Rethinking Interaction:
From instrumental interaction to human-computer partnerships

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Abstract

The extraordinary advances in hardware and networking technology over the past 50 years have not been matched by equivalent advances in software. Today's interactive systems are fraught with limitations and incompatibilities: they lack interoperability and flexibility for end users. The goal of this workshop is to rethink interaction by identifying frameworks, principles and approaches that break these limitations and create true human-computer partnerships.

Author Keywords

Design Principles; Human-Computer Partnerships; Instrumental Interaction; Information Substrates; Co-Adaptive Systems.

ACM Classification Keywords

H.5.2. User interfaces (Interaction styles).

Introduction

Over the past 50 years, human-computer interaction has moved from the command-line to graphical user interfaces, first on the desktop then on mobile devices, and now includes voice input and various forms of mixed and virtual reality. This evolution has led to a

highly fractured world organized around closed applications, non-interoperable online services and proprietary file formats. More and more often, applications create walled gardens under the strict control of a software vendor. Users' data is trapped in 'information silos' that restrict use and limit potential applications. At the same time, artificial intelligence techniques are becoming ever more popular for making recommendations and automating users' tasks.

The net result is a loss of control by human users of their digital environment. People have proven to be incredibly adept at appropriating physical objects by turning them into tools, and at using technology in ways for which it was not designed. However, the digital world is not designed for appropriation: most software is rigid and brittle and does not easily support user customization. Despite its name, software is not particularly soft.

The goal of the workshop is to discuss theoretical frameworks that help us rethink user interaction with the digital world and address the issues outlined above. We identify three primary challenges:

- How can we create interactive digital environments that are flexible enough to support appropriation by end users?

- How can we combine human intelligence with artificial intelligence to optimally benefit human activities rather than simply replace them?

- How can we help users shift easily across different types of human-computer partnerships, from full user control to full automation?

The workshop organizers have developed widely disseminated strategies that will serve as a starting point for the workshop. Instrumental interaction [1] takes advantage of our familiarity with tools, which mediate interaction by reifying abstract commands. For example, a scrollbar reifies the action of navigating through a document by creating a visual object that can be manipulated directly. Together with reification, the design principles of polymorphism and reuse [2] have proven particularly effective for generating new interaction techniques that are simultaneously more simple and more powerful than the state of the art, such as magnetic guidelines to align and distribute graphical objects [4].

Co-adaptation [6] is a natural phenomenon in which users *adapt* their behavior to the system's constraints, learning both its power and its idiosyncrasies, and users also *appropriate* the system, adapting it to meet immediate needs in the current context of use, often in ways unanticipated by the system designer. Making interactive technology explicitly co-adaptive requires support for both learning and appropriation. We envision a world in which users begin with simple instruments and, over time, add power and expressivity to meet their individual preferences and current needs. Co-adaptive instruments have a life cycle as well as a power curve: users may learn to use progressively more complex instruments, which they can customize over time. The goal is to create powerful and flexible partnerships between human users and interactive technology, not just for experts but for everyone.

Human-computer partnerships can take multiple forms. We can think of computers in the first person, as tools for augmenting our cognitive and physical capabilities.

This is the realm of human-computer interaction, and instrumental interaction in particular. We can also think of computers in the second person, as servants that we command to perform activities for us. This is the realm of artificial intelligence and machine learning. Finally, we can think of computers in the third person, as a medium that supports interaction among human beings. This is the realm of mediated communication. When we combine, for example, aspects of instrumental interaction with machine learning, we begin to create truly advanced human-computer partnerships, in which interactive systems both empower and serve their human users.

The workshop will address these and other approaches, such as Reality-Based Interfaces [5] and 3rd wave HCI [3], in order to create an agenda for future research. The specific goals of the Rethinking Interaction Workshop are to:

- Develop a research agenda that allows researchers to question the current foundations of graphical user interfaces in order to rethink interactive systems;

- Provide a forum for senior and junior researchers to share insights and develop an active network; and

- Create an interactive space and a set of resources for researchers and practitioners to discuss and share their ideas.

Organizers

Michel Beaudouin-Lafon (Ph.D., Université Paris-Sud) is a Professor of Computer Science, *classe exceptionnelle*, at Université Paris-Sud and a senior fellow of Institut Universitaire de France. He has published over 170 papers and is a member of the ACM SIGCHI Academy. His research interests include fundamental aspects of interaction, novel interaction techniques, computer-supported cooperative work and engineering of interactive systems. He is the laureate of an ERC Advanced Grant for his work on instrumental interaction and information substrates. Michel was director of LRI, the laboratory for computer science joint between Université Paris-Sud and CNRS (280 faculty, staff, and Ph.D. students), and now heads the Human-Centered Computing lab at LRI. He was Technical Program Co-chair for CHI 2013, sits on the editorial boards of ACM Books and ACM TOCHI, and has served on many ACM committees. He received the ACM SIGCHI Lifetime Service Award in 2015.

Wendy E. Mackay (PhD, Massachusetts Institute of Technology) is a Research Director, *classe exceptionnelle*, at Inria Saclay - Île-de-France and Université Paris-Saclay. She has managed research groups at Digital Equipment and Xerox EuroPARC, which were among the first to explore interactive video and tangible computing. She served as Vice President for Research at the University of Paris-Sud and as Visiting Professor at Stanford University and Aarhus University, where she recently received the Doctor Honoris Causa. Wendy is a member of the ACM CHI academy and received the ACM/SIGCHI Lifetime Achievement Service Award in recognition of her work as Chair of ACM/SIGCHI, General Chair of CHI'13, and multiple other roles within ACM and SIGCHI. She is the laureate of an ERC Advanced Grant for her research on co-adaptive instruments and human-computer partnerships. She has published nearly 200 peer-reviewed research articles in the area of Human-computer Interaction. Her current research interests include human-computer partnerships, creativity support, mixed reality and interactive paper, and multidisciplinary participatory design methods.

Workshop Website

Additional information about the workshop, including the above description as well as instructions for submissions, program committee members, schedule and keynote speakers, are available at: *http://ex-situ.fr/workshops/RethinkingInteraction-18*.

Pre-Workshop Plans

Before the workshop, the organizers will contact leading members of the HCI community, who will serve as members of the program committee. The workshop will be advertised to the HCI community, including posting to relevant mailing lists. Once workshop decisions have been made, workshop materials, relevant foundational research articles and position papers from participants will be posted on the website.

This workshop follows two workshops held in Paris funded by the organizers' European Research Council grants[1]. The organizers can fund travel expenses for up to four students to attend the workshop, to encourage the participation of more junior researchers who are interested in the long-term direction of the field.

Post-Workshop Plans

The website will provide a forum for ongoing discussion after the workshop. We will invite workshop participants to contribute to a white paper that outlines strategies for fundamentally rethinking the design of interactive systems. We will also propose a summary article for *Interactions* magazine intended for a more general audience. We plan to run additional workshops in Paris, sponsored by the organizers' ERC grants, with funding to support travel by junior researchers.

Workshop Organization

This one-day workshop will be held on Sunday, 22 April 2018 with 15 to 20 participants, and the following agenda:

9:00 - 9:15   Welcome   (15 minutes)
The workshop organizers introduce the workshop agenda and goals.

9:15 - 10:15   Keynotes   (60 minutes)
Descriptions of theoretical principles.

10:15 - 10:30   Break   (15 minutes)

10:30 - 12:30   Presentations   (120 minutes)
Participants give short presentations about the interaction design principles that underlie their work.

12:30 - 13:30   Lunch Break   (60 minutes)

13:30 - 15:00   Group Activities   (90 minutes)
Participants work in groups to compare and contrast different design principles as well as identify gaps and areas requiring future research.

15:00 - 15:30   Break   (30 minutes)

15:30 - 16:30   Groups Feedback (60 minutes)
Each group presents their work.

16:30 - 17:00   Wrap-Up   (30 minutes)
The workshop will conclude with a group discussion about the outcomes of the day, summarizing the take-away opportunities for future research. Participants will also be encouraged to contribute to the white paper and *Interactions* magazine article.

Call for Participation

We invite position papers for the CHI 2018 Workshop on *Rethinking Interaction: From Instrumental Interaction to Human-Computer Partnerships*.

Today's interactive systems are fraught with limitations and incompatibilities: they lack interoperability and flexibility for end users. This one-day workshop offers an interdisciplinary forum for researchers interested in challenging the fundamental assumptions that underlie today's graphical user interfaces. We will build upon existing design principles, such as instrumental interaction and co-adaptive systems, to rethink how to create productive human-computer partnerships. We will address three primary challenges:

- How can we create interactive digital environments that are flexible enough to support appropriation by end users?

- How can we combine human intelligence with artificial intelligence to optimally benefit human activities rather than simply replace them?

- How can we help users shift easily across different types of human-computer partnerships, from full user control to full automation?

We welcome submission of 3-4 page position papers in the CHI Extended Abstracts Format (excluding references) that describe theoretical frameworks or real-world examples that exceed the limits of current interactive systems. Submission instructions and additional information about the workshop are available on the workshop website:
http://ex-situ.fr/workshops/RethinkingInteraction-18

All papers will be reviewed by program committee members based on their relevance to the workshop and the likelihood of contributing to a lively discussion. At least one author of each accepted paper must attend the workshop and all participants must register for both the workshop and for at least one day of the conference. We will provide a limited number of grants for Ph.D. students to attend the workshop.

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