INRIA

INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET EN AUTOMATIQUE

Project-Team in-situ

Situated Interaction

Saclay - Île-de-France

THEME COG

Table of contents

Established in 2002, the INSITU project is a collaboration between INRIA Saclay–Île-de-France and the Laboratoire de Recherche en Informatique (Laboratory for Computer Science) of Paris-Sud University and CNRS (Centre National de la Recherche Scientifique), originally established within the framework of the PCRI (Pôle Commun de Recherche en Informatique).

1. Team

Research Scientist

Wendy Mackay [Team Leader, Principal Research Scientist (DR1), INRIA]
Caroline Appert [Research Scientist (CR2), CNRS, since September 2008]
Olivier Chapuis [Senior Research Scientist (CR1), CNRS]
Emmanuel Pietriga [Senior Research Scientist (CR1), INRIA]

Faculty Member

Michel Beaudouin-Lafon [Professor, Paris-Sud University, HdR]
Stéphane Huot [Assistant Professor, Paris-Sud University]
Nicolas Roussel [Assistant Professor, Paris-Sud University, HdR]

Technical Staff

Rémi Cardona [Engineer (Ingénieur associé), INRIA, CDD September 2007 to August 2009]
The Nhan Luong [Engineer (Ingénieur expert), INRIA, CDD October 2007 to September 2008]
Catherine Letondal [Engineer (Ingénieur expert), MSR-INRIA ReActivity, CDD June 2008 to May 2009]

PhD Student

Olivier Bau [Allocataire de recherche MENRT, INRIA]
Guillaume Besacier [Bourse doctorale Région Ile de France, Paris-Sud University]
Guillaume Faure [Allocataire de recherche MENRT, Paris-Sud University]
Emilien Ghomi [Allocataire de recherche MENRT, Paris-Sud University, since October 2008]
Sofiane Gueddana [Bourse doctorale INRIA, Paris-Sud University]
Clemens Nylandsted Klokmose [University of Aarhus, Denmark, November 2007 to April 2008]
Jérôme Lard [Thalès Research & Technology, CIFRE, defense in October 2008]
Danielle Lottridge [University of Toronto (Canada)]
Nicolas Masson [Lecturer (ATER), Paris-Sud University]
Mathieu Nancel [Bourse doctorale Région Ile de France/Digiteo, Paris-Sud University, since October 2008]
Yann Riche [Allocataire de recherche MENRT, INRIA, defense in September 2008]
Aurélien Tabard [Allocataire de recherche MENRT, INRIA]

Post-Doctoral Fellow

Theophanis Tsandilas

Administrative Assistant

Marie-Carol Lopes [part-time]

Other

Shengqiong Yuan [Wuhan Institute of Technology (China)]
Gennady Legostaev [Saint Petersburg State University (Russia), INRIA Intern from November 2007 to March 2008]
Evelyn Eastmond [MIT Media Lab (USA)]

2. Overall Objectives

2.1. Objectives

As computers permeate every aspect of society, the number and variety of computer users has multiplied dramatically as has the quantity and complexity of the data they manage. Computers are now ubiquitous and increasingly diverse, ranging from mobile phones and PDAs to laptops, desktops and wall-sized displays. Computers and telephony have converged to create a new communication medium, providing mobile access to myriad on-line services. This revolution poses major challenges for the design, implementation and deployment of interactive systems. The current failure to address these challenges has resulted in applications that users can no longer understand or control, lowering productivity and increasing frustration.

The focus of the INSITU project is to create innovative interactive systems that truly meet the needs of their users. For us, context is critical: we need to provide designers with tools and methods that actively take context into account. This requires a deeper understanding of the complementary characteristics of humans and computers as well as an analysis of specific situations of use. Our goal is to develop and facilitate the creation of such situated interfaces, which take optimal advantage of context to provide users with the particular tools they need to address the problems at hand.

The desktop metaphor that has driven personal computing for the past 25 years has reached its limits, with no short-term alternative. Our approach both expands today's graphical user interfaces and explores new possibilities, addressing the following goals:

- Flexibility to support end-user customization and programming as well as adaptation to physical context;
- Integration of physical and electronic worlds through the exploration of mixed reality and tangible interfaces;
- Scalability with respect to the quantity of data being managed, through the development of multi-scale interfaces and information visualization techniques;
- Cooperation and collaboration support in order to study new forms of person-to-person mediated communication;
- Integration of varied interaction styles and techniques into a single coherent environment, using appropriate interaction models and architectures.

2.2. Research Themes

INSITU addresses four major research themes:

Interaction and visualization paradigms focuses on the trade-off between power and simplicity in interactive systems, both in terms of interaction and in managing and visualizing data. Rather than accepting one or the other, our objective is to shift the trade-off curve, creating systems that provide more power while retaining simplicity. We are currently investigating multi-scale (zoomable) interfaces, interactive information visualization, bimanual interaction, multimedia (video and audio) and tangible interfaces. Our goal is to not only explore these paradigms individually but also to investigate how to integrate them into real-world applications.

Mediated communication focuses on how to help people to maintain peripheral awareness of each others' activities at a distance (to "stay in touch"), while maintaining privacy and ensuring that users stay in control of their communication channels. Our objective is to generate a design space for alternative forms of communication, developing and testing new communication applications that illustrate different dimensions of the design space. We are currently developing communication appliances for home settings, including support for the elderly, children, remote couples and families.

Research methods focuses on how multi-disciplinary teams can create effective interactive systems that take context into account. Our objective is to create new research methods that include users throughout the design process, to test these methods in real-world settings and to disseminate these methods to researchers and designers. We are currently investigating participatory design techniques that actively involve users throughout the design process and multidisciplinary design techniques that facilitate communication among researchers from engineering, social science and design disciplines.

Engineering of interactive systems focuses on creating effective tools for building interactive systems. Our objective is to generate libraries, exploratory toolkits and platforms that enable us to quickly implement and work with new concepts, while also enabling researchers within and outside of INSITU to benefit from our research. We are currently investigating tools that facilitate the design and adoption of effective interaction techniques and paradigms and component-based architectures to facilitate dynamic management of interactive systems. Our goal is to develop open source toolkits that enable us and our research colleagues to design and implement advanced interactive systems.

Although we articulate each theme separately, we often intermix them within actual projects. We also work across disciplines, providing us with research breadth, and at the same time, seek to obtain depth in particular projects. We apply our own research methods to the design of new interaction techniques, develop our own tools for developing these techniques and integrate these techniques in the design of innovative interactive systems, which we test in real-world settings. Our long-term goal is to create a new generation of interactive environments that provide a compelling alternative to the current generation of desktop computers.

2.3. Highlights of the year

Caroline Appert won first prize for the Gilles Kahn thesis award in Computer Science, sponsored by Specif and the French Science Academy (Académie des Sciences).

Wendy Mackay was interviewed by France Bleu and by France Inter radio stations and for the publication "Regards sur le numérique" (http://www.regardsurlenumerique.fr).

INSITU's research in mediated communication is now the focus of a Digiteo technology transfer project, ICI-TV. Praesto, a startup that provides services for the elderly, will use versions of VideoProbe, MarkerClock and MediaSpaces to help the elderly stay in touch with their families.

OctoPocus, INSITU's gesture-learning system, and Metisse, INSITU's advanced Window System, attracted the attention of the One-Laptop-Per-Child initiative. They will be working with us to incorporate advanced touch-based interaction into the next generation of OLPC.

3. Scientific Foundations

3.1. Scientific Foundations

INSITU uses a multi-disciplinary research approach, including computer scientists, psychologists and designers. Working together requires an understanding of each other's methods. Much of computer science relies on formal theory, which, like mathematics, is evaluated with respect to its internal consistency. The social sciences are based more on descriptive theory, attempting to explain observed behaviour, without necessarily being able to predict it. The natural sciences seek predictive theory, using quantitative laws and models to not only explain, but also to anticipate and control naturally occurring phenomena. Finally, design is based on a corpus of accumulated knowledge, which is captured in design practice rather than scientific facts but is nevertheless very effective.

Combining these approaches is a major challenge. We are exploring an integrative approach that we call *generative theory*, which builds upon existing knowledge in order to create new categories of artefacts and explore their characteristics. Our goal is to produce prototypes, research methods and software tools that facilitate the design, development and evaluation of interactive systems [34].

4. Application Domains

4.1. Application Domains

INSITU works actively with users from various application domains in order to understand their specific needs. By studying similar problems in different domains, we can generalise our results and develop more general principles. Our current application domains include:

- Biological research, in cooperation with the Institut Pasteur (Paris), INRA (Institut National de la Recherce Agronomique, Evry) and other laboratories of the University Paris-Sud;
- Creative industries (music composition), in cooperation with IRCAM (Institut de Recherche et Coordination Acoustique-Musique, Paris);
- Domestic technologies, in cooperation with France Telecom and ENSCI (Ecole Nationale Supérieure de Création Industrielle, Paris);
- Office settings, in cooperation with Mandriva (Paris);
- Semantic Web data management, in cooperation with MIT (Massachussetts Institute of Technology, U.S.A.) and W3C (World Wide Web Consortium);
- Mobile devices for sound-mediated communication (inter-personal music player), in cooperation with Sony CSL (Computer Science Laboratory, Paris).

We have selected these domains to ensure that we explore and address diverse validation criteria, e.g. enhancing productivity versus increasing communication access, diverse user characteristics, e.g. professionals versus non-professionals, and diverse user environments, e.g., desktops at work versus home versus mobile settings.

5. Software

5.1. The Zoomable Visual Transformation Machine

Keywords: *Focus + Context*, *Graphical User Interface (GUI) Toolkit*, *Java*, *Structured Graphics Editors*, *Visual Programming Languages*, *Zoomable User Interface (ZUI)*.

Participants: Caroline Appert, Emmanuel Pietriga [correspondant].

Current Graphical User Interface toolkits such as Java/Swing are powerful, generic and portable, but cannot be used for certain application classes such as structured graphics editors, e.g., graph editors and development environments for visual programming languages. Programmers are required to use lower-level APIs such as Java2D which are more expressive but harder to use. The ZVTM is a Zoomable User Interface (ZUI) toolkit implemented in Java, aimed at promoting the development of the HCI aspects of such applications by making their implementation easier, while favoring the rapid integration of novel interaction techniques.

ZVTM provides application programmers with building blocks for implementing complex multiscale interface components that cannot be handled by traditional WIMP widgets. Featuring off-the-shelf visualization and navigation components that are easy to combine, ZVTM provides a simple yet powerful API and handles low-level operations such as multi-threading, clipping, repaint requests and animation management. The toolkit is based on the metaphor of *universes* that can be observed through smart movable/zoomable cameras. The graphical object model permits management of a large number of complex geometrical shapes. It emphasizes perceptual continuity via an advanced animation module that can animate virtually any on-screen modification. This ranges from camera movements and activation of distortion lenses to modification of the visual variables of graphical objects. Various temporal pacing functions are available to control the execution of these animations. Current development activities around the toolkit now focus on multiscale navigation techniques (focus+context, overview+detail) and high-quality, rich graphics based on advanced 2D rendering techniques.

Figure 1. ZVTM used in various applications

Initially developed by Xerox Research Centre Europe and the World Wide Web Consortium (W3C) team at MIT, ZVTM has been available as open-source software under the GNU Lesser General Public License (LGPL) since early 2002. It is used in both academic and industrial projects such as IsaViz (http://www.w3.org/2001/11/IsaViz/), W3C's visual browser/editor for RDF, Blast2GO (Figure 1 - left) (http://www.blast2go.org/), or ZGRViewer (http://zvtm.sourceforge.net/zgrviewer.html) for viewing large graphs generated by AT&T GraphViz[1] (Figure 1 - right). The development of the toolkit is now supported by INRIA. More information can be found at http://zvtm.sourceforge.net and [45].

5.2. The Núcleo toolkit

Keywords: *Multimedia*, *Rapid prototyping*, *Telecommunications*, *Toolkit*, *Video*.

Participant: Nicolas Roussel.

Derived from VideoSpace [48], Núcleo is a software toolkit designed to help HCI and CSCW researchers to explore new uses of images and image streams within interactive systems. It supports both rapid prototyping and incremental development and has been used to implement most of the video-based systems designed by INSITU, including a web-based mediaspace, the Well, VideoProbe, MirrorSpace (Figure 2) and PêlMêl.

Núcleo provides developers with a set of tools and a C++ class library that makes it easy to integrate image streams within documents and applications. For example, users may display image streams in HTML documents in place of static images. The library makes it easy to create a video link with only a few lines of code, and managing multiple sources and processing video is only slightly more complex. The source code compiles on Linux and Mac OS X and is freely available under the GNU Lesser General Public License (LGPL). For more information, see http://insitu.lri.fr/~roussel/projects/nucleo/

5.3. The Metisse window system

Keywords: *OpenGL*, *Window management*, *X Window*, *input/output redirection*, *window system*.

Participants: Olivier Chapuis [correspondant], Nicolas Roussel, Rémi Cardona.

Metisse [3] is a window system that facilitates the design, implementation and evaluation of innovative window management techniques. The system is based on a compositing approach, making a clear distinction between the rendering and the interactive compositing processes. The Metisse server is a modified X server that supports both input and output redirection. The default compositor is a combination of a slightly modified version of FVWM, a standard window manager, with an interactive viewer application called *FvwmCompositor*.

[1] http://www.graphviz.org

Figure 2. Sample Núcleo applications: a web-based mediaspace [50]; the Well [49]; VideoProbe [36] and MirrorSpace [46].

FvwmCompositor uses OpenGL to display windows, which offers a rich graphics model well adapted to the exploration of new window management techniques. Texture mapping, for example, makes it possible to transform the window shapes in real-time (Figure 3, left). Alpha blending makes it easy to create translucent objects and shadows. Scaling, rotation and translation can also be used to position windows in 2D$\frac{1}{2}$ or 3D (Figure 3, middle and right). Input redirection makes it still possible to interact with applications no matter the visual transformations applied to the windows. It also makes it possible to adapt, reconfigure or re-combine existing graphical interfaces [51].

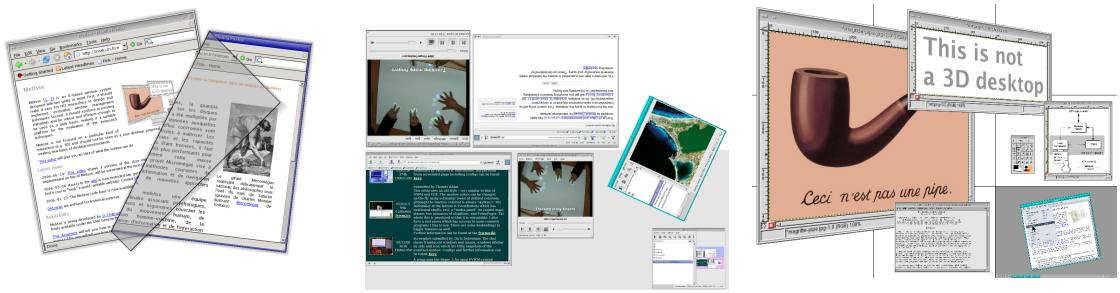

Figure 3. Sample window management techniques implemented with Metisse: extended paper metaphor (left), interactive table configuration that allows to duplicate and rotate windows (middle) and zoomable 3D desktop (right).

Metisse was used by Mekensleep to develop *Pok3D*[2], a multiplayer poker game. This application acts as a new compositor and uses the Metisse server to integrate external applications and 2D GTK+ interfaces into its OpenGL-based 3D scene. Metisse is similarly used by INRIA's ALCOVE project-team to integrate standard X Window applications into their Spin|3D [37] collaborative platform.

Implemented in C and C++, Metisse compiles and runs on Linux and Mac OS X and is freely available under the GNU General Public License (GPL). Distributed as a "Live CD" by Mandriva[3] in early 2007, it is now available as one of the standard desktop configurations in the *Mandriva Linux* distribution. It was publicly demonstrated in 2007 as part of the "Digital odyssey" exhibition[4] organised for INRIA's 40th anniversary.

[2] http://www.pok3d.com/
[3] http://www.mandriva.com/
[4] http://www.inria.fr/40ans/forum/expo.en.php

For more information, see http://insitu.lri.fr/metisse/

5.4. Wmtrace

Keywords: *Window management*, *activity log*.

Participant: Olivier Chapuis [correspondant].

Wmtrace [35] includes two tools that help us study an individual user's window management activity. The first tool runs in the background of an X Window session and continuously logs information about windows and how they are being manipulated. The second uses a VCR-like interface (Figure 4) to replay the resulting logs and analyze the entire session. This tool provides several ways to filter the logs and extract high-level information, including interactive move events and mouse speed. Both tools allow HCI researchers to perform qualitative and quantitative statistical analyses of window management activity.

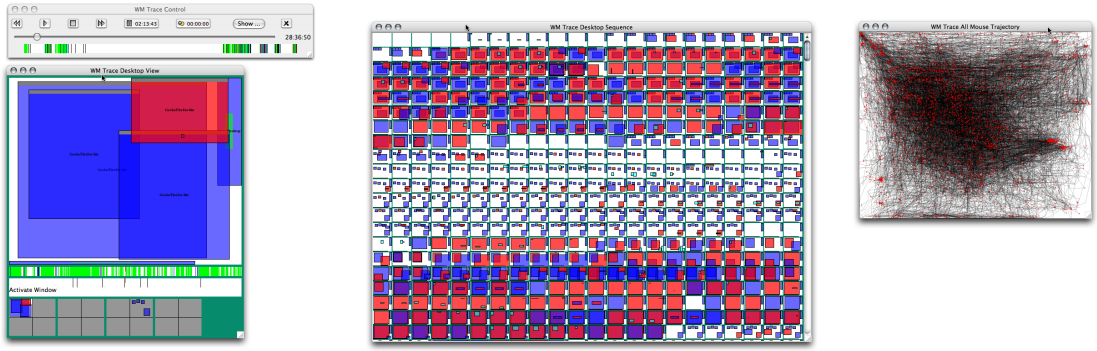

Figure 4. VCR-like interface, session overview and sample plots of mouse trajectories (black) and mouse clicks (red)

Wmtrace is freely available under the GNU General Public License (GPL) and the CeCILL licence. The log recorder compiles and runs on any X Window system (e.g. Linux or FreeBSD). The log viewer, written in Java, is more or less platform independent. Both software can be downloaded from http://insitu.lri.fr/~chapuis/software/wmtrace/.

5.5. The SwingStates Toolkit

Keywords: *Canvas*, *GUI*, *Java*, *State Machines*, *Swing*, *Toolkit*.

Participants: Caroline Appert [correspondant], Michel Beaudouin-Lafon.

SwingStates [13] is a library that adds state machines and a graphical canvas to the Java Swing user interface toolkit. It was motivated by the lack of widely disseminated toolkits that support advanced interaction techniques and the observation that HCI research toolkits are little used outside the lab. By extending the popular Java Swing toolkit rather than starting from scratch, the goal is to facilitate the dissemination and adoption of SwingStates by practitioners.

SwingStates uses *state machines* to specify interaction. It provides programmers with a natural syntax to specify state machines and reduces the potential for an explosion of the number of states by allowing multiple state machines to work together or separately. SwingStates can be used to add new interaction techniques to existing Swing widgets, e.g. to select buttons and checkboxes by crossing rather than clicking. It can also be used with the SwingStates canvas (see below) and to control high-level dialogues.

SwingStates also provides a powerful *canvas widget*. The canvas can contain any Java2D shape, including geometric shapes, images, text strings and even Swing widgets. Shapes can be manipulated individually or collectively, through *tags*. An intensive use of polymorphism allows to apply almost any command to a tag: the command is then applied to all objects with this tag. Tags are also used in conjunction with state machines, to specify transitions that occur only on objects with a given tag. For example, pie menus can be implemented by creating a canvas in the overlay layer of any Swing application (Figure 5).

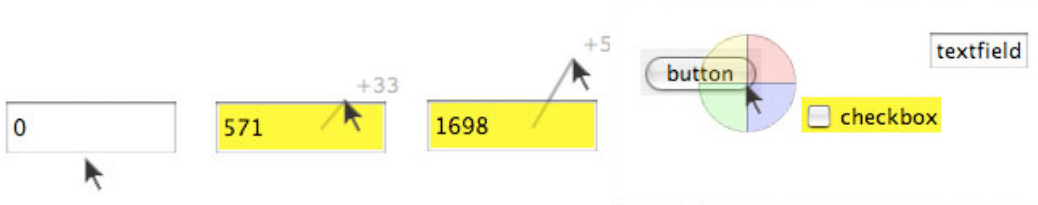

Figure 5. A numeric text field whose value can be set by a joystick-like interaction (left) and a semi-transparent menu to change the background color of Swing widgets (right)

SwingStates tightly integrates state machines, the Java language and the Swing toolkit to provide programmers with a natural and powerful extension to their natural programming environment. SwingStates is available at http://swingstates.sf.net under the GNU Lesser General Public License (LGPL).

5.6. JFresnel

Keywords: *Java*, *RDF*, *Semantic Web*.

Participants: The Nhan Luong, Emmanuel Pietriga [correspondant].

Fresnel [44] is a presentation vocabulary for Semantic Web data designed to be application- and representation-paradigm independent (see section 5.6). JFresnel is a Java library that implements the Fresnel specification for various RDF APIs, such as Jena and Sesame. JFresnel is a work-in-progress with contributions from HP Laboratories Palo Alto and MIT, freely available under the GNU Lesser General Public License (LGPL). JFresnel is used in the RNTL Platform WebContent (see section 7.2) and partly developed with funding from this contract.

More information about JFresnel can be found at http://jfresnel.gforge.inria.fr

6. New Results

6.1. Interaction Techniques

Keywords: *Fitts' law*, *Interaction Technique*, *Multi-scale Interfaces*.

Participants: Caroline Appert, Olivier Bau, Michel Beaudouin-Lafon [correspondant], Guillaume Besacier, Olivier Chapuis, Guillaume Faure, Stéphane Huot, Emmanuel Pietriga, Nicolas Roussel.

Today's graphical user interfaces (GUIs) are based on a small set of interaction techniques that rely heavily on two elementary actions: pointing to a target on the screen, e.g. an icon or button, and navigating to a non-visible part of the information space, e.g. by scrolling or zooming. In most cases, a user's performance with these techniques is roughly equivalent to pointing in the physical world.

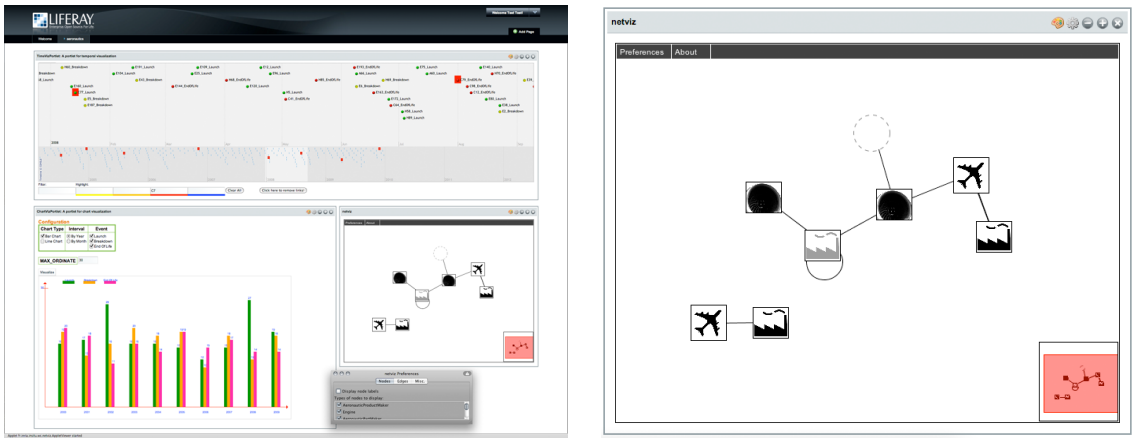

Figure 6. WebContent portlets developed with JFresnel - EADS/Airbus economic watch prototype application

Our goal is to take advantage of the computer to obtain a significant advantage when pointing in the information world. The major theoretical tool for studying pointing performance is Fitts' law [38] [5], which defines *movement time* as an affine function of the *index of difficulty* (ID), defined as the log of the ratio between target distance and target width. In other words, pointing performance strictly depends on the relative size of the target to the distance to the target.

We have studied two particular pointing situations. The first one corresponds to targets located along the edges of the screen. Placing widgets along the edges makes it easier for users to organize their workspace, i.e., their windows and icons, in the central area of the screen without occluding these widgets. However, from a motor perspective, it exhibits two opposite effects: (i) the theoretical index of difficulty is higher because distance is maximized between the cursor and these "edge widgets" but (ii) users can take advantage of the physical screen boundary to easily stop the movement. We have extensively studied this frequent pointing situation [14] to identify which factors affect pointing performance on screen edges and to quantify the gain due to the presence of an edge. Our empirical results show both practical implications for improving the current design of our desktop environments and theoretical refinements of the well-known "Fitts' pointing model".

The second pointing situation we have studied is the use of touchscreen-enabled mobile devices with a single hand, a common situation in mobility conditions. Since the palm and fingers are used to hold the device, the only finger available for pointing is the thumb. Unfortunately the thumb is not as dexterous as other fingers, it tends to occlude a large part of the display, and it usually cannot reach the whole display. We designed and evaluated TapTap and MagStick [21], two thumb interaction techniques for target acquisition on mobile devices with small touchscreens. They address these issues of screen accessibility, visual occlusion and pointing accuracy. A controlled experiment showed that TapTap and MagStick allow the selection of targets in all areas of the screen quickly and accurately. They had the lowest error rate of the five tested techniques and were faster than the other techniques except Direct Touch (which is however unusable in these conditions because of its high error rate).

We have also continued our work on pointing and navigation in *multi-scale interfaces*, where objects can be represented at different levels of scale in order to combine an overview of the document and details of its parts [5]. Focus + context techniques such as fisheye lenses provide in-place magnification of a region without requiring users to zoom the whole representation and consequently lose context. Their adoption is however hindered by usability problems mostly due to the nature of the transition between focus and context. Existing transitions are often based on a physical metaphor (magnifying glass, fisheye, rubber sheet), and are almost

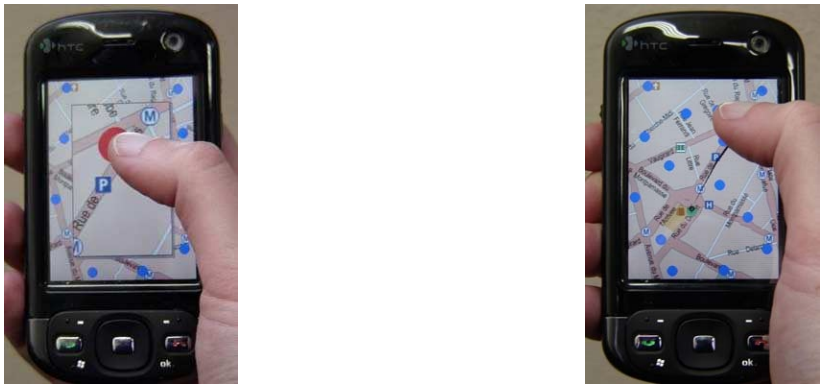

Figure 7. TapTap (left) and MagStick (right). Both techniques allow to point with the thumb on a mobile device.

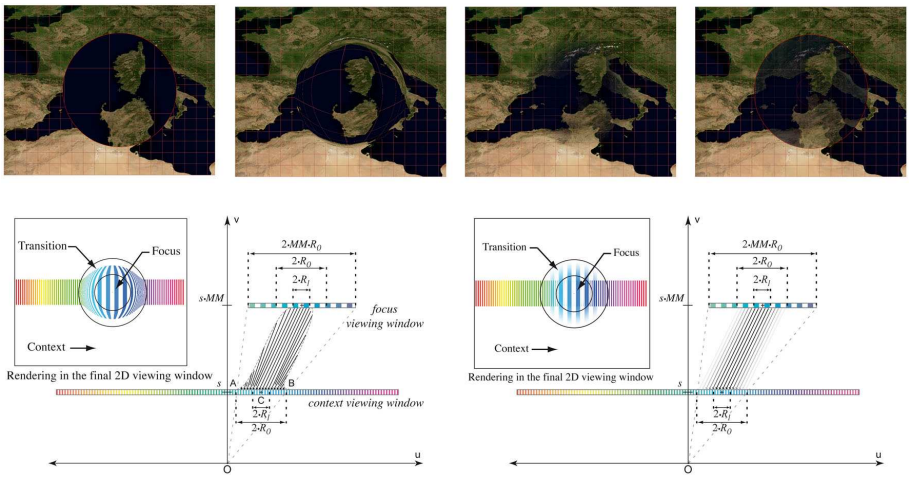

Figure 8. Sigma Lenses use multiple dimensions to transition between focus and context in multi-scale interfaces. From left to right: step transition, distorting space, using gradually increasing translucence, dynamic translucence.

always achieved through a single dimension: space. We investigated how other dimensions, namely time and translucence, could be used to achieve more efficient transitions [8]. We extended Carpendale's framework to accommodate these new dimensions and defined new lenses in that space, called *Sigma lenses* (Figure 8). We conducted a controlled experiment comparing Sigma lenses to existing lenses and showed that a particular lens, the *Speed-coupled flattening lens*, significantly outperforms all others. This lens couples the amount of distortion to the cursor speed: when the cursor moves quickly, the lens "flattens", which facilitates the coarse acquisition of the target area. When the cursor slows down or stops, the lens becomes fully active, facilitating precise pointing.

We have also started to explore the *learnability* of interaction techniques. A very efficient technique is not very useful if users cannot learn it quickly. This is especially true for gesture-based interfaces. While gestures can be very efficient, a gesture-based interface is not self-revealing: it is difficult to know which gestures are available. We developed OctoPocus [15], a dynamic guide that combines on-screen feedforward and feedback to help users learn, execute and remember gesture sets. OctoPocus can be applied to a wide range of single-stroke gestures and recognition algorithms and helps users progress smoothly from novice to expert performance. We conducted two experiments that show that OctoPocus is significantly faster than conventional help techniques and improves learning of arbitrary gestures. OctoPocus also outperforms a two-level, four-item Hierarchical Marking Menu.

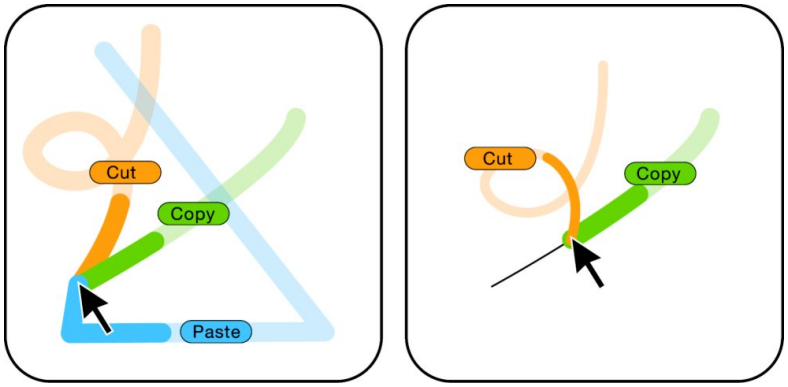

Figure 9. OctoPocus displays three gestures and commands. Tracing copy causes paste to disappear and cut to get thinner.

6.2. Tangible and Reflective Interfaces

Keywords: *contextual bookmarks*, *interactive paper*, *tangible interfaces*.

Participants: Evelyn Eastmond, Wendy Mackay [correspondant], Nicolas Masson, Aurélien Tabard, Theophanis Tsandilas.

Tangible interfaces integrate computing into physical objects, providing the user with the benefits of both. Although we work on a number of tangible interfaces, our focus has been on interactive paper, both as an input and an output medium. In the context of the ReActivity project, we have been studying the evolving work practices of biologists and the role that paper and electronic lab notebooks play in supporting their individual and collaborative activity. Aurélien Tabard, Wendy Mackay and Evelyn Eastmond developed PRISM [22], a hybrid laboratory notebook that lets biologists capture, visualize and interact with cross-linked streams of physical and electronic data. We conducted a nine-month field test of Prism with bioinformaticians at INRA and explored how to integrate additional activity streams, such as RSS feeds, and allow them share information

with each other. We highlighted two major implications for design: 1. Every biologist needs a *master notebook*, whether paper or electronic, to act as a central reference point for handling and organizing the diverse strands of personal activity. They need tools that help them manage activities that are spread across the physical and electronic world, or across different hardware and software platforms. 2. Redundancy should not be treated as a problem to solve but rather an important element that helps biologists to make sense of their data: redundant ideas are often the most important and indicate potential for new discoveries.

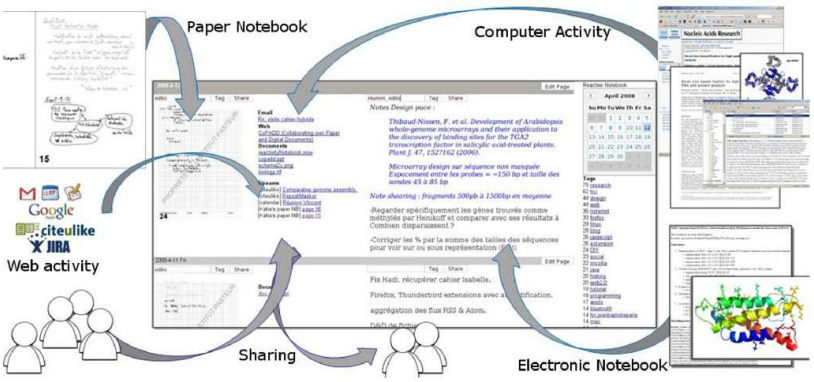

Figure 10. Prism captures both on-line and off-line user activity, including paper and electronic notes, email, web visits and RSS feeds.

Reflective interfaces capture traces of the user's activity and provide feedback or tools that allow the user to reflect upon their activity and, ideally, improve it in the future. We demonstrated that Prism can act as a flexible, extensible tool for supporting individual and collaborative reflection in creative scientific work. Shengqiong Yuan, Aurélien Tabard and Wendy Mackay also developed StreamLiner [23] a zoomable tool for visualizing activity data collected by Prism, including hand-written notes in the paper notebook, electronic notes in the electronic notebook, visits to related websites and relevant email, all presented in a multi-window interactive timeline. Users can tag information and see both detailed and summary views of their past activity.

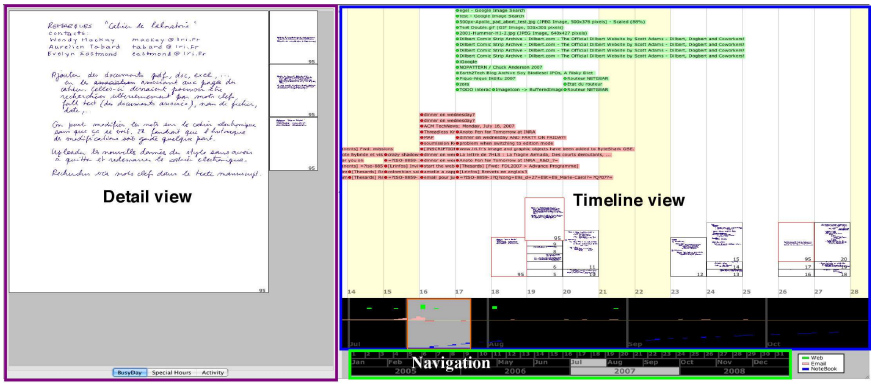

Figure 11. StreamLiner provides a multi-scale timeline view of activity data captured by the Prism hybrid laboratory notebook.

In addition to paper-based interfaces, we have also been exploring tangible interfaces for sound and music. Olivier Bau and Wendy Mackay collaborated with Atau Tanaka at Sony Research Lab in Paris and Sonia Nagala, from Stanford University. We combined two concepts, the musical instrument as metaphor and *technology probes* [40] to explore how tangible interfaces can exploit the semantic richness of sound. Using participatory design methods, we designed and tested the *A20* [16], a polyhedron-shaped, multi-channel audio input/output device. The software maps sound around the edges and responds to the user's gestural input, allowing both aural and haptic modes of interaction as well as direct manipulation of media content. The software is designed to be very flexible and can be adapted to a wide range of shapes. Our tests of the *A20*'s perceptual and interaction properties showed that users can successfully detect sound placement, movement and haptic effects on this device. Our participatory design workshops explored the possibilities of the *A20* as a generative tool for the design of an extended, collaborative personal music player. The *A20* helped users to enact scenarios of everyday mobile music player use and to generate new design ideas.

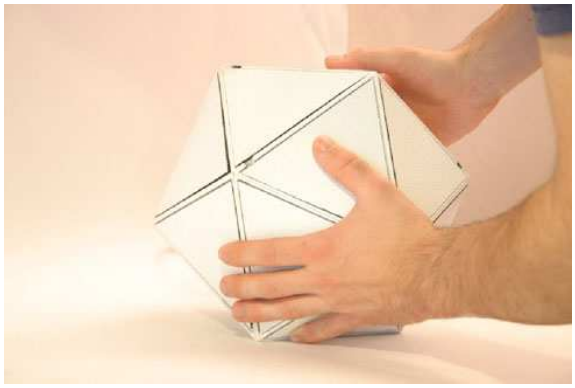

Figure 12. The A20 is a working prototype of a technology probe for exploring music and sound in a tangible interface.

6.3. Mediated Communication

Keywords: *Ambient communication*, *communication appliances*, *computer-mediated communication*, *group communication*, *multiscale communication*, *video-mediated communication*.

Participants: Sofiane Gueddana, Nicolas Roussel [correspondant], Wendy Mackay [correspondant], Danielle Lottridge, Nicolas Masson.

The communication infrastructure around us is a rich but fragmented environment made of separated services corresponding to different levels of engagement. The multiscale approach to communication [47] proposes instead to create systems that support a variable degree of engagement and smooth transitions between degrees. After designing and implementing such a system, Pêle-Mêle [39], we conducted a longitudinal study of its use and a controlled laboratory experiment in order to evaluate it [30]. The longitudinal study illustrates the importance of providing gradual attention management mechanisms to support transitions between background and foreground communications. The laboratory experiment shows the influence of peripheral update rate on subjects' attention in a dual-task situation, combining snapshot-based peripheral awareness with a central text correcting task. Overall, our results suggest that control over information pace and salience can help users of communication systems adjust both their local distraction and remote attractiveness.

We have explored mediated communication at different levels, in a variety of separate research projects. The least intrusive simply shares activity levels between remote participants. For example, Marker Clock [12] captures activity levels, both local and remote, and display it on a clock face. Our studies with elderly users showed that they can easily determine if the remote person is there use it to identify patterns in their daily lives, such as noting that the grandchildren have come home from school. The next level of activity allows both random capture of images and intentional message sharing. For example, VideoProbe [36] takes a snapshot when no movement has been detected for 3 seconds. This results in spontaneous shots but users also quickly learn that they can send particular images simply by freezing for three seconds in front of the camera. The most engaged level of sharing involves live video of both participants, as in media spaces [43] or video chat. For example, MirrorSpace [46] allows participants to see live video of themselves and the remote person, while controlling privacy by adding blur when participants are far from the screen.

The ICI-TV project, sponsored by Digiteo, is a practical application of multi-scale communication, providing three progressively more focused levels of engagement in a single interface. Working with Praesto, a startup that provides services to the elderly, we create dedicated communication channels, via a settop box on a television, that connect the elderly with remote family members. The research challenge is to integrate these different levels of engagement in an extremely intuitive and easy to use interface.

6.4. Research Methods

Keywords: *Exploratory experiment design*, *exaptation*.

Participants: Caroline Appert, Michel Beaudouin-Lafon, Olivier Chapuis, Danielle Lottridge, Wendy Mackay [correspondant], Yann Riche.

The **Research Methods** theme includes four sub-themes: *Benchmarking, Context integration, Participatory Design* and *Multi-disciplinary design*.

We have been exploring new methods to support participatory design, including techniques for sketching design spaces [18] and Generative Walkthroughs. The design space work provides specific techniques for creating design spaces that help developers generate new ideas and analyze them. Generative walkthroughs, which we have taught in courses at both the University of Toronto and the University of Paris-Sud, focus on the *redesign* phase, and provide a structured method for incorporating socio-technical principles to improve the human side of the design. These two methods are part of a larger approach that we call *Generative Deconstruction* and is the basis for the revised course on *Conception et Evaluation des Interfaces* (design and evaluation of interfaces).

Over the summer, an intern worked on a web-based version of Touchstone [41], an experiment design platform that provides a strong empirical foundation for comparing and evaluating interaction and visualization techniques. We also placed the *UIST 2.0 20th Anniversary Celebration* archives online, which includes 20 years of archived proceedings and videos, video interviews with seven UIST pioneers, a video of the ZUIST zoomable interface for browsing the UIST archives, a timeline illustrating the history of interaction techniques, a social network graph of UIST authors, and the results of the two *interactive thread* [42] exercises, which identified 150 of most influential UIST research over the past 20 years and several hundred novel design ideas for future technologies, inspired by images collected from the past 10 years of UIST.

6.5. User interface toolkits

Keywords: *Adaptable user interfaces*, *Interaction Technique*, *Multi-scale Interfaces*, *Window System*, *Window management*, *ZUI*.

Participants: Caroline Appert, Michel Beaudouin-Lafon, Olivier Chapuis, Stéphane Huot, Wendy Mackay, Emmanuel Pietriga [correspondant], Nicolas Roussel.

The **Engineering of Interactive Systems** research theme involves the creation and deployment of development tools, in particular user interface toolkits.

Zoomable User Interfaces (ZUIs) are an Information Visualization technique that makes it possible to navigate in both space and scale, providing smooth zooming capabilities in large and complex multi-scale virtual worlds. Our work on ZUI toolkits has continued with a new release of our ZVTM toolkit that includes the Sigma-lenses framework that we presented at the CHI conference this year [19]. We have also continued to develop our SwingStates toolkit [13] to better integrate non-standard input devices and have explored the integration of SwingStates' state machines with ZVTM.

The new iStar project, funded by ANR, started this year. The goal of the project is to develop a powerful "interaction kernel" that can be used across programming languages and platforms to create interactive applications. The underlying programming model is based on a combination of communicating processes and reactive behaviors. During the first year of the project, we have developed usage scenarios, explored the state of the art in a wide range of topics, from operating systems to programming languages, and started the specification of the model.

7. Contracts and Grants with Industry

7.1. Experimental communication systems for the home environment

Keywords: *Computer-mediated communication*, *domestic settings*.

Participants: Sofiane Gueddana, Nicolas Roussel [correspondant].

Research project funded by France Télécom R&D, 36 months (2005-2008). The goal of this project is to design innovative communication systems for the home environment. In this context, we are particularly interested in supporting smooth transitions between alternative forms of communication involving different media combination.

7.2. WebContent: the Semantic Web Platform

Keywords: *Peer-to-peer*, *RDF*, *Semantic Web*, *Visualization Components*, *Web Services*, *XML*.

Participants: Gennady Legostaev, The Nhan Luong, Emmanuel Pietriga [correspondant].

Research project funded by national network on software technology (RNTL), 36 months (2006-2009). Partners: INRIA/Gemo, EADS, CEA, INRA, Thalès, LRI/IASI, LIP6, INRIA/Mostrare, and more.

The WebContent project is creating a software platform to accommodate the tools necessary to efficiently exploit and extend the future of the Internet : the Semantic Web. Its objective is to produce a flexible and generic platform for content management and to integrate Semantic Web technologies in order to show their effectiveness on real applications with strong economic or societal stakes. INSITU works on the design and implementation of the platform's Web-based, advanced visualization components, including networks, timelines and charts using JFresnel (section 5.6), ZVTM (section 5.1) and ZUIST (section 6.5).

7.3. iStar

Keywords: *Toolkits*.

Participants: Michel Beaudouin-Lafon [correspondant], Olivier Chapuis, Stéphane Huot, Wendy Mackay.

Research project funded by ANR, 36 months (2008-2011). Partners: IntuiLab, ENAC, INSITU, Anyware Technologies.

The goal of the iStar project is to create a new generation of programming tools for interaction systems, which support interoperability across components developed and deployed on different platforms and in different languages. The project will create an "interaction kernel", implemented as a virtual machine, a server or a library, that will be used to develop a number of demonstrators. INSITU is in charge of creating two such demonstrators, one implementing instrumental interaction and the other multi-surface interaction. The underlying programming model will be based on a reactive model of communicating processes organized as a tree of components. Other applications include post-WIMP interfaces and Web 2.0 applications.

7.4. WILD

Keywords: *Interaction*, *Multi-surface interaction*, *Visualization*.

Participants: Michel Beaudouin-Lafon, Olivier Chapuis, Emilien Ghomi, Stéphane Huot, Wendy Mackay, Mathieu Nancel, Emmanuel Pietriga [correspondant].

Research project funded by Digiteo, 36 months (2008-2011). Partners: INSITU, INRIA/AVIZ, LIMSI.

The goal of this project is to create the world's largest high-resolution interactive wall (20480 x 7680 pixels or 131 million pixels) coupled with one or two interactive tables and other interactive devices, and to develop interaction techniques to support the interactive and collaborative visualization of very large data sets. Nine research laboratories on or near the Orsay campus will be collaborating with us on the issues of how to visualize and interact with their data. These labs cover a wide range of sciences: Astrophysics, Physics, Chemistry, Biology, Mechanics, Neuroimagery, and Applied Mathematics. Using additional funding from ReActivity and LRI, we have specified and ordered the equipment, which will be installed in a dedicated room in early 2009.

7.5. REACTIVITY

Keywords: *Capture*, *Interaction*, *Temporal Data*, *Visualization*.

Participants: Michel Beaudouin-Lafon, Stéphane Huot, Catherine Letondal, Wendy Mackay [correspondant], Nicolas Masson, Mathieu Nancel, Emmanuel Pietriga, Fanis Tsandilas, Aurélien Tabard, Shengqiong Yuan.

Research project funded by INRIA-Microsoft, 36 months (2008-2011). Partners: INSITU, INRIA/AVIZ, Microsoft Research VIBE.

The goal of this project is to help researchers capture, visualize and interact with their own and their colleagues activities, over time. We are interested in increasing researchers awareness of their activities, so as to improve not only productivity, but also their creativity and understanding. We use a participatory design approach with biologists and bioinformaticians at the Institut Pasteur, INRA, INSERM and at the University of Paris-Sud. We are developing a hybrid laboratory notebook, called Prism, which combines paper and electronic notebooks with other streams of activity. We are also exploring advanced forms of interaction with very large quantities of heterogeneous data, in conjunction with the WILD project (above).

8. Other Grants and Activities

8.1. National actions

- *SiMu with Sony CSL, Paris*. Members of INSITU involved: Olivier Bau, Wendy Mackay.
- *Paperoles project with IRCAM, Paris*. Members of INSITU involved: Catherine Letondal, Wendy Mackay, Aurélien Tabard, Theophanis Tsandilas.
- *Prism Notebook with Institut Pasteur and INRA, France*. Members of INSITU involved: Catherine Letondal, Wendy Mackay, Aurélien Tabard, Shengqiong Yuan.

8.2. International actions

- *EDGE: Evaluation methods, Design Guidelines and Environments for Virtual Reality and Information Visualization Techniques*. This project is a French-Brazilian collaboration supported by INRIA and CNPq (36 months, 2005-2008). The partners are MErLIn, INSITU and AVIZ (INRIA), the CS Institute of the Federal University of Rio Grande do Sul and the CS Department of PUC-Rio University. Members of INSITU involved: Nicolas Roussel (coordinator of the French side).

- *MUSE joint lab with University of Toronto*. Wendy Mackay and Michel Beaudoin-Lafon traveled to the University of Toronto and gave a course with Danielle Lottridge. Danielle Lottridge came to Paris and worked with Wendy Mackay on a poster for CSCW'08 [18] and they are preparing two new papers: *Generative Walkthroughs* and *Probing Technology Probes*. Danielle Lottridge, Nicolas Masson and Wendy Mackay also submitted a paper on MissU, a technology for remote couples, which will be presented at CHI'09. INSITU hired Fanis Tsandilas, Ph.D. University of Toronto, as a post-doc, working with musicians at IRCAM on an interactive paper project. Fanis Tsandilas, Catherine Letondal and Wendy Mackay collaborated on a project called Musink, which provides musicians with progressive levels of interpretation of their gestures on paper, which will be presented at CHI'09.

  Members of INSITU involved: Michel Beaudouin-Lafon, Danielle Lottridge, Wendy Mackay Nicolas Masson and Fanis Tsandilas.

9. Dissemination

9.1. Keynote addresses and Invited Lectures

- Caroline Appert: "How to model, evaluate and generate interaction techniques?", 1st Digiteo Annual Forum, October 2008
- Wendy Mackay: "Participatory design within and across disciplines", Keynote Address, The Sixth International Conference on Creating, Connecting and Collaborating through Computing (C5'08), Poitiers, France, January 2008
- Wendy Mackay: "Participatory design: Designing for and with users", Keynote Address, SAKAI conference, Paris, July 2008
- Wendy Mackay: "Faire un logiciel simple ... C'est difficile !", Invited talk, Unithé ou Café ?, Saclay, March, 2008.
- Wendy Mackay: "Intelligence ambiante : De la perspective de l'utilisateur", Invited Address, International Contactless Technologies Forum, ICTC'08, Lille, June, 2008.
- Wendy Mackay: VIA Valorisation of Innovation, Round Table, February 2008

9.2. Journal editorial board

- Transactions on Computer Human Interaction (ACM): Wendy Mackay
- International Journal of Human-Computer Study (IJHCS), Elsevier: Michel Beaudouin-Lafon
- Journal of Computer Supported Cooperative Work (JCSCW), Springer: Michel Beaudouin-Lafon
- Communications of the ACM: Wendy Mackay
- Journal d'Interaction Personne-Système (AFIHM): Nicolas Roussel (co-editor in chief)

9.3. Journal reviewing

- Journal of the American Society for Information Science and Technology (Wiley): Emmanuel Pietriga (reviewer)
- Software: Practice and Experience (Wiley): Caroline Appert (reviewer), Michel Beaudouin-Lafon (reviewer)
- Transactions on Visualization and Computer Graphics (IEEE): Caroline Appert (reviewer)
- Journal of the Brazilian Computer Society (SBC): Nicolas Roussel (reviewer)
- International Journal of Human-Computer Studies (IJHCS): Wendy Mackay (reviewer)

9.4. Conference organization

- ACM Symposium on Software Visualization (SoftVis) 2008: Emmanuel Pietriga (Program Committee member)
- ACM Symposium on User Interface Software and Technology (UIST) 2008: Michel Beaudouin-Lafon (Program Chair), Caroline Appert (Program Committee member), Wendy Mackay (Program Committee member)
- ACM Conference on Human Factors in Computing (CHI) 2009: Wendy Mackay (Area Chair), Michel Beaudouin-Lafon (Program Committee Member), Catherine Letondal (Program Committee Member)
- IEEE European Conference on Artificial Intelligence (ECAI) Wendy Mackay (Area Chair)
- IEEE Symposium on Visual Languages and Human-Centric Computing (VL/HCC) 2008: Emmanuel Pietriga (Program Committee member and Publicity chair)
- ACM conference on Computer Supported Cooperative Work (CSCW) 2008: Nicolas Roussel (Program Committee member and Interactive Posters co-chair)
- Simpósio de Fatores Humanos em Sistemas Computacionais de la Sociedade Brasileira de Computação (IHC) 2008: Nicolas Roussel (Program Committee member)

9.5. Conference reviewing

- ACM CHI 2008: Caroline Appert, Michel Beaudouin-Lafon, Olivier Chapuis, Stéphane Huot, Wendy Mackay, Mathieu Nancel, Emmanuel Pietriga, Nicolas Roussel, Theophanis Tsandilas
- ACM UIST 2008: Olivier Chapuis, Stéphane Huot, Mathieu Nancel, Emmanuel Pietriga, Nicolas Roussel
- ACM SoftVis 2008: Emmanuel Pietriga
- IEEE Symposium on Visual Languages and Human-Centric Computing 2008: Emmanuel Pietriga
- Advanced Visual Interfaces (AVI) 2008: Nicolas Roussel
- Conférence Francophone d'Interaction Homme-Machine (IHM) 2008: Olivier Chapuis, Emmanuel Pietriga, Nicolas Roussel
- Simpósio de Fatores Humanos em Sistemas Computacionais de la Sociedade Brasileira de Computação (IHC) 2008: Nicolas Roussel

9.6. Scientific associations

- AFIHM (French speaking HCI asssociation): Stéphane Huot (Executive Committee member, 2005-2008), Michel Beaudouin-Lafon member of the Scientific Board (CPPMS)
- ACM: Michel Beaudouin-Lafon member at large of the ACM Council and member of the ACM Publications Board

9.7. Evaluation committees and invited expertise

- European Commission's 7th Framework Programme: FP7 ICT Call 3, Strategic Objective 4.2: Intelligent Content and Semantics (50 Meuros): Emmanuel Pietriga
- European Research Council (ERC), Advanced Grants evaluation panel: Michel Beaudouin-Lafon
- Comité pour l'attribution du prix de thèse Gilles Kahn 2008 (décerné par l'association SPECIF et patronné par l'académie des sciences): Caroline Appert
- ANR "contenus et interactions" reviewer: Nicolas Roussel
- ANR VERSO "Réseaux du Futur et Services", jury member: Wendy Mackay

- ANR Jeunes Chercheurs, reviewer: Wendy Mackay
- Université des Sciences et Technologies de Lille (Lille 1) hiring committee, Commission de Spécialité et d'Enseignement 27ème section (computer science): Nicolas Roussel
- Univ. Paris-Sud hiring committee, Commission de Spécialité et d'Enseignement 27ème section (computer science): Michel Beaudouin-Lafon
- TELECOM ParisTech Research Committee member: Michel Beaudouin-Lafon
- Commission d'evaluation, INRIA, elected representative: Wendy Mackay
- Comité d'evaluation BQR Financier, Univ. Paris-Sud, jury member: Wendy Mackay
- Comité d'evaluation BQR Emploi, Univ. Paris-Sud, jury member: Wendy Mackay
- Comité d'evaluation ANR Preciput, Univ. Paris-Sud, jury member: Wendy Mackay
- Group de Travail "Evaluation des activités de chercheurs", INRIA, member: Wendy Mackay
- Group de Travail "Mobilité", INRIA, organizer: Wendy Mackay
- European Science Foundation Exploratory Workshop, proposal EW08-135, expert reviewer: W. Mackay
- EPSRC Large Grants, Avoidance, recovery and coordinating activities (ARC): Minimising slips and developing resilient behaviour in individuals and small teams, expert reviewer: Wendy Mackay
- Comité ad-hoc : evaluations d'HDR, LRI, Univ. Paris-Sud, member: Wendy Mackay

9.8. PhD defenses

- Jérôme Lard (Université Paris-Sud): Michel Beaudouin-Lafon, adviser
- Benoît Martin (Université de Metz): Michel Beaudouin-Lafon, reviewer (Habilitation)
- Yann Riche (Université Paris-Sud): Wendy Mackay, adviser
- Frédéric Lemoine (Université Paris-Sud): Wendy Mackay, president of the jury
- Scott Sherwood (Glasgow University): Wendy Mackay, external examiner
- Danielle Lottridge (University of Toronto): Wendy Mackay, thesis proposal jury member

10. Bibliography

Major publications by the team in recent years

[1] M. BEAUDOUIN-LAFON, W. MACKAY. *Prototyping Development and Tools*, in "Human Computer Interaction Handbook", JULIE A. JACKO, A. SEARS (editors), Lawrence Erlbaum Associates, 2002, p. 1006-1031, http://www.isrc.umbc.edu/HCIHandbook/.

[2] R. BLANCH, Y. GUIARD, M. BEAUDOUIN-LAFON. *Semantic Pointing: Improving Target Acquisition with Control-Display Ratio Adaptation*, in "Proceedings of ACM Conference on Human Factors in Computing Systems (CHI2004)", CHI Letters, vol. 6(1), ACM Press, April 2004, p. 519–526, http://doi.acm.org/10.1145/985692.985758.

[3] O. CHAPUIS, N. ROUSSEL. *Metisse is not a 3D desktop!*, in "Proceedings of UIST'05, the 18th ACM Symposium on User Interface Software and Technology", ACM Press, October 2005, p. 13-22, http://doi.acm.org/10.1145/1095034.1095038.

[4] O. CHAPUIS, N. ROUSSEL. *Copy-and-Paste Between Overlapping Windows*, in "Proceedings of ACM CHI 2007 Conference on Human Factors and Computing Systems", ACM Press, April 2007, p. 201–210, http://doi.acm.org/10.1145/1240624.1240657.

[5] Y. GUIARD, M. BEAUDOUIN-LAFON. *Target acquisition in multiscale electronic worlds*, in "International Journal of Human Computer Studies (IJHCS), Special Issue "Fitts' law fifty years later: Applications and contributions from human-computer interaction"", vol. 61, n° 6, December 2004, p. 875-905, http://dx.doi.org/10.1016/j.ijhcs.2004.09.005.

[6] H. HUTCHINSON, W. MACKAY, B. WESTERLUND, B. BEDERSON, A. DRUIN, C. PLAISANT, M. BEAUDOUIN-LAFON, S. CONVERSY, H. EVANS, H. HANSEN, N. ROUSSEL, B. EIDERBÄCK, S. LINDQUIST, Y. SUNDBLAD. *Technology Probes: Inspiring Design for and with Families*, in "Proceedings of ACM CHI 2003 Conference on Human Factors in Computing Systems", CHI Letters, vol. 5(1), ACM Press, 2003, p. 17-24, http://doi.acm.org/10.1145/642611.642616.

[7] W. MACKAY, C. APPERT, M. BEAUDOUIN-LAFON, O. CHAPUIS, Y. DU, J.-D. FEKETE, Y. GUIARD. *TouchStone: Exploratory Design of Experiments*, in "Proceedings of ACM CHI 2007 Conference on Human Factors and Computing Systems", ACM Press, April 2007, p. 1425-1434, http://doi.acm.org/10.1145/1240624.1240840.

[8] E. PIETRIGA, C. APPERT. *Sigma Lenses: Focus-Context Transitions Combining Space, Time and Translucence*, in "Proceedings of ACM CHI 2008 Conference on Human Factors and Computing Systems", ACM Press, April 2008, p. 1343-1352, http://doi.acm.org/10.1145/1357054.1357264.

[9] E. PIETRIGA, C. BIZER, D. KARGER, R. LEE. *Fresnel - A Browser-Independent Presentation Vocabulary for RDF*, in "Lecture Notes in Computer Science (LNCS 4273), Proceedings of the 5th International Semantic Web Conference (ISWC 2006)", Springer, November 2006, p. 158-171, http://dx.doi.org/10.1007/11926078_12.

[10] A. TABARD, W. MACKAY, N. ROUSSEL, C. LETONDAL. *PageLinker: Integrating Contextual Bookmarks into a Browser*, in "Proceedings of ACM CHI 2007 Conference on Human Factors and Computing Systems", ACM Press, April 2007, p. 337–346, http://doi.acm.org/10.1145/1240624.1240680.

Year Publications

Doctoral Dissertations and Habilitation Theses

[11] J. LARD. *Portabilité, réemploi et transposition des modèles d'interaction homme-machine: implications de la gestion des contextes humains pour les architectures logicielles*, Thèse de Doctorat, Université Paris-Sud, Orsay, France, Octobre 2008.

[12] Y. RICHE. *Designing communication appliances to support aging in place*, 311 pages, Thèse de Doctorat, Université Paris-Sud, Orsay, France, Septembre 2008, http://www.lri.fr/~yann/phd/yann-riche-thesis.pdf.

Articles in International Peer-Reviewed Journal

[13] C. APPERT, M. BEAUDOUIN-LAFON. *SwingStates: Adding State Machines to Java and the Swing Toolkit*, in "Software: Practice and Experience", vol. 38, n° 11, 2008, p. 1149 - 1182, http://dx.doi.org/10.1002/spe.867.

International Peer-Reviewed Conference/Proceedings

[14] C. APPERT, O. CHAPUIS, M. BEAUDOUIN-LAFON. *Evaluation of Pointing Performance on Screen Edges*, in "Proceedings of AVI'08, the 9th International Working Conference on Advanced Visual Interfaces", ACM Press, May 2008, p. 119-126, http://doi.acm.org/10.1145/1385569.1385590.

[15] O. BAU, W. MACKAY. *OctoPocus: A Dynamic Guide for Learning Gesture-Based Command Sets*, in "Proceedings of ACM Symposium on User Interface Software and Technology (UIST 2008), Monterey, CA", ACM, October 2008, p. 37-46, http://doi.acm.org/10.1145/1449715.1449724.

[16] O. BAU, A. TANAKA, W. MACKAY. *The A20: Musical Metaphors for Interface Design*, in "Proceedings of International Conference on New Interfaces for Musical Expression (NIME 08), Genova, Italy", June 2008, http://insitu.lri.fr/~bau/files/nime2008.pdf.

[17] N. ELMQUIST, N. HENRY, Y. RICHE, JEAN-DANIEL. FEKETE. *Melange: Space Folding for Multi-Focus Interaction*, in "Proceedings of the 2008 ACM SIGCHI Conference on Human Factors in Computing Systems", ACM Press, 2008, http://doi.acm.org/10.1145/1357054.1357263.

[18] D. LOTTRIDGE, W. MACKAY. *Sketching Design Space*, in "Extended Proceedings of ACM CSCW'08 Conference on Computer-Supported Cooperative Work", 2 pages, ACM, November 2008.

[19] E. PIETRIGA, C. APPERT. *Sigma Lenses: Focus-Context Transitions Combining Space, Time and Translucence*, in "Proceedings of ACM CHI 2008 Conference on Human Factors and Computing Systems", ACM Press, April 2008, p. 1343-1352, http://doi.acm.org/10.1145/1357054.1357264.

[20] Y. RICHE, M. SIMPSON, S. VILLER. *Zebra : Exploring participatory design engagement in fieldwork*, in "Proceedings of the 7th international ACM SIGCHI conference on Designing Interactive Systems", ACM Press, 2008, http://doi.acm.org/10.1145/1394445.1394451.

[21] A. ROUDAUT, S. HUOT, E. LECOLINET. *TapTap and MagStick: Improving One-Handed Target Acquisition on Small Touch-screens*, in "Proceedings of AVI'08, the 9th International Working Conference on Advanced Visual Interfaces", ACM Press, May 2008, p. 146-153, http://doi.acm.org/10.1145/1385569.1385594.

[22] A. TABARD, W. MACKAY, E. EASTMOND. *From Individual to Collaborative: The Evolution of Prism, a Hybrid Laboratory Notebook*, in "Proceedings of ACM CSCW'08 Conference on Computer-Supported Cooperative Work, San Diego, CA", ACM, November 2008, p. 569-578, http://doi.acm.org/10.1145/1460563.1460653.

[23] S. YUAN, A. TABARD, W. MACKAY. *Streamliner: A General-Purpose Interactive Course-Visualization Tool*, in "Proceedings of KAM'08, International Symposium on Knowledge Acquisition and Modeling", 6 pages, IEEE Press, 2008.

National Peer-Reviewed Conference/Proceedings

[24] A. TABARD. *Interfaces réflexives, faciliter la co-adaptation avec des historiques d'interaction*, in "Actes des 4èmes Rencontres Jeunes Chercheurs en Interaction Homme-Machine", 4 pages, AFIHM, Mai 2008, http://www.lri.fr/~tabard/publications/rjcihm-2008-tabard2.pdf.

Scientific Books (or Scientific Book chapters)

[25] M. BEAUDOUIN-LAFON. *Interaction is the Future of Computing*, in "HCI Remixed, Reflections on Works That Have Influenced the HCI Community", T. ERICKSON, D. MCDONALD (editors), MIT Press, 2008, p. 263-266, http://www.visi.com/~snowfall/HCIremixed.html.

[26] W. MACKAY. *From Gaia to HCI: On Multi-disciplinary Design and Co-adaptation*, in "HCI Remixed, Reflections on Works That Have Influenced the HCI Community", T. ERICKSON, D. MCDONALD (editors), MIT Press, 2008, p. 247-251, http://www.visi.com/~snowfall/HCIremixed.html.

Books or Proceedings Editing

[27] S. COUSINS, M. BEAUDOUIN-LAFON (editors). *UIST '08: Proceedings of the 21st annual ACM symposium on User interface software and technology*, ACM, October 2008.

Research Reports

[28] O. BAU, U. PETREVSKI, W. MACKAY. *BubbleWrap: Dynamic Passive Feedback for Displaying Ambient Information*, 4 pages, Technical report, n^{o} 1507, LRI, Université Paris-Sud, France, December 2008, http://www.lri.fr/~bibli/Rapports-internes/2008/RR1506.pdf.

[29] O. CHAPUIS, P. DRAGICEVIC. *Small Targets: Why are they So Difficult to Acquire?*, 10 pages, Technical report, n^{o} 1508, LRI, Université Paris-Sud, France, December 2008, http://insitu.lri.fr/~chapuis/publications/lri-rr-1508-smalltargets.pdf.

[30] S. GUEDDANA, N. ROUSSEL. *A study of multiscale communication and the influence of information pace on peripheral attention*, 10 pages, Rapport de Recherche, n^{o} 1507, LRI, Université Paris-Sud, France, December 2008, http://insitu.lri.fr/~roussel/publications/lri-1507-pelemele.pdf.

[31] S. GUEDDANA, N. ROUSSEL. *Designing new communication systems for the home*, 3 pages, Position paper, InteractiveSpaces workshop on Imagining Domestic Interiors, Århus (Denmark), January 2008, http://www.interactivespaces.net/imagine/.

[32] S. HUOT, M. NANCEL, M. BEAUDOUIN-LAFON. *PushMenu: Extending Marking Menus for Pressure-Enabled Input Devices*, 4 pages, Research Report, n^{o} 1502, LRI, Université Paris-Sud, France, 2008, http://www.lri.fr/~bibli/Rapports-internes/2008/RR1502.pdf.

[33] M. NANCEL, M. BEAUDOUIN-LAFON. *Extending Marking Menus with Integral Dimensions : Application to the Dartboard Menu*, 10 pages, Research Report, n^{o} 1503, LRI, Université Paris-Sud, France, 2008, http://www.lri.fr/~bibli/Rapports-internes/2008/RR1503.pdf.

References in notes

[34] M. BEAUDOUIN-LAFON. *Designing interaction, not interfaces*, in "Proc. Conference on Advanced Visual Interfaces, AVI 2004, Gallipoli (Italy)", Invited keynote address, ACM Press, May 2004, p. 15–22, http://doi.acm.org/10.1145/989863.989865.

[35] O. CHAPUIS. *Gestion des fenêtres : enregistrement et visualisation de l'interaction*, in "Proceedings of IHM 2005, 17ème conférence francophone sur l'Interaction Homme-Machine", ACM Press, International Conference Proceedings Series, Septembre 2005, p. 255-258, http://doi.acm.org/10.1145/1148550.1148590.

[36] S. CONVERSY, N. ROUSSEL, H. HANSEN, H. EVANS, M. BEAUDOUIN-LAFON, W. MACKAY. *Partager les images de la vie quotidienne et familiale avec videoProbe*, in "Proceedings of IHM 2003, 15ème conférence sur l'Interaction Homme-Machine", ACM Press, International Conference Proceedings Series, Novembre 2003, p. 228-231, http://doi.acm.org/10.1145/1063669.1063704.

[37] C. DUMAS, S. DEGRANDE, C. CHAILLOU, G. SAUGIS, P. PLÉNACOSTE, M. VIAUD. *SPIN: A 3-D Interface for cooperative work*, in "Virtual Reality Journal", 1999, p. 15-25, http://dx.doi.org/10.1007/BF01434991.

[38] P. FITTS. *The Information Capacity of the Human Motor System in Controlling the Amplitude of Movement*, in "Journal of Experimental Psychology", vol. 47, 1954, p. 381–391.

[39] S. GUEDDANA, N. ROUSSEL. *Pêle-Mêle, a video communication system supporting a variable degree of engagement*, in "Proceedings of ACM CSCW'06 Conference on Computer-Supported Cooperative Work", ACM Press, November 2006, p. 423-426, http://doi.acm.org/10.1145/1180875.1180938.

[40] H. HUTCHINSON, W. MACKAY, B. WESTERLUND, B. BEDERSON, A. DRUIN, C. PLAISANT, M. BEAUDOUIN-LAFON, S. CONVERSY, H. EVANS, H. HANSEN, N. ROUSSEL, B. EIDERBÄCK, S. LINDQUIST, Y. SUNDBLAD. *Technology Probes: Inspiring Design for and with Families*, in "Proceedings of ACM CHI 2003 Conference on Human Factors in Computing Systems", CHI Letters, vol. 5(1), ACM Press, April 2003, p. 17-24, http://doi.acm.org/10.1145/642611.642616.

[41] W. MACKAY, C. APPERT, M. BEAUDOUIN-LAFON, O. CHAPUIS, Y. DU, J.-D. FEKETE, Y. GUIARD. *TouchStone: Exploratory Design of Experiments*, in "Proceedings of ACM CHI 2007 Conference on Human Factors and Computing Systems", ACM Press, April 2007, p. 1425-1434, http://doi.acm.org/10.1145/1240624.1240840.

[42] W. MACKAY. *The Interactive Thread: Exploring Methods for Multi-disciplinary Design*, in "DIS '04: Proceedings of the 2004 conference on Designing interactive systems, New York, NY, USA", ACM Press, August 2004, p. 103–112, http://doi.acm.org/10.1145/1013115.1013131.

[43] W. MACKAY. *Media Spaces: Environments for Informal Multimedia Interaction*, in "Computer-Supported Cooperative Work, Trends in Software Series", M. BEAUDOUIN-LAFON (editor), John Wiley & Sons Ltd, 1999, http://www.lri.fr/~mackay/pdffiles/TRENDS99.Mediaspaces.pdf.

[44] E. PIETRIGA, C. BIZER, D. KARGER, R. LEE. *Fresnel - A Browser-Independent Presentation Vocabulary for RDF*, in "Lecture Notes in Computer Science (LNCS 4273), Proceedings of the 5th International Semantic Web Conference (ISWC 2006)", Springer, November 2006, p. 158-171, http://dx.doi.org/10.1007/11926078_12.

[45] E. PIETRIGA. *A Toolkit for Addressing HCI Issues in Visual Language Environments*, in "IEEE Symposium on Visual Languages and Human-Centric Computing (VL/HCC'05)", September 2005, p. 145–152, http://doi.ieeecomputersociety.org/10.1109/VLHCC.2005.11.

[46] N. ROUSSEL, H. EVANS, H. HANSEN. *Proximity as an interface for video communication*, in "IEEE Multimedia", vol. 11, n° 3, July-September 2004, p. 12-16, http://doi.ieeecomputersociety.org/10.1109/MMUL.2004.15.

[47] N. ROUSSEL, S. GUEDDANA. *Beyond "Beyond being there": towards multiscale communication systems*, in "Proceedings of ACM Multimedia 2007", ACM Press, September 2007, p. 238-246, http://doi.acm.org/10.1145/1291233.1291283.

[48] N. ROUSSEL. *Exploring new uses of video with videoSpace*, in "Proceedings of EHCI'01, the 8th IFIP International Conference on Engineering for Human-Computer Interaction", R. LITTLE, L. NIGAY (editors), Lecture Notes in Computer Science, vol. 2254, Springer, 2001, p. 73-90, http://springerlink.com/link.asp?id=mev6gnypq9cvana3.

[49] N. ROUSSEL. *Experiences in the design of the well, a group communication device for teleconviviality*, in "Proceedings of ACM Multimedia 2002", ACM Press, December 2002, p. 146-152, http://doi.acm.org/10.1145/641007.641036.

[50] N. ROUSSEL. *Mediascape: a Web-based Mediaspace*, in "IEEE Multimedia", vol. 6, n^{o} 2, April-June 1999, p. 64-74, http://doi.ieeecomputersociety.org/10.1109/MMUL.1999.10007.

[51] W. STUERZLINGER, O. CHAPUIS, D. PHILLIPS, N. ROUSSEL. *User Interface Façades: Towards Fully Adaptable User Interfaces*, in "Proceedings of UIST'06, the 19th ACM Symposium on User Interface Software and Technology", ACM Press, October 2006, p. 309-318, http://doi.acm.org/10.1145/1166253.1166301.