IN PARTNERSHIP WITH:
CNRS

Université des sciences et technologies de Lille (Lille 1)

Activity Report 2013

Project-Team MINT

Methods and tools for gestural interactions

RESEARCH CENTER
Lille - Nord Europe

THEME
Interaction and visualization

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Project-Team MINT

Keywords: Interaction, Interactive Computing, User Interface, Interactive Graphics

Creation of the Team: 2010 January 01*, updated into Project-Team:* 2012 January 01.

1. Members

Research Scientists
- Fanny Chevalier [Inria, Researcher, from November]
- Nicolas Roussel [Inria, Senior Researcher, HdR]

Faculty Members
- Géry Casiez [Univ. Lille 1, Professor, HdR]
- Frédéric Giraud [Univ. Lille 1, Associate Professor, HdR]
- Laurent Grisoni [Team leader, Univ. Lille 1, Professor, HdR]
- Thomas Pietrzak [Univ. Lille 1, Associate Professor]
- Betty Semail [Univ. Lille 1, Professor, HdR]

External Collaborators
- Fabrice Aubert [Univ. Lille 1, Associate Professor]
- Christophe Chaillou [Univ. Lille 1, Professor, HdR]
- Michel Amberg [Univ. Lille 1, Research Engineer]
- Samuel Degrande [CNRS, Research Engineer]
- Damien Marchal [CNRS, Research Engineer]
- Patricia Plénacoste [Univ. Lille 1, Associate Professor]

Engineers
- Bruno de Araujo [Inria]
- Marc-Antoine Dupre [Inria, Région Nord - Pas de Calais then FUI TOUCHIT]
- Florian Renaut [Univ. Lille 1, Région Nord - Pas de Calais]

PhD Students
- Jonathan Aceituno [Inria, CORDI-S]
- Wael Ben Messaoud [Univ. Lille 1]
- Nicolas Bremard [Univ. Lille 1]
- Andéol Evain [Univ. Rennes 1]
- Jérémie Gilliot [Inria, CORDI-C, ANR InSTInCT & Région Nord - Pas de Calais]
- Sofiane Ghenna [Univ. Lille 1, from October]
- Alix Goguey [Inria, CORDI-S, from October]
- Hanaë Rateau [Univ. Lille 1]
- Yosra Rekik [Univ. Lille 1, ATER]
- Thomas Sednaoui [Univ. Lille1, FP7 Prototouch]
- David Selosse [Univ. Lille 1, ATER]
- Eric Vezzoli [Univ. Lille1, FP7 Prototouch]

Post-Doctoral Fellows
- Takashi Miyaki [Inria, FUI TOUCHIT, from September]
- Clement Nadal [Univ. Lille 1]
- Ludovic Potier [Inria]

Visiting Scientist
- Adrian Amanci [Inria, from Sep 2013 until Oct 2013]

Administrative Assistant
- Karine Lewandowski [Inria]

2. Overall Objectives

2.1. Overall Objectives

The Mint team focuses on *gestural interaction*, i.e. the use of gesture for human-computer interaction (HCI). The New Oxford American Dictionary defines *gesture* as *a movement of part of the body, especially a hand or the head, to express an idea or meaning*. In the particular context of HCI, we are more specifically interested in movements that a computing system can sense and respond to. A gesture can thus be seen as a function of time into a set of sensed dimensions that might include but are not limited to positional information (the pressure exerted on a contact surface being an example of non-positional dimension).

Simple pointing gestures have long been supported by interactive graphics systems and the advent of robust and affordable sensing technologies has somewhat broadened their use of gestures. Swiping, rotating and pinching gestures are now commonly supported on touch-sensitive devices, for example. Yet the expressive power of the available gestures remains limited. The increasing diversity and complexity of computer-supported activities calls for more powerful gestural interactions. Our goal is to foster the emergence of these new interactions, to further broaden the use of gesture by supporting more complex operations. We are developing the scientific and technical foundations required to facilitate the design, implementation and evaluation of these interactions. Our interests include:

- gestures captured using held, worn or touched objects or contactless perceptual technologies;
- transfer functions possibly used during the capture process;
- computational representations of the captured gestures;
- methods for characterizing and recognizing them;
- feedback mechanisms, and more particularly haptic ones;
- tools to facilitate the design and implementation of tactile and gestural interaction techniques;
- evaluation methods to assess the usability of these techniques.

2.2. Highlights of the Year

Gery Casiez was hired as full Professor.

Fanny Chevalier has been recruited as an Inria Researcher.

3. Research Program

3.1. Human-Computer Interaction

The scientific approach that we follow considers user interfaces as means, not an end: our focus is not on interfaces, but on interaction considered as a phenomenon between a person and a computing system [32]. We *observe* this phenomenon in order to understand it, i.e. *describe* it and possibly *explain* it, and we look for ways to significantly *improve* it. HCI borrows its methods from various disciplines, including Computer Science, Psychology, Ethnography and Design. Participatory design methods can help determine users' problems and needs and generate new ideas, for example [37]. Rapid and iterative prototyping techniques allow to decide between alternative solutions [33]. Controlled studies based on experimental or quasi-experimental designs can then be used to evaluate the chosen solutions [39]. One of the main difficulties of HCI research is the doubly changing nature of the studied phenomenon: people can both adapt to the system and at the same time adapt it for their own specific purposes [36]. As these purposes are usually difficult to anticipate, we regularly *create* new versions of the systems we develop to take into account new theoretical and empirical knowledge. We also seek to *integrate* this knowledge in theoretical frameworks and software tools to disseminate it.

3.2. Numerical and algorithmic real-time gesture analysis

Whatever is the interface, user provides some curves, defined over time, to the application. The curves constitute a gesture (positionnal information, yet may also include pressure). Depending on the hardware input, such a gesture may be either continuous (e.g. data-glove), or not (e.g. multi-touch screens). User gesture can be multi-variate (several fingers captured at the same time, combined into a single gesture, possibly involving two hands, maybe more in the context of co-located collaboration), that we would like, at higher-level, to be structured in time from simple elements in order to create specific command combinations.

One of the scientific fundations of the research project is an algorithmic and numerical study of gesture, which we classify into three points:

- *clustering*, that takes into account intrinsic structure of gesture (multi-finger/multi-hand/multi-user aspects), as a lower-level treatment for further use of gesture by application;
- *recognition*, that identifies some semantic from gesture, that can be further used for application control (as command input). We consider in this topic multi-finger gestures, two-handed gestures, gesture for collaboration, on which very few has been done so far to our knowledge. On the contrary, in the case of single gesture case (i.e. one single point moving over time in a continuous manner), numerous studies have been proposed in the current literature, and interestingly, are of interest in several communities: HMM [40], Dynamic Time Warping [42] are well-known methods for computer-vision community, and hand-writing recognition. In the computer graphics community, statistical classification using geometric descriptors has previously been used [38]; in the Human-Computer interaction community, some simple (and easy to implement) methods have been proposed, that provide a very good compromise between technical complexity and practical efficiency [41].
- *mapping to application*, that studies how to link gesture inputs to application. This ranges from transfer function that is classically involved in pointing tasks [34], to the question to know how to link gesture analysis and recognition to the algorithmic of application content, with specific reference examples.

We ground our activity on the topic of numerical algorithm, expertise that has been previously achieved by team members in the physical simulation community (within which we think that aspects such as elastic deformation energies evaluation, simulation of rigid bodies composed of unstructured particles, constraint-based animation... will bring up interesting and novel insights within HCI community).

3.3. Design and control of haptic devices

Our scientific approach in the design and control of haptic devices is focused on the interaction forces between the user and the device. We search of controlling them, as precisely as possible. This leads to different designs compared to other systems which control the deformation instead. The research is carried out in three steps:

- *identification:* we measure the forces which occur during the exploration of a real object, for example a surface for tactile purposes. We then analyze the record to deduce the key components – *on user's point of view* – of the interaction forces.
- *design:* we propose new designs of haptic devices, based on our knowledge of the key components of the interaction forces. For example, coupling tactile and kinesthetic feedback is a promising design to achieve a good simulation of actual surfaces. Our goal is to find designs which leads to compact systems, and which can stand close to a computer in a desktop environment.
- *control:* we have to supply the device with the good electrical conditions to accurately output the good forces.

4. Application Domains

4.1. Next-generation desktop systems

The term *desktop system* refers here to the combination of a window system handling low-level graphics and input with a window manager and a set of applications that share a distinctive look and feel. It applies not only to desktop PCs but also to any other device or combination of devices supporting graphical interaction with multiple applications. Interaction with these systems currently rely on a small number of interaction primitives such as text input, pointing and activation as well as a few other basic gestures. This limited set of primitives is one reason the systems are simple to use. There is, however, a cost. Most simple combinations being already used, few remain to trigger and control innovative techniques that could facilitate task switching or data management, for example. Desktop systems are in dire need of additional interaction primitives, including gestural ones.

4.2. Ambient Intelligence

Ambient intelligence (AmI) refers to the concept of being surrounded by intelligent systems embedded in everyday objects [35]. Envisioned AmI environments are aware of human presence, adapt to users' needs and are capable of responding to indications of desire and possibly engaging in intelligent dialogue. Ambient Intelligence should be unobtrusive: interaction should be relaxing and enjoyable and should not involve a steep learning curve. Gestural interaction is definitely relevant in this context.

4.3. Serious Games

Serious game refers to techniques extensively used in computer games, that are being used for other purposes than gaming. Fields such as learning, use of Virtual Reality for rehabilitation, 3D interactive worlds for retail, art-therapy, are specific context with which the MINT group has scientific connection, and industrial contacts. This field of application is a good opportunity for us to test and transfer our scientific knowledge and results.

5. Software and Platforms

5.1. LibGINA

Participant: Laurent Grisoni [correspondant].

This library has been developped within the context of the ADT GINA, for one of the installation that have been made in collaboration with Le Fresnoy national studio (Damassama, Léonore Mercier). This library is currently being posted as APP, and has been used by Idées-3com small company, in the context of our join I-lab program. This library allows for use of gesture for command, and is able to handle strong variability into recognized patterns.

Current version: version 1.0

Software characterization: A-2 SO-3 SM-2-up EM-3 SDL-3 OC-DA4-CD4-MS2-TPM4

5.2. 3D interaction using mobile phone

Participants: Samuel Degrande [correspondant], Laurent Grisoni.

This work has been achieved in the context of the Idées-3com I-lab. In this context a module, that allows to use any android based smartphone to control an Explorer module for navigation and interaction with VRML-based content. This module was used as a basis by Idées-3com in their commercial product this year.

Current version: version 1.0

Software characterization: A-2 SO-3 SM-2-up EM-2-up SDL-3 OC-DA4-CD4-MS2-TPM4

5.3. tIO (tactile input & output)

Participants: Marc-Antoine Dupré, Nicolas Roussel [correspondant], Takashi Miyaki.

tIO is a library designed to facilitate the implementation of doubly tactile interaction techniques (tactile input coupled with tactile feedback) based on the STIMTAC technology. Supporting all current STIMTAC prototypes, it makes it easy to move the system pointer of the host computer according to motions detected on them and adapt their vibration amplitude based on the color of the pointed pixel or the nature of the pointed object. The library includes a set of `Qt` demo applications that illustrate these two different approaches and makes it easy to "augment" existing `Qt` applications with tactile feedback. It also makes it possible to supplement or substitute tactile feedback with basic auditory feedback synthesized using `portaudio` (friction level is linearly mapped to the frequency of a sine wave). This not only facilitates the development and documentation of tactile-enhanced applications but also makes it easier to demonstrate them to a large audience.

Software characterization: A2, SO3-up, SM-2, EM2, SDL1.

5.4. libpointing

Participants: Géry Casiez [correspondant], Damien Marchal, Nicolas Roussel.

Libpointing is a software toolkit that provides direct access to HID pointing devices and supports the design and evaluation of pointing transfer functions [2]. The toolkit provides resolution and frequency information for the available pointing and display devices and makes it easy to choose between them at run-time through the use of URIs. It allows to bypass the system's transfer functions to receive raw asynchronous events from one or more pointing devices. It replicates as faithfully as possible the transfer functions used by Microsoft Windows, Apple OS X and Xorg (the X.Org Foundation server). Running on these three platforms, it makes it possible to compare the replicated functions to the genuine ones as well as custom ones. The toolkit is written in C++ with Python and Java bindings available. It is publicly available under the GPLv2 license.

Web site: http://libpointing.org/

Software characterization: A3, SO3, SM-2, EM2, SDL4

5.5. Platform PIRVI

MINT is associated to the CPER-CIA (2007-2013), and participates to the PIRVI platform (Framework for Computer Human Animation, Virtual Reality and Images, handled by F. Aubert, co-animated by F. Aubert and D. Marchal), which aims at promoting research achieved by participant research teams (6 research teams, among which MINT), as well as encouraging collaborations with regional economical tissue on the knowledge fields covered within the associated research teams. The PIRVI allows these research teams to share a Virtual-Reality Room and various mid-size research equipments : multitouch tables, cameras (depth, infrared, ...), interactive devices (force-feedback, multitouch, smartphones...), a configurable multitouch wall. This dissemination activity has been supported with a regional contract 500 Keuros.

6. New Results

6.1. Human limits in small unidirectional mouse movements

Participants: Jonathan Aceituno [correspondant], Géry Casiez, Nicolas Roussel.

Computer mouse sensors keep increasing in resolution. The smallest displacement they can detect gets smaller, but little is known on our ability to control such small movements. Small target acquisition has been previously tackled, but the findings do not apply to the problem of finding the useful resolution of a user with a mouse, which corresponds to the smallest displacement (s)he can reliably produce with that device. In [16], we detail this definition and provide an associated experimental protocol to measure the useful resolution. We then report on the results of a study suggesting that high-end mice are not likely to be used to their full potential. We further comment on the different strategies used by participants to acheive best performance, and derive implications for user interfaces.

6.2. Small, Medium, or Large? Estimating the User-Perceived Scale of Stroke Gestures

In [27], we show that a large consensus exists among users in the way they articulate stroke gestures at various scales (i.e., small, medium, and large) and formulate a simple rule that estimates the user-intended scale of input gestures with 87% accuracy. Our estimator can enhance current gestural interfaces by leveraging scale as a natural parameter for gesture input, reflective of user perception (i.e., no training required). Gesture scale can simplify gesture set design, improve gesture- to-function mappings, and reduce the need for users to learn and for recognizers to discriminate unnecessary symbols.

6.3. Métamorphe : a shape changing keyboard

Métamorphe is a keyboard with mobile keys [21]. Whether keys are pressed or released, they can be at their usual height, or raised. This mechanism allows both to provide haptic feedback to ease eyes-free interaction, and to access the side of the keys. The sides of the keys can be pushed, like the top of the keys. Therefore each key can be mapped to several actions. For instance this could be useful for command selection.

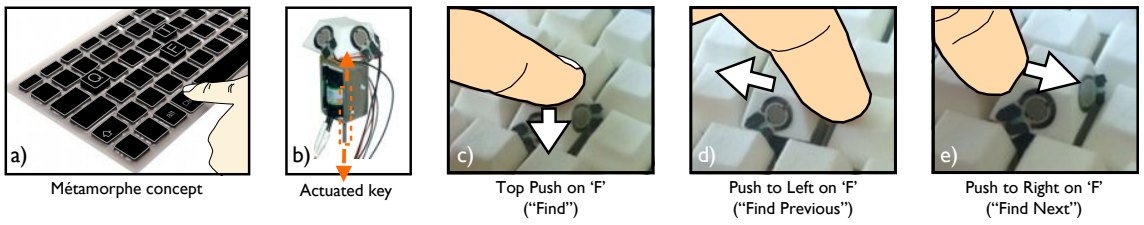

Figure 1. a) Métamorphe concept: the user presses the control key, keys corresponding to hotkeys rise b) key mounted on a solenoid, with force sensors on the sides c) press on the top of the key d) press on the right of the key e) press on the left of the key.

6.4. Designing Intuitive Multi-touch 3D Navigation Techniques

Participants: Géry Casiez, Damien Marchal [correspondant], Nicolas Roussel, Clement Moerman.

Multi-touch displays have become commonplace over recent years. Numerous applications take advantage of this to support interactions that build on users' knowledge and correspond to daily practices within the real world. 3D applications are also becoming more common on these platforms, but the multi-touch techniques for 3D operations often lag behind 2D ones in terms of intuitiveness and ease of use. Intuitive navigation techniques are particularly needed to make multi-touch 3D applications more useful, and systematic approaches are direly needed to inform their design: existing techniques are still too often designed in ad-hoc ways. In [25], we propose a methodology based on cognitive principles to address this problem. The methodology combines standard user-centered design practices with optical flow analysis to determine the mappings between navigation controls and multi-touch input. It was used to design the navigation technique of a specific application for our industrial partner Idées3Com. The resulting technique proved to be more efficient and preferred by users when compared to existing ones, which provides a first validation of the approach.

6.5. Mockup Builder: 3D modeling on and above the surface

Mockup Builder [11] is a semi-immersive environment for conceptual design which allows virtual mockups to be created using gestures. Our goal is to provide familiar ways for people to conceive, create and manipulate three-dimensional shapes. To this end, we developed on-and-above-the-surface interaction techniques based

Figure 2. (Left) The optical flow for camera movements are used to design the shape of the interaction gestures. (Right) The evaluation scenario used to compare several state of the art navigation techniques.

on asymmetric bimanual interaction for creating and editing 3D models in a stereoscopic environment. Our approach combines both hand and finger tracking in the space on and above a multi-touch surface. This combination brings forth an alternative design environment where users can seamlessly switch between interacting on the surface or above it to leverage the benefit of both interaction spaces. A formal user evaluation conducted with experienced users shows very promising avenues for further work towards providing an alternative to current user interfaces for modeling.

6.6. Towards Many Gestures to One Command: A User Study for Tabletops

Participants: Yosra Rekik, Laurent Grisoni [correspondant], Nicolas Roussel.

This work has been accepted as a long paper at Interact 2013. Multi-touch gestures are often thought by application designers for a one-to-one mapping between gestures and commands, which does not take into account the high variability of user gestures for actions in the physical world; it can also be a limitation that leads to very simplistic interaction choices. Our motivation is to make a step toward many-to-one mappings between user gestures and commands, by understanding user gestures variability for multi-touch systems; for doing so, we set up a user study in which we target symbolic gestures on tabletops. From a first phase study we provide qualitative analysis of user gesture variability; we derive this analysis into a taxonomy of user gestures, that is discussed and compared to other existing taxonomies. We introduce the notion of atomic movement; such elementary atomic movements may be combined throughout time (either sequentially or in parallel), to structure user gesture. A second phase study is then performed with specific class of gesture-drawn symbols; from this phase, and according to the provided taxonomy, we evaluate user gesture variability with a fine grain quantitative analysis. Our findings indicate that users equally use one or two hands, also that more than half of gestures are achieved using parallel or sequential combination of atomic movements. We also show how user gestures distribute over different movement categories, and correlate to the number of fingers and hands engaged in interaction. Finally, we discuss implications of this work to interaction design, practical consequences on gesture recognition, and potential applications.

6.7. Sub-space gestures: elements of design for mid-air interaction with distant displays

Participants: Hanae Rateau, Laurent Grisoni [correspondant], Bruno de Araujo.

(Research report, accepted to publication in a modified version to IUI 2014). Multi-touch gestures are often thought by application designers for a one-to-one mapping between gestures and commands, which does not take into account the high variability of user gestures for actions in the physical world; it can also be a limitation that leads to very simplistic interaction choices. Our motivation is to make a step toward many-to-one mappings between user gestures and commands, by understanding user gestures variability for multi-touch systems; for doing so, we set up a user study in which we target symbolic gestures on tabletops. From a first phase study we provide qualitative analysis of user gesture variability; we derive this analysis into a taxonomy of user gestures, that is discussed and compared to other existing taxonomies. We introduce the notion of atomic movement; such elementary atomic movements may be combined throughout time (either sequentially or in parallel), to structure user gesture. A second phase study is then performed with specific class of gesture-drawn symbols; from this phase, and according to the provided taxonomy, we evaluate user gesture variability with a fine grain quantitative analysis. Our findings indicate that users equally use one or two hands, also that more than half of gestures are achieved using parallel or sequential combination of atomic movements. We also show how user gestures distribute over different movement categories, and correlate to the number of fingers and hands engaged in interaction. Finally, we discuss implications of this work to interaction design, practical consequences on gesture recognition, and potential applications.

6.8. Merging two tactile stimulation principles: Electrovibration and Squeeze film effect

Participants: Michel Amberg, Frédéric Giraud, Clément Nadal, Betty Semail [correspondant].

Electrovibration and squeeze film effect can modify the perception a user has of a flat surface, with opposite action. In fact, electrovibration increases the friction of the finger on the surface, while the squeeze film reduces it. These two stimulation principles are compatible, and in this work [23], we wanted to merge them in a tactile stimulator, in order to enhance the control of the lateral force. Our approach was to identify the effect of each tactile stimulation, and we proposed its modelling: the dynamic of the mecahnical response of the fingerpulp has to be taken into account between the programmed stimulus and the resulting lateral force. We have shown also that the two techniques may be used simultaneously accounting to a few precautions. From the first experimental trials, the conclusion here is that the squeeze film effect is able to reduce tangential forces generated by the electrostatic forces, by going on acting on the friction coefficient.

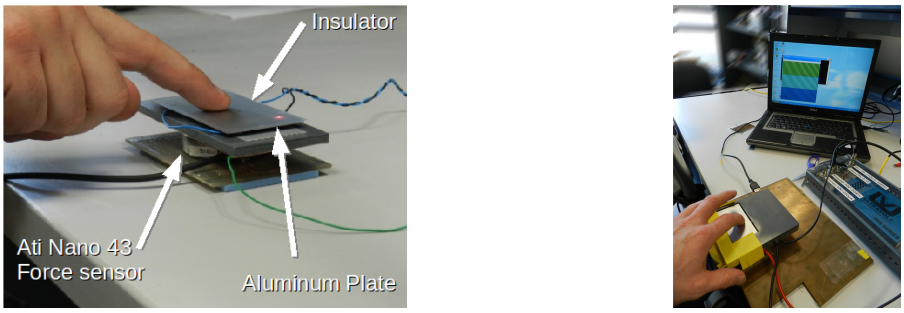

Figure 3. (Left) The experimental test bench to measure the forces produced during the stimulation. (Right) The tactile stimulator merging the two stimulation principles.

7. Partnerships and Cooperations

7.1. National Initiatives

7.1.1. InSTInCT (ANR ContInt, 2009-2013)

Participants: Géry Casiez [correspondant], Frédéric Giraud, Laurent Grisoni, Nicolas Roussel.

This project focused on the design, development and evaluation of new simple and efficient touch-based interfaces, with the goal of bringing widespread visibility to new generations of interactive 3D applications.

Partners: Inria [Mint, Iparla], Immersion, Cap Sciences

Web site: http://anr-instinct.cap-sciences.net/

7.1.2. TOUCHIT (13th FUI, 2012-2015)

Participants: Michel Amberg, Géry Casiez, Frédéric Giraud, Thomas Pietrzak, Nicolas Roussel [correspondant], Betty Lemaire-Semail [correspondant].

The purpose of this project is twofold. It aims at designing and implementing hardware solutions for tactile feedback based on programmable friction. It also aims at developing the knowledge and software tools required to use these new technologies for human-computer interaction. Grant for MINT is balanced on 272 keuro handled at University for L2EP, and 220 Keuros for Inria.

Partners: STMicroelectronics, CEA/LETI, Univ. Lille 1, Inria, Orange Labs, CNRS, EASii IC, MENAPIC and ALPHAUI.

Competitive clusters involved: Minalogic, Cap Digital and MAUD.

7.1.3. Smart-Store (12th FUI, 2011-2014, extended to 2015)

Participants: Samuel Degrande [correspondant], Laurent Grisoni, Fabrice Aubert.

The aim of this project is to set up, in the context of retail, some middleware and hardware setup for retail interactive terminal, that allows customer to connect with their own smart-phone on a system that includes a large screen, and allows to browse some store offer, as well as pre-order and/or link to further reconsulting. SME Idées-3com leads this FUI, which also includes Immochan, Oxylane, and VisioNord. Grant for MINT is 301 Keuros. This project start on september 2012 (start of this project has been delayed due to administrative problems), for a duration of 36 months.

Associated competitivity cluster: PICOM (retail)

7.2. International Research Visitors

7.2.1. Visits of International Scientists

Short visits:

- Michael Terry (University of Waterloo, Canada) in June
- Andy Cockburn (University of Canterbury, New Zealand) in July
- Karan Singh (University of Toronto, Canada) in December

7.2.2. Visits to International Teams

F. Giraud was invited researcher at the electrical and computer engineering department of the University of Toronto (Ontario, Canada). He was granted with the sabbatical program of the international relations (september 2012, july 2013).

8. Dissemination

8.1. Scientific Animation

8.1.1. Invited Talks

- "Future generation of tactile stimulators": F. Giraud, Haptic Forum organized by the Femto-ST (november 30th)
- "Past interfaces still have a future": N. Roussel, LIRMM, Montpellier (April 11th)
- "Perception-action coupling for Human-Computer Interaction": N. Roussel, Inria Executive Committee (February 6th)

8.1.2. Journal reviewing

- Transactions on Computing and Cultural Heritage (ACM): T. Pietrzak, D. Marchal
- Transactions on Applied Perception (ACM): T. Pietrzak
- Transactions on Haptics (IEEE): T. Pietrzak, B. Semail
- Transactions on Visualization and Computer Graphics (IEEE): F. Chevalier
- Technique et Science Informatique (Lavoisier) special issue on big data visualization: F. Chevalier (program committee)

8.1.3. Conference organization

- ACM CHI: G. Casiez, PC member and member of the best paper committee; N. Roussel, video showcase co-chair
- ACM UIST: F. Chevalier, PC member
- IEEE 3DUI: G. Casiez, PC member
- ACM EICS: N. Roussel, PC member
- ACM SUI: G. Casiez, PC member
- IEEE VIS, : F. Chevalier, fast-forward co-chair
- IEEE BigData Congress: F. Chevalier, PC member
- IHC (*Simpósio de Fatores Humanos em Sistemas Computacionais*): N. Roussel, PC member
- IHM: N. Roussel, co-president; F. Chevalier, tutorials and workshops co-chair; G. Casiez & T. Pietrzak, PC members
- fOSSa: N. Roussel, PC member
- *Journée IHM-IA*: N. Roussel, co-organizer
- EPE 2013: B. Semail, general chairman

8.1.4. Conference reviewing

- ACM CHI: G. Casiez, F. Chevalier, T. Pietrzak, N. Roussel
- ACM UIST: G. Casiez, F. Chevalier
- ACM EICS: N. Roussel
- IEEE PacificVis: F. Chevalier
- ACM ITS: G. Casiez
- GI: G. Casiez
- TEI: G. Casiez
- IFIP Interact: T. Pietrzak, N. Roussel
- IHC (*Simpósio de Fatores Humanos em Sistemas Computacionais*): N. Roussel

- IHM: G. Casiez, F. Chevalier, T. Pietrzak, D. Marchal

8.1.5. Scientific associations

- AFIHM, the French speaking HCI asssociation: N. Roussel and T. Pietrzak, members of the Executive Committee (vice-president and secretary from November 2011 to November 2013)
- EPE, European Power Electronic association: B.Semail is member of the steering commitee

8.1.6. Evaluation committees and invited expertise

- Inria's acceptance jury for junior researcher positions: N. Roussel
- Inria Lille's eligibility jury for junior researcher positions: N. Roussel (president)
- ANR SIMI 2 panel (*JCJ*, *Blanc* and *Blanc international* calls): N. Roussel
- Expert reviewer for EPSRC (United Kingdom): N. Roussel
- Expert reviewer for Digiteo-DigiCosme: G. Casiez
- Expert reviewer for MITACS (Canada): G. Casiez

8.2. Teaching - Supervision - Juries

8.2.1. Teaching

Licence: T. Pietrzak; Compilation, 36h, L3, Univ. Lille 1

Licence: T. Pietrzak; Algorithms and data structures, 36h, L3, Univ. Lille 1

Licence: T. Pietrzak; Automatas and Logic, 55h, L2, Univ. Lille 1

Licence: N. Roussel; Algorithms and imperative programming, 64h, L1, Univ. Lille 1

Licence: G. Casiez; Algorithms and imperative programming, 64h, IUT A, Univ. Lille 1

Licence: G. Casiez; Databases, 48h, IUT A, Univ. Lille 1

Licence: F. Aubert; Introduction to Programming, 48h, L1, Univ. Lille 1

Licence: F. Aubert; Algorithms and imperative programming, 36h, L3, Univ. Lille 1

Master: G. Casiez, L. Grisoni, P. Plénacoste & T. Pietrzak; Human-Computer Interaction, 48h, M1, Univ. Lille 1

Master: G. Casiez & F. Aubert; Multi-Touch Interaction, 24h, M1, Univ. Lille 1

Master: F. Aubert; Computer Graphics, 48h, M1, Univ. Lille1

Master: L. Grisoni & F. Aubert; Advanced 3D modeling, 20h, M2, Univ. Lille 1

Master: G. Casiez & L. Grisoni; Artificial Vision, 12h, M2, Univ. Lille 1

Master: G. Casiez; Multitouch interaction, 7h, M2, Telecom Lille 1

Master: G. Casiez, D. Marchal, F. Aubert & T. Pietrzak; Virtual Reality, 36h, M2, Univ. Lille 1

Master: D. Marchal; Introduction to Unity for Virtual Reality, 10h, M2, Univ. Lille 1

Master: D. Marchal; Game Developement with Unity, 21h, Formation professionnelle, Univ. Lille 1

Introduction to HCI, haptics and computer graphics, 12h, Ecole Centrale de Lille (G2): N. Roussel

8.2.2. Supervision

PhD in progress: Alix Goguey, "Ìnteracting between physical and digital tools", Univ. Lille 1, started October 2013, co-advised by G. Casiez and T. Pietrzak

PhD in progress: Andéol Evain, "Smart user interfaces based on BCI", Univ. Rennes 1, started September 2013, co-advised by A. Lecuyer (in Rennes), G. Casiez and N. Roussel

PhD in progress: Jonathan Aceituno, "Designing the ubiquitous desktop", Univ. Lille 1, started October 2011, advised by N. Roussel

Yosra Rekik, “Multi-finger gestural interaction”, Univ. Lille 1, started September 2010, co-advised by L. Grisoni and N. Roussel

PhD in progress: Jérémie Gilliot, “Interactions multi-points indirectes sur grands écrans”, Univ. Lille 1, started December 2010, co-advised by N. Roussel and G. Casiez, defense expected in February 2014

PhD in progress: David Selosse, “Annotation interactive de modèles 3D, application à la reconstruction”, Univ. Lille 1, started October 2009, co-advised by L. Grisoni and J. Dequidt

PhD: Gina Craciun, “Nouvelles interfaces pour la simulation des opérations d’assemblage dans des environnements virtuels”, Suceava Univ. (Romania), defended, co-advised by L. Grisoni and S-G. Pentiuc

PhD: Yi Yang, “Design and Control of an integrated haptic interface for touch screen applications”, Beihang University, November 2013, co-supervised by B.Semail, Yuru Zheng (in Beihang University) and M. Amberg

PhD in progress: Wael Ben Messaoud, “Développement et contrôle d’un stimulateur tactile pour textures réelles”, University Haute-Alsace, started september 2012, co-supervised by B. Semail and M.-A Bueno (in University Haute-Alsace)

PhD in progress: Sofiane Ghenna, “Modélisation et commande multimodales d’actionneurs piézoélectriques”, Univ. Lille1, started October 2013, co-supervised by F.Giraud and C. Giraud-Audine (Arts et Métiers Paris Tech)

PhD in progress: Eric Vezzoli, “Analysis of the interaction between a fingertip and a surface in case of a global tactile stimulation”, Univ. Lille1, supervised by B. Semail

PhD in progress: Thomas Sednaoui, “Design and optimization of tactile stimulators”, Univ. Lille1, co-supervised by B. Semail and C. Chappaz (ST-Microelectronics)

PhD in progress: Nicolas Bremard, “Interaction hybride via smarthphone”, Univ. Lille1, started December 2012, co-advised by L. Grisoni and F. Aubert

8.2.3. Juries

PhD committees

- Cyprien Pindat (Univ. Paris-Sud, December): G. Casiez, reviewer
- Huiyuan Cao (Université de Technologie de Compiègne, November): N. Roussel, reviewer
- Dong-Bach Vo (Télécom ParisTech, September): N. Roussel, reviewer
- Simon Perrault (Télécom ParisTech, May): G. Casiez, reviewer
- Bérenger Arnaud (Univ. Montpellier 2, April): N. Roussel, reviewer
- Mikaël Martin (Ensam ParisTech, November): F. Giraud, reviewer
- Edouard Leroy (CEA, Polytechnique, December), B. Semail reviewer

8.3. Popularization

- “*Douglas Engelbart, inventeur et visionnaire*”, an article for the Interstices web site (J. Aceituno & N. Roussel, December 20th)
- MIRIM, an installation within Inria’s demonstration area at EuraTechnologies to illustrate the experimental nature of HCI research (M. Amberg, M-A. Dupré & N. Roussel, starting from October)
- Interview with Benoit Georges, from Les Echos, published as a supplement to his article on novel interfaces for tablets, smartphones and computers (N. Roussel, October 14th)
- *Chercheurs itinérants*: brief introduction to research topics for high-school students (J. Aceituno, L. Grisoni, L. Potier, H. Rateau, Y. Rekik & N. Roussel, October)

- Invited talk for a group of high-school teachers from Nice academy involved in the ISN (*informatique et sciences du numérique*) specialty (N. Roussel, June 4th)
- Co-organization of the press and VIP tour of the interactive exhibition of the ACM CHI conference in Paris (N. Roussel, April 29th)
- "*A propos de l'interaction homme-machine*", a podcast for the Interstices web site (N. Roussel, April 26th)
- Invited talk as part of the launch of the 2013 "Questions numériques" publication by FING (N. Roussel, February 21st)

9. Bibliography

Major publications by the team in recent years

[1] M. BIET, F. GIRAUD, B. LEMAIRE-SEMAIL. *Squeeze film effect for the design of an ultrasonic tactile plate*, in "IEEE Transactions on Ultrasonic, Ferroelectric and Frequency Control", December 2007, vol. 54, n^{o} 12, pp. 2678-2688, http://dx.doi.org/10.1109/TUFFC.2007.596

[2] G. CASIEZ, N. ROUSSEL. *No more bricolage! Methods and tools to characterize, replicate and compare pointing transfer functions*, in "Proceedings of UIST'11", ACM, October 2011, pp. 603-614, http://dx.doi.org/10.1145/2047196.2047276

[3] G. CASIEZ, N. ROUSSEL, R. VANBELLEGHEM, F. GIRAUD. *Surfpad: riding towards targets on a squeeze film effect*, in "Proceedings of CHI 2011", ACM, May 2011, pp. 2491-2500, "Honorable mention" award (top 5%), http://dx.doi.org/10.1145/1978942.1979307

[4] G. CASIEZ, D. VOGEL, R. BALAKRISHNAN, A. COCKBURN. *The impact of control-display gain on user performance in pointing tasks*, in "Human-Computer Interaction", 2008, vol. 23, n^{o} 3, pp. 215–250, Taylor and Francis, http://dx.doi.org/10.1080/07370020802278163

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[10] D. VOGEL, G. CASIEZ. *Conté: multimodal input inspired by an artist's crayon*, in "Proceedings of UIST'11", ACM, October 2011, http://dx.doi.org/10.1145/2047196.2047242

Publications of the year

Articles in International Peer-Reviewed Journals

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[12] F. GIRAUD, C. GIRAUD-AUDINE, M. AMBERG, B. LEMAIRE-SEMAIL. *Vector control method applied to a traveling wave in a finite beam*, in "Ultrasonics, Ferroelectrics and Frequency Control, IEEE Transactions on", January 2014, vol. 61, n° 1, pp. 147-158 [*DOI :* 10.1109/TUFFC.2014.6689782], http://hal.inria.fr/hal-00924624

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[16] J. ACEITUNO, G. CASIEZ, N. ROUSSEL. *How low can you go? Human limits in small unidirectional mouse movements*, in "CHI'13, the 31th Conference on Human Factors in Computing Systems", Paris, France, April 2013, pp. 1383-1386 [*DOI :* 10.1145/2470654.2466182], http://hal.inria.fr/hal-00799954

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[28] J. ACEITUNO, N. ROUSSEL. , *The Hotkey Palette: Flexible Contextual Retrieval of Chosen Documents and Windows*, Inria, June 2013, n° RR-8313, 10 p. , http://hal.inria.fr/hal-00829917

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