search behavior would help interface designers inform and validate their design. Such a tool would benefit from a semantic component that would help predict search behavior even in the absence of exact textual matches between goal and target. This paper discusses a comparison of three semantic systems - LSA, WordNet and PMI-IR - to evaluate their performance in predicting the link that people would select given an information goal and a webpage. PMI-IR best predicted human performance as observed in a user study.

Findex: Search Result Categories Help Users When Document Ranking Fails

Mika Käki, *University of Tampere, Finland*

Long web search result lists can be hard to browse. We demonstrated experimentally, in a previous study, the usefulness of a categorization algorithm and filtering interface. However, the nature of interaction in real settings is not known from an experiment in laboratory settings. To address this problem, we provided our categorizing web search user interface to 16 users for a two month period. The interactions with the system were logged and the users' opinions were elicited with two questionnaires. The results show that categories are successfully used as part of users' search habits. They are helpful when the result ranking of the search engine fails. In those cases, the users are able to access results that locate far in the rank order list with the categories. Users can also formulate simpler queries and find needed results with the help of the categories. In addition, the categories are beneficial when more than one result is needed like in an exploratory or undirected search task.

Is Your Web Page Accessible? A Comparative Study of Methods for Assessing Web Page Accessibility for the Blind

Jennifer Mankoff, *Carnegie Mellon University, USA*; Holly Fait, *The Exploratorium, USA;* Tu Tran, *University of California, Berkeley, USA*

Web access for users with disabilities is an important goal and challenging problem for web content developers and designers. This paper presents a comparison of different methods for finding accessibility problems affecting users who are blind. Our comparison focuses on techniques that might be of use to Web developers without accessibility experience, a large and important group that represents a major source of inaccessible pages. We compare a laboratory study with blind users to an automated tool, expert review by web designers with and without a screen reader, and remote testing by blind users. Multiple developers, using a screen reader, were most consistently successful at finding most classes of problems, and tended to find about 50% of known problems. Surprisingly, a remote study with blind users was one of the least effective methods. All of the techniques, however, had different, complementary strengths and weaknesses.

Saving and Using Encountered Information: Implications for Electronic Periodicals

Catherine C. Marshall, *Microsoft, USA;* Sara Bly, *Sara Bly Consulting, USA*

As part of a focus on electronic publications, we undertook an exploratory study of how people saved and used the information they encountered while reading. In particular, we wanted to understand the role of clipping and whether it would be a necessary form of interaction with electronic publications. We interviewed 20 diverse individuals at home and at work, bringing together narrative accounts and physical and digital examples to investigate how people currently collect and use clippings from their everyday reading. All study participants had examples of materials they had deliberately saved from periodicals, ranging from ads torn from newspapers and URLs received in email messages to large stacks of magazines. Participants rarely read periodicals specifically to clip but rather recognized items of interest when they were encountered. The work highlights the importance of encountering information as an activity distinct from task-focused browsing and searching and reveals design implications for online reading and clipping technologies.

Effects of Task Properties, Partner Actions, and Message Content on Gaze Patterns in a Collaborative Task

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Helpers providing guidance for collaborative physical tasks shift their gaze between the workspace, supply area, and instructions. Understanding when and why helpers gaze at each area is important both for a theoretical understanding of collaboration on physical tasks and for thedesign of automated video systems for remote collaboration. In a laboratory experiment using a collaborative puzzle task, we recorded helpers' gaze while manipulating task complexity and piece differentiability. Helpers gazed toward the pieces bay more frequently when pieces were difficult to differentiate and less frequently over repeated trials. Preliminary analyses of message content show that helpers tend to look at the pieces bay when describing the next piece and at the workspace when describing where it goes. The results are consistent with a grounding model of communication, in which helpers seek visual evidence of understanding unless they are confident that they have been understood. The results also suggest the feasibility of building automated video systems based on remote helpers' shifting visual requirements.

Individual Differences in Multimodal Integration Patterns: What Are They and Why Do They Exist?

Sharon Oviatt, Rebecca Lunsford, Rachel Coulston, *Oregon Health & Science University, USA*

Techniques for information fusion are at the Techniques for information fusion are at the heart of multimodal system design. To develop new user-adaptive approaches for multimodal fusion, the present research investigated the stability and underlying cause of major individual differences that have been documented between users in their multimodal integration pattern. Longitudinal data were collected from 25 adults as they interacted with a map system over six weeks. Analyses of 1,100 multimodal constructions revealed that everyone had a dominant integration pattern, either simultaneous or sequential, which was 95-96% consistent and remained stable over time. In addition, coherent behavioral and linguistic differences were identified between these two groups. Whereas performance speed was comparable, sequential integrators made only half as many errors and excelled during new or complex tasks. Sequential integrators also had more precise articulation (e.g., fewer disfluencies), although their speech rate was no slower. Finally, sequential integrators more often adopted terse and direct command-style language, with a smaller and less varied vocabulary, which appeared focused on achieving error-free communication. These distinct interaction patterns are interpreted as deriving from fundamental differences in reflective-impulsive cognitive style. Implications of these findings are discussed for the design of adaptive multimodal systems with substantially improved performance characteristics.

Who Gets to Know What When: Configuring Privacy Permissions in an Awareness Application

Sameer Patil, *University of California, Irvine, USA;* Jennifer Lai, *IBM T.J. Watson Research Center, USA*

We report on a study (N=36) of user preferences for balancing awareness with privacy. Participants defined permissions for sharing of location, availability, calendar information and instant messaging (IM) activity within an application called mySpace. MySpace is an interactive visualization of the physical workplace that provides dynamic information about people, places and equipment. We found a significant preference for defining privacy permissions at the group level. While "family" received high levels of awareness sharing, interestingly, "team" was granted comparable levels during business hours at work. Surprisingly, presenting participants with a detailed list of all pieces of personal context to which the system had access, did not result in more conservative privacy settings. Although location was the most sensitive aspect of awareness, participants were comfortable disclosing room-level location information to their team members at work. Our findings suggest utilizing grouping mechanisms to balance privacy control with configuration burden, and argue for increased system transparency to build trust.

Conversing with the User Based on Eye-Gaze Patterns

Pernilla Qvarfordt, *Linköping University, Sweden*; Shumin Zhai, *IBM Almaden Research Center, USA*

Motivated by and grounded in observations of eye-gaze patterns in human-human dialogue, this study explored using eye-gaze patterns in managing human-computer dialogue. We developed an interactive system, iTourist, for city trip planning, which encapsulated knowledge of eye-gaze patterns gained from studies of human-human collaboration systems. User study results show that it is possible to sense users' interest based on eye-gaze patterns and manage computer information output accordingly. Study participants could successfully plan their trip with iTourist and positively rated their experience of using it. We demonstrated that eye-gaze could play an important role in managing future multimodal human-computer dialogue.

Use of Eye Movements as Feedforward Training for a Synthetic Aircraft Inspection Task

Sajay Sadasivan, Joel Greenstein, Andrew Duchowski, Anand Gramopadhye, *Clemson University, USA*

Aircraft inspection is a vital element in assuring safety and reliability of the air transportation system. The human inspector performing visual inspection of an aircraft is the backbone of this process and training is an effective strategy for improving their inspection performance. Previous studies have shown offline feedback training to be effective in improving subsequent visual inspection performance. Because experienced inspectors are known to adopt a better inspection strategy than novices, providing visualization of experts' cognitive processes a priori can accelerate novices' adoption of the experts' strategy. Using eye tracking equipment, we record the point of regard of an expert inspector performing an inspection task in a virtual reality simulator. Analysis of their eye movements leads to a visualization of their scanpaths and allows us to display the inspector's visual search (hence cognitive) strategy. We show how providing this type of scanpath-based feedforward training of novices leads to improved accuracy performance in the simulator coupled with an observed speed-accuracy tradeoff. We contend that the tradeoff results from trained novices adopting a slower paced strategy through increased fixation durations, suggesting trained novices learn a more deliberate target search/discrimination strategy that requires more time to execute.

Listening In: Practices Surrounding iTunes Music Sharing

Amy Voida, Rebecca E. Grinter, *Georgia Institute of Technology, USA*
Nicolas Ducheneaut, *Palo Alto Research Center, USA*; W. Keith Edwards, *Georgia Institute of Technology, USA*; Mark W. Newman, *Palo Alto Research Center, USA*

This paper presents a descriptive account of the social practices surrounding the iTunes music sharing of 13 participants in one organizational setting. Specifically, we characterize adoption, critical mass, and privacy; impression management and access control; the musical impressions of others that are created as a result of music sharing; the ways in which participants attempted to make sense of the dynamic system; and implications of the overlaid technical, musical, and corporate topologies. We interleave design implications throughout our results and relate those results to broader themes in a music sharing design space.

Six Themes of the Communicative Appropriation of Photographic Images

Amy Voida, Elizabeth D. Mynatt, *Georgia Institute of Technology, USA*

In this paper, we explore the use of digital photographs in computer-mediated communication. We present Lascaux, an instant messaging client that serves as a research platform for studying visual communication with digital photographs. Through combined analyses of the uses of images in Lascaux as well as the uses of images in other communicative contexts, we arrived at six themes of appropriation: the image as amplification, the image as narrative, the image as awareness, the image as local expression, the image as invitation, and the image as object/instrument. For each theme, we explore the ways in which a medium may be designed to support that class of appropriation. Finally, we reflect on the relationship between literacy, mastery, and appropriation.