INRIA

INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET EN AUTOMATIQUE

# *Project-Team in-situ*

# *Situated Interaction*

*Futurs*

THEME COG

# Table of contents

# 1. Team

*Established in 2002, the INSITU project is a collaboration between INRIA Futurs 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).*

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# 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 themes:

**Interaction and visualization paradigms** focus 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

**Academic honors, promotions and personnel changes** Nicolas Roussel obtained his habilitation and Caroline Appert, Jean-Baptiste Labrune, Emmanuel Nars all successfully defended their doctoral dissertations. INSITU spun off the AVIZ project, headed by Jean-Daniel Fekete, who was promoted to Directeur de Recherche level 2 last year. Stéphane Huot was hired as a Maître de Conference at the University Paris-Sud. Emmanuel Pietriga was promoted to Chargé de Recherche level 1 and Wendy Mackay was promoted to Directeur de Recherche level 1.

**Publications** INSITU had six long papers accepted at CHI'2007, the most prestigious conference in our field and a record for France.

**Valorisation** Metisse (Olivier Chapuis & Nicolas Roussel) is now available as one of the standard desktop configurations in the *Mandriva Linux* distribution.

**Dissemination** Wendy Mackay was featured as the September interview of the month for *La Recherche*. Members of INSITU ran the UIST 2.0 20th Anniversary event.

# 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 [44].

# 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:** *Distortion Lenses*, *Graphical User Interface (GUI) Toolkit*, *Java*, *Structured Graphics Editors*, *Visual Programming Languages*, *Zoomable User Interface (ZUI)*.

**Participants:** Caroline Appert, Emmanuel Pietriga [correspondant], Boris Trofimov.

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 activation 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.

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://bioinfo.cipf.es/blast2go/), 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.

*Figure 1. ZVTM used in various applications*

More information can be found at http://zvtm.sourceforge.net and [61].

## 5.2. IsaViz - A Visual Authoring Tool for RDF

**Keywords:** *Java*, *RDF*, *Semantic Web*, *Visual Graph Authoring Tool*.

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

IsaViz [60] is a visual authoring tool for RDF [68] designed and distributed by the World Wide Web Consortium (W3C). RDF models are graphs whose textual serializations in RDF/XML or other triple-oriented formats are not user-friendly, partly because they fail to convey the models' graph structure. IsaViz generates editable visual representations as zoomable 2D graphs which are often easier to understand.

IsaViz is also used as a testbed for experimenting with new methods and vocabularies for presenting RDF data. IsaViz features a rendering engine capable of interpreting Graph Stylesheets (GSS [62]) and another one for the Fresnel vocabulary [59]. As shown in Figure 2, IsaViz provides a visual debugger for FSL path expressions and now supports most elements of the Fresnel core vocabularies (see section 6.2).

More information can be found at http://www.w3.org/2001/11/IsaViz/

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

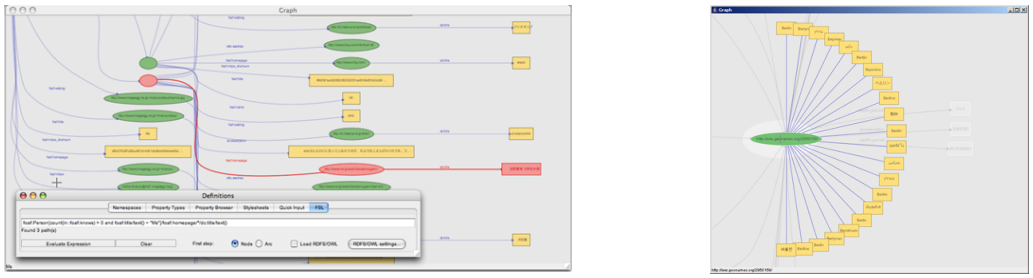

*Figure 2. Support for the Fresnel Vocabulary in IsaViz*

## 5.3. The Núcleo toolkit

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

**Participant:** Nicolas Roussel.

Derived from VideoSpace [64], 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 3) and PêlMêl.

Núcleo provides developers with a set of tools and a C++ class library that makes is 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 mulitple 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/

*Figure 3. Sample Núcleo applications: a web-based mediaspace [66]; the Well [65]; VideoProbe [49] and MirrorSpace [63].*

## 5.4. The Metisse window system

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

**Participants:** Olivier Chapuis [correspondant], Nicolas Roussel.

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*.

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 4, 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 4, 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 [67].

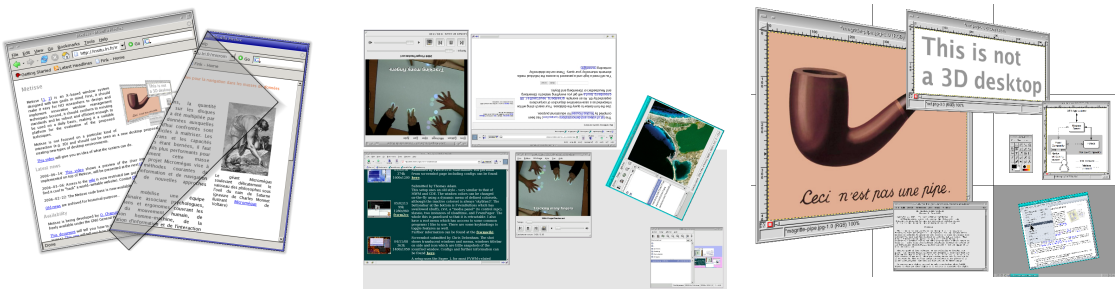


*Figure 4. Sample window management techniques implemented with Metisse: extended paper metaphor (left), interactive table configuration that allows to duplicate and rotate windows (middle) and zoomable 3D desktop (right).*

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 [50] 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.

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

## 5.5. Wmtrace

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

**Participant:** Olivier Chapuis [correspondant].

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

Wmtrace [48] 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 5) 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.

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/.

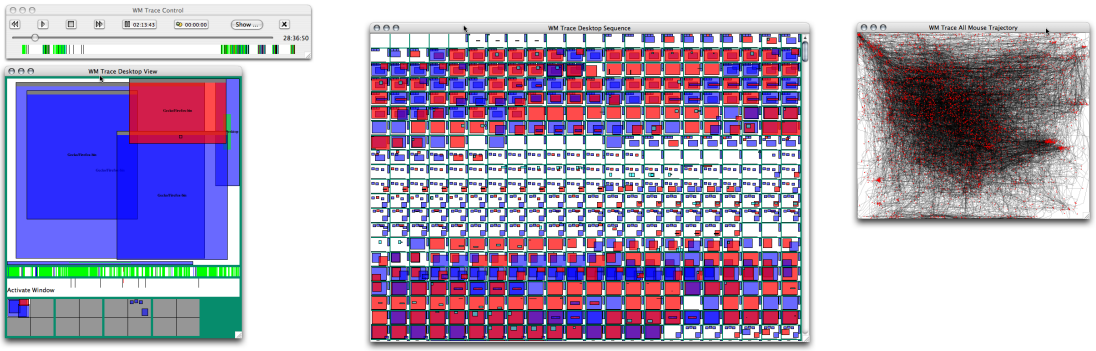


*Figure 5. VCR-like interface, session overview and sample plots of mouse trajectories (black) and mouse clicks (red)*

## 5.6. The SwingStates Toolkit

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

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

SwingStates [42], [40] 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 is uses *state machines* to specify interaction. While listeners and callbacks tend to split the code of a single interaction into several unrelated parts, state machines provide a powerful control structure and localize all of the interaction code in one place. By using Java's inner class, SwingStates provides programmers with a natural syntax to specify state machines and facilitates debugging and maintenance. It 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, while being compatible with traditional listeners. For example, a 20-line state machine can be assigned to Swing buttons and checkboxes so that they can be selected by crossing rather than clicking. State machines can also be used with the SwingStates canvas (see below) and to control high-level dialogues.

The second contribution of SwingStates is a powerful *canvas widget*. The canvas can contain any Java2D shape, including geometric shapes, images, text strings and even Swing widgets. Beyond the usual functions of a canvas display list, such as changing the order of objects, specifying a parent relative to which the coordinate system is specified and specifying a clipping object, SwingStates provides powerful *tags*, inspired by the Tcl/Tk toolkit. Any number of tags can be assigned to the canvas objects and an intensive use of polymorphism allows us to apply almost any command that works for a canvas object to a tag: the command is then applied to all objects with this tag. SwingStates provides extensional tags, which are explicitely assigned to objects, and intentional tags, which are specified by a predicate. Tags are also used in conjunction with state machines: transitions can be specified so as to occur only even if the event took place on an object with the specified tag. While a single state machine can control the whole canvas, it is also possible to assign separate state machine to different objects. For example, pie menus can be implemented by creating a canvas in the overlay layer of any Swing application (Figure 6).

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://www.lri.fr/logiciel.brevet.php?log=25.

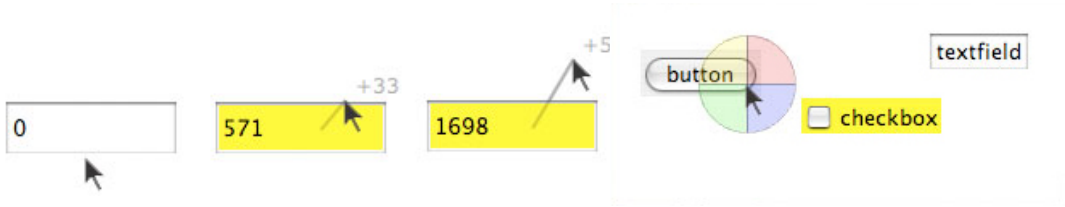


*Figure 6. A numeric text field whose value can be set by a joystick-like interaction (left) and a semi-transparent menu to change the background color of Swing widgets (right)*

## 5.7. JFresnel

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

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

Fresnel [59] is a presentation vocabulary for Semantic Web data designed to be application- and representation-paradigm independent (see section 6.2). 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. 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.

The **Interaction and visualization paradigms** research theme includes four sub-themes: *Interaction techniques, Information visualization, Tangible interfaces* and *reflective interfaces*. The first sub-theme concerns evaluation and optimization of pointing and interaction techniques.

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.

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 [51] [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. Our approach is based on the concept of *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].

Yves Guiard worked with us on a novel quantitative dimension for the taxonomy of navigation tasks in general, called the *degree of goal directedness* (DGD) [25]. We also introduced the serial target-acquisition (STA) experimental paradigm, which operationalizes the DGD concept in the context of electronic documents navigation. The DGD and STA paradigms are intended to enrich the conceptual toolkit of HCI research for the evaluation of navigation techniques. We use these concepts to illustrate the situations in which *perspective navigation* is especially useful, i.e. where navigation is not completely directed by the terminal goal, that is, where, in addition to trying to reach particular item, the user also wants to pick up information along the way.

We are also interested in the evaluation of multi-scale navigation techniques. Multi-scale interfaces have generated a growing interest over the past decade as a powerful way of representing, navigating and manipulating large sets of data. A number of multi-scale navigation techniques have been designed and implemented, ranging from the original pan & zoom [58] to various focus+context techniques [39], [47], [69]. Until now, the efficiency of these techniques has been evaluated mostly with usability studies based on domain-specific tasks, yielding discrepancies among their results. We designed a more generic framework similar in spirit to Fitts' reciprocal pointing task, but adapted to a task that significantly differs from pure pointing: multi-scale search. This framework [8] is based on an abstract task and is used to evaluate how navigation techniques perform in various multi-scale world configurations. The results of our first experiment indicate that, in the context of a small-world, pan & zoom combined with an overview is the most efficient technique, compared to two focus + context techniques (graphical fisheye lens and Drag Mag) and to the classical pan & zoom (see [8] for details).

Finally we have continued our work on interaction techniques for window management by studying a very common but little-studied dual pointing taks: copy-paste [4]. Copying and pasting information across windows incurs additional costs when the source and destination are not simultaneously visible: users must move windows and change their stacking order, which takes time but also destroys the original layout. We conducted the first study comparing tradtional copy-paste technique and introduced two new window management methods to improve these techniques: *restack* temporarily moves the window being clicked to the front for the copy operation, and puts it back when the mouse button is release, while *roll* (see Figure 7) rolls the overlapping windows away with an animation similar to our folding technique [43] during the copy operation. Both methods suppress the window management operations described above as long as part of the source window is visible. Our results show that the X-Window technique, where the middle button is used for the paste operation, outperforms all other techniques, including keyboard equivalents. Our *restack* and *roll* methods both improved the other techniques in all conditions. They are now available in our Metisse system and are an integral part of the version of Metisse distributed by Mandriva. Guillaume Faure has started a thesis this year on interaction techniques for window management to expand this work, while Guillaume Besacier is continuing his investigation of tabletop interfaces.

## 6.2. Information Visualization

**Keywords:** *Information Visualization*, *RDF*, *Semantic Web*, *Structured data representation*.

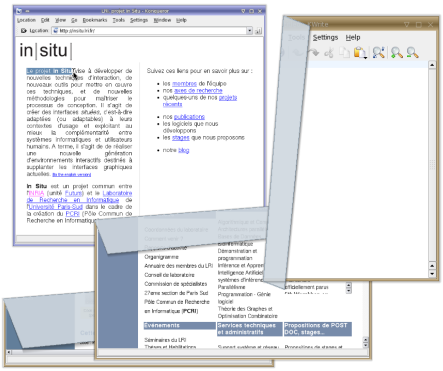

*Figure 7. The Restack 'n Roll technique for copy-paste among overlapping windows.*

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

The Semantic Web aims at extending the current Web with information that is "given well-defined meaning, better enabling computers and people to work in cooperation" [46]. Software agents are the primary consumers of Semantic Web content. RDF [68], the foundational framework for describing information in the Semantic Web, is thus designed to facilitate machine interpretability of information and does not define a visual presentation model since human readability is not one of its stated goals. However, RDF applications are not only about the semantic processing of information. Information coming from the Semantic Web, either directly from RDF repositories or as a result of complex processes, often must be presented to users. This requires transforming logically-structured, computer-oriented data so as to produce representations better suited for human consumption.

The work on Fresnel [59], an RDF vocabulary for describing Semantic Web presentation knowledge, continues, with new applications adopting it to capture RDF presentation knowledge, thus demonstrating the application- and representation paradigm-independence of core Fresnel vocabularies. The following applications, implemented with various languages such as Java, PHP, or AJAX technologies, make use of core Fresnel vocabularies: Simile Longwell & Piggy-bank (MIT CSAIL), Horus (Freie Univ. Berlin), Cardovan (IBM), IsaViz (INRIA/W3C), GNB (INRIA), Arago (Deri), Hyena (Univ. München), Oink (Nokia), RDF Browser (Open Link), Semantic Lenses (Univ. Stutgart).

At INRIA, development efforts have been focused on JFresnel, a Fresnel API for Java (see section 5.7). JFresnel currently implements the full FSL specification[5] and most Fresnel core vocabulary constructs. HP Laboratories Palo Alto have recently contributed to the development of JFresnel. Implementation efforts now focus on implementing support for the remaining vocabulary elements. This work is partially supported by an ANR contract: RNTL WebContent (see section 7.2).

A new tool has also been developed in collaboration with the IASI team (joint with the Gemo researcth team at INRIA Futurs), for the visualization and editing of ontologies shared within a peer-to-peer context (see Figure 8). This tool, called SOM, supports a subset of the OWL Web Ontology Language, called OWL-PL (for propositional logic) defined by the IASI team as part of the ongoing work on the *Somewhere* platform. SOM is based on ZVTM (see Section 5.1). Its interface is based on post-WIMP interaction techniques, featuring pie menus, smooth animation of changes to graphical elements resulting from user interaction and modifications made to the ontology's structure, and smooth zooming capabilities.

[5] http://www.w3.org/2005/04/fresnel-info/fsl/

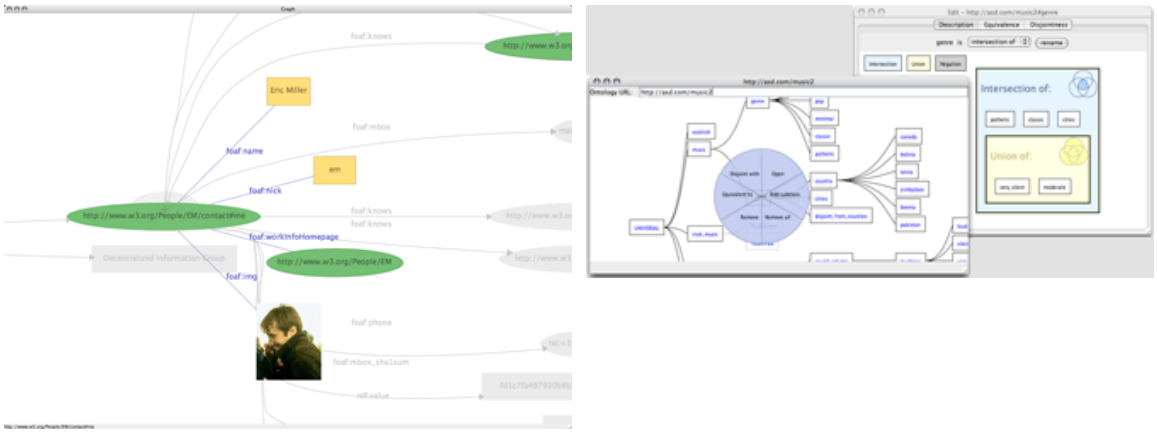


*Figure 8. Visual tools for the manipulation of Semantic Web data: IsaViz, an RDF authoring tool with support for Fresnel, and SOM, an OWL-PL ontology editor*

## 6.3. Tangible and Reflective Interfaces

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

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

*Tangible and Reflective interfaces* are two subthemes of **Interaction and visualization paradigms**. The goal of a tangible interface is to create a hybrid that enables users to integrate physical objects and computers. We are particularly interested in paper, both as an input and output medium. The Paperoles project, in collaboration with Catherine Letondal and researchers at IRCAM in Paris, investigates how music composers use a combination of paper and computer throughout the composition process. We challenged the common assumption that the key value of paper lies in its flexibility, since it is also seen as the best medium for creating the 'original' archival work. Based on our observations and interviews with working composers, reported in [27], we began development of a tool that uses Anoto technology [6] for capturing handwritten text on paper. The goal is to enable musicians to go back and forth between paper sketches and on-line music programs such as Open-Music [28] (see Figure 9).

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. As part of our on-going work with biologists at the Institut Pasteur, we explored the problem of how they manage their complex searches over the internet. Based on observations, interviews and participatory design workshops, we found that they treat the web as an enormous database of algorithms and data, that they search repeatedly to perform and re-perform similar collections of tasks. Existing tools, such as history and bookmarks, are rarely helpful and they often end up wasting time recreating a particular path. Aurélien Tabard, Wendy Mackay and Nicolas Roussel, with Catherine Letondal, created PageLinker [10], a browser extension that allows users to *contextualise* their navigation by linking web pages together via contextual bookmarks. We ran a month-long controlled field study that demonstrated that PageLinker significantly reduced time, page loads and mouse clicks. PageLinker's presentation of links in context facilitated web page revisitation, was less prone to bookmark overload, and was very robust to change.

[6] http://www.anoto.com

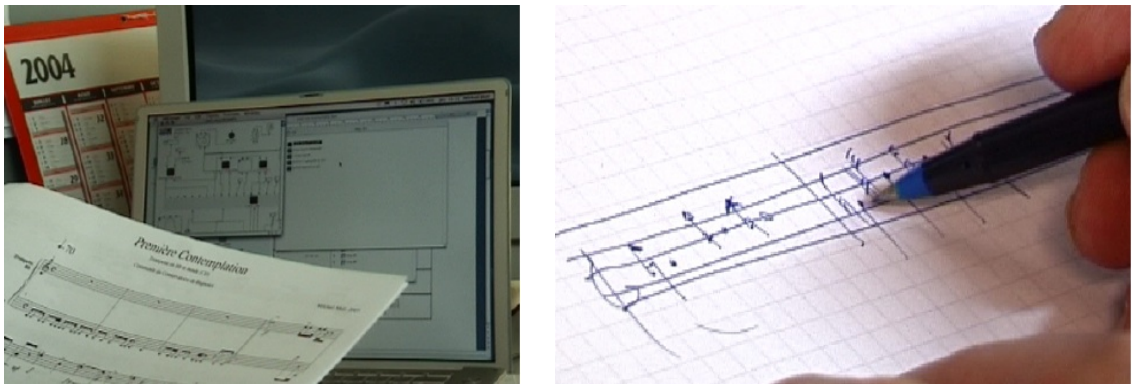


*Figure 9. Composers move back and forth between paper and electronic versions of their scores.*

## 6.4. Mediated Communication

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

**Participants:** Sofiane Gueddana, Emmanuel Nars, Nicolas Roussel [correspondant], Wendy Mackay, Danielle Lottridge, Nicolas Masson, Yann Riche.

The **Mediated Communication** research theme includes three sub-themes: *Ambient communication, Multimedia communication* and *Mobile devices*.

Instant messaging applications make it easy for users to indicate their status and adapt the pace of the conversation to their current context, supporting transparent transitions between synchronous and asynchronous communication. But most other communication systems lack this ability to seamlessly transition back and forth between loosely-coupled interactions and highly-coupled ones, and transitions between systems are usually hard to achieve.

The idea of supporting a variable degree of engagement through an adaptable level of detail and smooth transitions between levels led us to a new design strategy that takes this variability into account through a multiscale approach (Figure 10). As part of a research project funded by France Télécom R&D, we are designing a series of image-based communication systems to explore the notion of *multiscale communication* in the context of the home environment. One of our first prototypes, Pêle-Mêle [52], is a multiparty communication system that combines computer vision techniques, spatial and temporal filtering of the video streams and an original layout to support different forms of communication ranging from casual awareness to focused face-to-face interactions. Our recent efforts in this context aimed at improving and extending this system as well as specifying the general notion of multiscale communication [35].

Yann Riche and Wendy Mackay worked with elderly, through a series of participatory design workshops and interviews. They created the concept of 'PeerCare', in which elderly people who live alone maintain a local network with other local elderly via communication appliances [54]. The goal is to avoid the stigma of being monitored while providing the benefits of staying in touch with friends. MarkerClock [32] was designed to reflect this work, providing the elderly with a clock that is also a communication device. Two clocks are set up in two homes, with a continuous, dedicated network connection. Each clock records motion levels, providing an indication of ambient activity, and displays both the local and the remote activity levels as two streams that appear in a circle throughout the day. Participants can also touch the screen to leave 'markers' that let the other person know that, at that time, someone intentionally touched the clock.

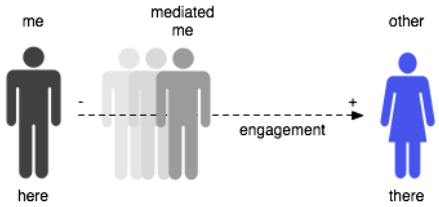


*Figure 10. Engagement as a variable characteristic of communication: the extent to which users are ready to expose themselves and open to others*

Despite recent advances in networking technologies, the implementation, the configuration and even the use of group communication systems like Pêle-Mêle or Marker Clock remain difficult. While the network environment is much faster and widespread, it is also more complex. Firewalls and NATs, for example, can make it difficult for one process to communicate with another. On the user side, group communication is usually achieved through simple lists of addresses that are hard to maintain and hard to synchronize or reuse between applications and users.

Network-related services based on DNS-SD, STUN and XMPP have been recently added to Núcleo (section 5.3) to facilitate the implementation of networked communication systems with this toolkit. In order to further facilitate the implementation, the configuration and the use of these systems, Emmanuel Nars proposed in his PhD thesis to make groups available as first class objects to both developers and users [15]. The new C++ library and the various interfaces he developed, including a tangible one, make it easy to create and manage groups, to use them with an arbitrary number of applications and to create multi-group applications. All these services are currently being incorporated into Núcleo.

## 6.5. Research Methods

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

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

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

The Touchstone [7] project relates to the first theme. In well-established empirical fields such as biology and experimental psychology, with over a century of experience conducting experiments, graduate students are taught that experiments build upon each other and that no individual experiment provides the ultimate answer to the question being studied. Researchers form theories, operationalize hypotheses based on those theories and perform controlled experiments to determine cause and correlation. Individual studies are published in the literature; other researchers repeat those experiments to confirm or refute them, and then extend them. No one experiment is ever definitive, although obtaining significant results may provide support for the theory in question.

Replicating and extending experiments is very difficult in practice, even for experienced researchers. In order to compare a new interaction technique to existing ones, HCI researchers must not only program their own techniques, but also re-implement or obtain running versions of the existing techniques based on the information published in the literature. This is time-consuming and does not guarantee generalizability, since tiny differences in the details of the implementation may have major effects on performance. As a result, the most common practice is to compare a new interaction technique to a single standard technique on a single task and ignore other possible contenders.

We developed the Touchstone experiment design platform with the goal of providing a strong empirical foundation for comparing and evaluating interaction and visualization techniques. We provide a repository and set of tools that support the experimental evaluation of interaction techniques. Touchstone includes a *design platform* for exploring optional designs of controlled laboratory experiments, a *run platform* for comparing novel techniques against existing benchmarks and a limited analysis platform for advice and access to on-line statistics packages. The design platform lets users explore the consequences of alternative designs and determine important issues such as how many subjects are required, experiment length, and counter-balancing strategies. The run platform uses SwingStates to create runnable experiments, based on the decisions specified by the researcher in the design platform. The run platform includes a number of standard interaction techniques and also supports plug-ins for novel interaction techniques. The run platform also has an experiment module that manages the dialog between the human subject and the application module, and logs the results in table and cinematic log files.

We validated the Touchstone design and run platforms by conducting a controlled experiment that replicated and extended a previous study of multiscale pointing interaction techniques. We found that the two fastest techniques were created by INSITU (Orthozoom Slider, followed by bi-manual Pan & Zoom). Both traditional Pan & Zoom and the technique considered fasted in the literature (SDAZ or Speed-Dependent Automatic Zooming) were significantly slower.

In addition to Touchstone, INSITU published a number of research methodology papers. Michel Beaudouini-Lafon and Wendy Mackay published a chapter on Prototyping Techniques in the second edition of *The HCI Handbook*, Ehrlbaum [18] and a chapter on Participatory Design Techniques in *The Disappearing Computer*, Springer [20]. Wendy Mackay published a chapter on co-adaptive systems in *HCI ReMixed*, MIT Press [17] and led two *Interactive Thread* [56] exercises at the UIST 2.0 20th Anniversary Celebration, (User Interface Software and Technology) which collected 150 historical examples of influential interaction techniques and generated several hundred novel design ideas, inspired by the images collected from the past 10 years of UIST research papers.

Jean-Baptiste Labrune's thesis [14] investigates a series of interactive tools to support children's creative exploration. He introduces the concept of *exaptation* to describe how children re-interpret and re-create technology, through play, and developed interactive tools, such as SketchCam [26], which allow children to capture and interact with the world through annotations (see Figure 11).


*Figure 11. Sketchcam allows children to capture and interact with the world through annotations.*

## 6.6. Engineering toolkits

**Keywords:** *Adaptable user interfaces*, *Copy-and-Paste*, *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 and involves the creation and deployment of user interface toolkits and includes four sub-themes: *Multimedia, Desktop, Information Visualization* and *Communication* .

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. Various techniques help users navigate in these worlds [8]: classical pan & zoom, overview+detail, focus+context (fisheye, drag mag, rubber sheet), OrthoZoom [41], and more [53], [55]. Other techniques, such as Semantic Zooming [58], make it possible to change the visibility and appearance of a graphical object (and thus the amount and type of information it conveys). This makes for a rich design space, featuring powerful representation and interaction capabilities. However the design and implementation of such multi-scale interfaces is made difficult by the lack of dedicated toolkits to handle their complexity. Several generic graphics toolkit such as ZVTM (section 5.1) Jazz and Piccolo [45] that feature smooth zooming capabilities provide a graphics-oriented API and set of widgets for instantiating graphical objects in a zoomable environment, with powerful features such as animation. However the design and implementation of the actual interface (navigation and representation) remains difficult because the application programmer must use low-level interfaces in an imperative programming environment.

We developed ZUIST to ease the design and implementation of rich multi-scale interfaces. ZUIST is a generic multi-scale engine that enables programmers to describe a multi-scale world and to specify the behavior of its components in a declarative way, using a dedicated XML vocabulary. The engine handles many complex aspects of multi-scale interface programming, such as loading or unloading graphical objects to or from memory, depending on the region of the virtual world observed by the user.

ZUIST was used to implement a navigation interface for interactively viewing 578 research papers, published at the ACM UIST conference during its 20 years of existence (see Figure 12), as part of the UIST2.0 20th Anniversary Celebration. This collection of papers, which represents about 3 Gigabytes of compressed PNG images, can be browsed by year, author, or keywords. The multi-scale scene is generated automatically from the PDF file of each paper and associated metadata from the ACM Digital Library. We also use ZUIST in our multi-scale navigation technique evaluation environment [8], to load and display a scene based on a high-resolution (86400x43200 pixels) satellite map of the world generated by NASA enriched with geographical data taken from the Geonames database [7].

We have also started to apply the multi-scale approach to navigate time-based data with a new version of our DIVA system [57], called DASE. DASE manages *streams*, i.e. time-based data sets, that can be manipulated through a stream algebra and visualized in a zoomable interface. Olivier Le Floch implemented a first prototype of this new version during a four-month internship, and we expect to continue this effort in the coming year.

# 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].

[7] http://www.geonames.org

*Figure 12. Navigating in the 578 research papers published at ACM UIST from 1988 to 2007, and in a multi-scale version of NASA's Blue Marble Next Generation world map enriched with geographical data taken from the Geonames database.*

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], Boris Trofimov.

Research project funded by national network on software technology (RNTL), 36 months (2006-2008). Partners: INRIA/Gemo, LIMSI/CNRS, EADS, CEA, INRA, Thalès, LRI/IASI, Xylème, 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 and LIMSI collaborate on the design and implementation of the platform's visualization components.

# 8. Other Grants and Activities

## 8.1. National actions

- Michel Beaudouin-Lafon is member of the board of the RNTL national network on software technology, a program of the French ANR.
- *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, Theophanis Tsandalis.
- *ReActivity Notebook with Institut Pasteur and INRA, France*. Members of INSITU involved: Catherine Letondal, Wendy Mackay, Aurélien Tabard.

## 8.2. European actions

- Wendy Mackay is workpackage leader of the Convivio European network of excellence

## 8.3. International actions

- *UIST 2.0: 20th Anniversary Celebration of the ACM UIST Conference*. Michel Beaudouin-Lafon and Wendy Mackay co-chaired the celebrations of the 20th anniversary of the prestigious ACM User Interface Software and Technology (UIST) conference. They produced a one-hour video of the interviews of seven of the conference pioneers. Emmanual PIetriga created the ZUIST zoomable user interface for navigating the 20-year proceedings archive, which was on display at the conference on a large interactive whiteboard (Smartboard). Stéphane Huot created a web site on the DVD that was distributed to all the attendees to navigate the proceedings archive. Nathalie Henry, Pierre Dragicevic and Jean-Daniel Fekete of the AVIZ group created a poster visualizing the co-authorship network of all UIST authors. Frédéric Vernier of LIMSI created a poster visualizing the citation index of all UIST papers. Wendy Mackay ran two interactive thread events to collect historical material and brainstorm the future of interaction techniques. The event was a great success and a web-site is being put together to make it a permanent resource to the community.
- *Fresnel: modeling presentation knowledge for the display of Semantic Web data*. Emmanuel Pietriga participates in a community-based effort initiated in the context of MIT project Simile[8]. The partners are INSITU, MIT DIG (Decentralized Information Group), MIT project Haystack, MIT Libraries, Freie Universität Berlin, and W3C. See section 6.2 for more details.
- *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*. The first year of the MUSE Joint Lab involved transatlantic visits in both directions, with two accepted papers at CHI'07 and InfoVIS'07. Several additional papers have either been submitted or are in field test. Wendy Mackay conducted a series of research workshops at U. Toronto with Danielle Lottridge and members of DGP collaborated on the UIST2.0 event with Michel Beaudouin-Lafon and Wendy Mackay. The latter also participated in the UIST program committee meeting at U. Toronto with Ravin Balakrishan. Danielle Lottridge visited INSITU for three weeks in the summer and Pierre Dragicevic, a post-doc at U. Toronto, was hired as a CR2 (INRIA) in the AVIZ group (which was part of INSITU at the beginning of the MUSE project). INSITU hired Fanis Tsandilas as a post-doc, after he completed his Ph.D. at U. Toronto. 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: "A Generative approach to GUI design", Dynamic Graphics Project, University of Toronto
- Michel Beaudouin-Lafon: ENSAD Ecole Nationale Supérieure des Arts Décoratifs (Mar 2007)
- Wendy Mackay: ReActivity: Multiscale Visualisation for Scientists, Invited address, INRIA/Microsoft Lab Inauguration (Jan 2007)
- Wendy Mackay: Quels sont les critères d'attractivité d'un grand campus de recherche international ?, LIST/CEA: Perspectives on Digiteo Seminar, Abbaye de Cernay, France (Apr 2007)
- Wendy Mackay: Applications Domestiques, OFTA (May 2007)

[8] http://simile.mit.edu

- Wendy Mackay: Augmented Paper, Stanford University, USA (Jun 2007)
- Wendy Mackay: Air Traffic Control Revisited, University of California, San Diego, USA (Jun 2007)
- Wendy Mackay: ReActive Notebook, presentation to C. Mundie, Microsoft president (Sep 2007)
- Wendy Mackay: Ambient Communication in the Home, Invited address, AIR&D Seminar on Ambient Intelligence (Oct 2007)
- Wendy Mackay: Interview, France Inter
- Wendy Mackay: "En informatique, les utilisateurs sont les innovateurs", Interview of the month, La Recherche, Vol. 411, pages 62-65
- Emmanuel Pietriga: Visualisation de données du Web sémantique, INRIA Sophia-Antipolis (Oct 2007)

## 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
- Interactions Magazine (ACM) : Wendy Mackay

## 9.3. Journal reviewing

- Transactions on Computer Human Interaction (ACM): Caroline Appert, Michel Beaudouin-Lafon, Wendy Mackay, Emmanuel Pietriga
- Human-Computer Interaction Journal: Michel Beaudouin-Lafon (reviewer), Wendy Mackay (reviewer, co-editor of a special issue on awareness systems)
- User modeling and user-adapted interaction: Theophanis Tsandalis
- Software Practice & Experience (SP&E), Wiley: Michel Beaudouin-Lafon (reviewer)
- Journal of Computer Supported Cooperative Work (JCSCW), Springer: Michel Beaudouin-Lafon (reviewer)

## 9.4. Conference organization

- IEEE Symposium on Visual Languages and Human-Centric Computing (VL/HCC) 2007, Coeur d'Alène, USA: Emmanuel Pietriga (Program Committee member and Publicity chair)
- ACM Symposium on User Interface Software and Technology (UIST) 2007, poster submissions committee: Caroline Appert
- ACM Symposium on User Interface Software and Technology (UIST) 2007, UIST2.0 20th Anniversary Celebration Co-Chairs: Michel Beaudouin-Lafon, Wendy Mackay
- 19ème Conférence Francophone d'Interaction Homme-Machine (IHM '07), Paris, Novembre 2007: Michel Beaudouin-Lafon (Program Committe chair), Nicolas Roussel (Proceedings chair)
- ACM 20th Symposium on User Interface Software and Technology (UIST '07), Newport, USA, October 2007: Michel Beaudouin-Lafon, Wendy Mackay (Program Committe members)
- Eleventh IFIP TC13 International Conference on Human-Computer Interaction (Interact 2007), Rio de Janeiro, Brésil, September 2007: Michel Beaudouin-Lafon (Program Committe member)
- ACM Multimedia 2007, Augsburg, Germany: Nicolas Roussel (Program Committee member)
- ECSCW 2007, Limerick, Ireland: Nicolas Roussel (Program Committee member)

## 9.5. Conference reviewing

- ACM CHI 2007, San Jose, USA: Caroline Appert, Michel Beaudouin-Lafon, Olivier Chapuis, Wendy Mackay, Emmanuel Pietriga, Nicolas Roussel, Theophanis Tsandalis
- ACM UIST 2007, Newport, USA: Olivier Bau, Michel Beaudouin-Lafon, Olivier Chapuis, Wendy Mackay, Emmanuel Pietriga, Nicolas Roussel, Yann Riche, Aurélien Tabard, Theophanis Tsandalis
- ACM Multimedia 2007, Augsburg, Germany: Nicolas Roussel
- IEEE Symposium on Visual Languages and Human-Centric Computing 2007, Coeur d'Alene, USA: Emmanuel Pietriga
- IEEE Symposium on 3D User Interfaces 2007, Charlotte, USA: Olivier Bau
- Visual Interactions in Software Artifacts Mini-track in the Software Technology Track of HICSS-40 2007: Emmanuel Pietriga
- Interact 2007: Yann Riche
- ECSCW 2007, Limerick, Ireland: Nicolas Roussel
- IFIP Engineering Interactive Systems 2007 (EHCI+DSV-IS+HCSE), Salamanca, Spain: Nicolas Roussel
- IEEE Tabletop 2007, Newport, USA: Nicolas Roussel
- Conférence Francophone d'Interaction Homme-Machine (IHM) 2007, Paris, France: Michel Beaudouin-Lafon, Olivier Chapuis, Wendy Mackay, Emmanuel Pietriga, Nicolas Roussel, Yann Riche

## 9.6. Scientific associations

- AFIHM (French speaking HCI asssociation): Michel Beaudouin-Lafon, Executive Committee members
- 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 1, Strategic Objective 4.2: Intelligent Content and Semantics (51 Meuros): Emmanuel Pietriga
- CPER (Contrat de Projet Etat-Région) Lorraine, research theme MIS (Modélisation, Interaction, Simulation): Emmanuel Pietriga
- Franklyn Bower Award committee (USD 250,000.00 prize, oldest U.S. scientific prize): Wendy Mackay
- Comité d'evaluation BQR Financier, Univ. Paris-Sud: Wendy Mackay
- Comité d'evaluation BQR Emploi, Univ. Paris-Sud: Wendy Mackay
- Expert reviewer, EPSRC Equator Evaluation (6-year, £10,000,000.00 project): Wendy Mackay
- Stanford University HCI jury: Michel Beaudouin-Lafon and Wendy Mackay
- CHI'07 Doctoral Consortium jury: Wendy Mackay
- UIST'07 Doctoral Consoritum faculty: Wendy Mackay
- INRIA AVIZ project evaluation (lead by J.D. Fekete): Wendy Mackay
- INRIA GRAVITE project evaluation (lead by G. Mélançon): Wendy Mackay
- ASTI jury de prix de thèse, France: Wendy Mackay
- Comité ad-hoc : evaluations d'HDR, LRI, Univ. Paris-Sud: Wendy Mackay

- Prof. T. Rodden (Engineering and Physical Sciences Research Council), Interdisciplinary Foundations for Ubiquitous Computing Fellowship: Wendy Mackay, fellowship committee
- RNTL Réseau National des Technologies Logicielles / ANR TechLog program, member of the board: Michel Beaudouin-Lafon
- Conseil Scientifique of IRCAM, Paris, France: Michel Beaudouin-Lafon
- Evaluation committee of I3S laboratory, Sophia Antipolis: Michel Beaudouin-Lafon
- Ministry of Research, Committee for Prime d'Encadrement Doctoral et de Recherche: Michel Beaudouin-Lafon
- Ministry of Research, expertise for lab evaluations: Michel Beaudouin-Lafon
- Univ. Paris-Sud hiring committee, Commission de Spécialité et d'Enseignement 27ème section (computer science): Michel Beaudouin-Lafon
- Université des Sciences et Technologies de Lille (Lille 1) hiring committee, Commission de Spécialité et d'Enseignement 27ème section (computer science): Nicolas Roussel
- ANR "Jeunes chercheurs" reviewer: Nicolas Roussel

## 9.8. PhD defenses

- Danielle Lottridge (University of Toronto, Canada), Thesis Proposal Exam, Sep 2007: Wendy Mackay, jury member
- Nicolas Roussel (Université Paris-Sud), Habilitation, Dec 2007: Wendy Mackay, jury member
- Mountaz Hascoët (Université Montpellier II), Habilitation, Nov 2007: Wendy Mackay, reviewer
- Jean-Baptiste Labrune (Université Paris-Sud), : Wendy Mackay, adviser
- Jean Bresson (IRCAM, Paris, novembre 2007): Michel Beaudouin-Lafon, jury member
- Gaëlle Calvary (LIG, Grenoble, novembre 2007), Habilitation: Michel Beaudouin-Lafon, reviewer
- Julien Letessier (LIG, Grenoble, octobre 2007): Michel Beaudouin-Lafon, reviewer
- Stéphane Renouard (INT, Evry, avril 2007): Michel Beaudouin-Lafon, reviewer
- Emmanuel Nars (LRI, Orsay, septembre 2007): Michel Beaudouin-Lafon and Nicolas Roussel, advisers
- Caroline Appert (LRI, Orsay, mai 2007): Michel Beaudouin-Lafon, adviser.

# 10. Bibliography

## Major publications by the team in recent years

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