
Blended Interaction: Envisioning Future Collaborative Interactive Spaces

Hans-Christian Jetter

Human-Computer Interaction
Group
University of Konstanz
Konstanz, Germany
hans-christian.jetter@uni-
konstanz.de

Harald Reiterer

Human-Computer Interaction
Group
University of Konstanz
Konstanz, Germany
harald.reiterer@uni-konstanz.de

David Benyon

School of Computing
Edinburgh Napier University
Edinburgh, Scotland
D.Benyon@napier.ac.uk

Raimund Dachsel

Interactive Media Lab Dresden
Technische Universität Dresden
Dresden, Germany
dachsel@acm.org

Aaron Quigley

School of Computer Science
University of St Andrews
St Andrews, Scotland
aquigley@st-andrews.ac.uk

Michael Haller

Media Interaction Lab
Upper Austria University of
Applied Sciences
Hagenberg, Austria
haller@fh-hagenberg.at

Abstract

Blended Interaction is interaction in physical environments including meeting rooms, design studios, or libraries, that are augmented with new UI technologies to *blend* the power of digital computing with natural work practices and collaboration styles. It combines the virtues of physical and digital artifacts so that desired properties of each are preserved and computing is integrated in a considered manner. Since rapid technological advances constantly challenge existing designs, we believe that HCI should move beyond creating new technologies, single applications, and novel interaction techniques towards an overarching unified vision and theory of *Blended Interaction*. Our workshop will bring together leading experts in cognitive theories and post-WIMP designs and technologies to create this unified view of *Blended Interaction* in a multidisciplinary approach.

Keywords

blended interaction; post-WIMP user interfaces; HCI theory; ubiquitous computing; collaboration; embodied cognition; reality-based interaction

ACM Classification Keywords

H.5.2 [Information Interfaces and Presentation]: User Interfaces—input devices and strategies;

Copyright is held by the author/owner(s).
CHI 2013 Extended Abstracts, April 27–May 2, 2013, Paris, France.
ACM 978-1-4503-1952-2/13/04.

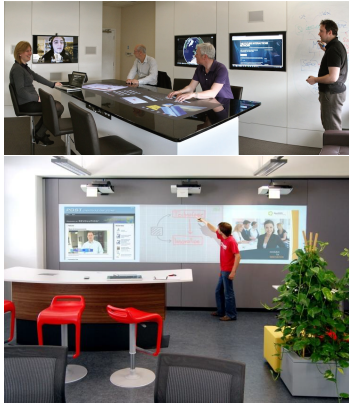


Figure 1: Examples of *Blended Interaction* from [1,2].

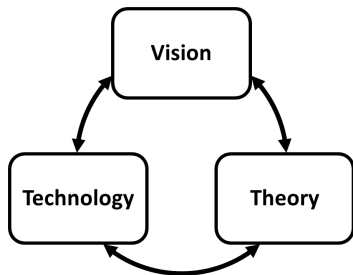


Figure 2: The three pillars of *Blended Interaction*.

Introduction

By *Blended Interaction* we understand interaction in physical environments including meeting rooms, design studios, or libraries, that are augmented with new UI technologies to *blend* the power of digital computing with natural work practices and collaboration styles [7]. *Blended Interaction* combines the virtues of physical and digital artifacts and practices, so that desired physical properties, e.g., being graspable or siftable, are preserved while integrating computing power in a considered manner. Computing is woven into the fabric of our natural physical and social environment without being too obtrusive or disruptive. Using it does not create the cognitive load (or “mental gymnastics” [12]) of using today’s desktop computers, so that we are freed to use computers without thinking and to focus beyond them on new goals [12]. As a consequence, the quality of *Blended Interaction* is judged by its compatibility with our natural cognitive processes when we interact and collaborate in the real non-digital world.

Although visions of such interactive spaces date back to the 1990s (e.g., [12]), rapid technological advances require us to constantly rethink their design. Technological progress steadily introduces new but also competing solutions. Novel interaction techniques widen the design space, but little contribute to a generalizable theory or framework of interaction. As a result, designers are left alone with a vast design space and without generalizable theories, models, or design principles. Therefore, we believe that HCI needs a more holistic, domain-independent, and theoretical view to approach post-WIMP interaction. It should move beyond simply creating new technologies, applications, and interaction techniques towards a vision and theory of future post-WIMP interaction in interactive spaces. This workshop will bring together leading experts in theories, designs, and technologies to establish this novel approach and to base it on the three pillars of *Blended Interaction*: *technology*, *vision*, and *theory*.

Technology for Blended Interaction

Novel post-WIMP technologies ultimately define how we will interact in interactive spaces. In the case of *Blended Interaction* it means interaction with physical and digital artifacts (1.) that takes place across device boundaries on multiple public, private, mobile, and tangible displays [1,10,11]; (2.) involves collaboration of co-located users, e.g., around interactive tabletops [1,8] or in front of large vertical screens [2]; (3.) is based on non-traditional post-WIMP interaction styles, e.g., pen-based [2], multi-touch, and tangible user interfaces [8]; (4.) and seeks new forms of providing functionality beyond the traditional WIMP model of “applications”, e.g., object-oriented UIs [6] or instrumental interaction [9]. This workshop invites creators of novel technologies to contribute their expertise on novel input and output devices, sensor technologies, computer vision, gesture recognition, and software frameworks to create a common understanding of what will drive future post-WIMP interaction. Furthermore, attendees from other fields of expertise will help to critically reflect on the benefit of novel technologies and designs in the light of recent user research and cognitive theories and models.

Vision of Blended Interaction

In its past, HCI has benefited from ambitious visions of future interaction such as Apple’s Knowledge Navigator or Mark Weiser’s “A day in the life of Sal” [12]. Although visions are not always helpful and can also lead into wrong directions, we believe that HCI as a discipline needs to create a new overarching vision of future post-WIMP interaction. This vision is intended to inform researchers, designers, and laymen likewise: For researchers, a vision can serve to illustrate research goals, trigger new research directions, and create awareness for as yet unreflected presuppositions in our field. For designers, visions help to present concepts and technologies as a part of a believable scenario and not only in the isolation of conference papers. Furthermore, visions serve to fascinate



Figure 3: Examples of *Blended Interaction* from [8,10].

and inspire laymen, who prefer to learn about future technologies from narrations instead of from purely technical publications. Our workshop aims at creating a unified vision of *Blended Interaction* based on the individual contributions and experiences of the workshop attendees. This vision will be developed in highly interactive project groups and prototyped using simple non-digital materials, to be summarized and published to the HCI community in a shareable format (e.g., web page, YouTube video) after the workshop. The envisioning process will be guided by the principle of thoughtfully *blending* advantages of the physical and digital world. To ensure that our vision is credible and not science-fiction, it is developed together with the participating experts on technologies and technological feasibility and critically reflected in the light of cognitive theories of interaction. By this, we want to fuse the perspectives of user researchers, designers, and technologists, primarily to achieve a more realistic vision, but also to transfer knowledge between the different communities.

Theory of Blended Interaction

In the light of the countless variants and dynamics of post-WIMP interaction, traditional collections of design guidelines or “golden rules” cannot provide enough guidance about “good” or “bad” designs. Instead, we need better theories and models of human cognition to be able to understand and classify new post-WIMP interaction designs and to predict their appropriateness. In the workshop, we will use Jacob et al.’s framework of Reality-based Interaction (RBI) as a starting point [5]. RBI UIs build on users’ pre-existing knowledge of the everyday, non-digital world and use good tradeoffs between the power of the digital world and our familiarity with the real world. However, RBI alone is not sufficient. To understand the relation between our experience of the physical and social environment and our cognition, we must consider theories from *embodied cognition* and *cognitive linguistics*. Their concepts of *conceptual blending* or *blends* [4] explain how we create higher-level emergent

cognitive structures from lower-level physical and social experiences, even to the extent of learning to use a complex symbolic programming language as a UI. However, the more interaction design relies on lower-level concepts and direct experiences from the real world such as *image schemas* [3], the easier users will find it to comprehend and use. Currently, these theories and models are still scattered across different fields, ranging from software engineering to tangible user interfaces. The workshop will be an excellent opportunity to collect and discuss this existing knowledge and to establish a basis for a unifying theory.

Workshop Approach

The workshop is intended as a forum for 15-20 attendees with multidisciplinary backgrounds and not as a mini-conference. We want to achieve a productive and critical reflection on *Blended Interaction* by letting experts from different fields work on a shared vision and theory. Therefore, we will carefully select attendees to ensure an equal distribution of expertise across the three pillars *technology*, *vision*, and *theory*. The workshop will be structured into 5 phases P1-P5: P1 will allow attendees to introduce themselves and their work in brief Pecha Kucha presentations. P2 will establish a common ground for the workshop (e.g., goals, terminology) by one invited longer impulse talk for each of the three pillars. P3 will be dedicated to envisioning: Participants are split into groups of 3-4 persons with an equal distribution of expertise on the three pillars within each group. Each group will envision future concepts of *Blended Interaction* for the particular context of a given physical environment (e.g., meeting room, design studio, library). Groups will rapidly prototype their vision using paper or other traditional crafting material. This underlines our idea of a blend between the physical and digital and our goal of letting participants rediscover the many virtues of physical artifacts. In P4 groups will present their results to the workshop to let the audience experience the envisioned interaction, e.g.,

by acting out. After each presentation, the concept will be discussed and reflected on by all. By this we intend to reconnect the visions to the theory of *Blended Interaction*: Experts on different theories (e.g., blending theory, image schemas) will comment on the concepts from their perspective and trigger a discussion about generalizable cognitive models. P5 will be dedicated to an in-depth discussion about particular research dimensions and topics based on the previous phases. Suggestions for these topics will be collected throughout the entire workshop on a wall and are clustered by a facilitator for discussion. During P1-P5, we capture results and discussions in formats that can be made accessible to the HCI community after the workshop, e.g., video recording, photos, scans. Furthermore, a mindmap will be created and updated by a facilitator to collect abstract ideas, topics, problems, and visions.

References

1. Benyon, D. and Mival, O. Blended Spaces for Collaborative Creativity. *DCIS 2012 (an AVI 2012 workshop)*, HCI Group, University of Konstanz (2012). http://hci.uni-konstanz.de/downloads/dcis2012_Benyon.pdf
2. Haller, M., Leitner, J., Seifried, T., Wallace, J.R., Scott, S.D., Richter, C., Brandl, P., Gokcezade, A., and Hunter, S. The NiCE Discussion Room: Integrating Paper and Digital Media to Support Co-Located Group Meetings, *Proc. CHI 2010*, ACM Press (2010), 609-18.
3. Hurtienne, J. and Israel, J.H. Image schemas and their metaphorical extensions: intuitive patterns for tangible interaction, *Proc. TEI '07*, ACM Press (2007), 127-34.
4. Imaz, M. and Benyon, D., *Designing with Blends: Conceptual Foundations of Human-Computer Interaction and Software Engineering*, MIT Press, 2007.
5. Jacob, R.J.K., Girouard, A., Hirshfield, L.M., Horn, M.S., Shaer, O., Solovey, E.T., and Zigelbaum, J. Reality-based interaction: a framework for post-WIMP interfaces, *Proc. CHI '08* ACM Press (2008), 201-10.
6. Jetter, H.C., Zöllner, M., Gerken, J., Reiterer, H. Design and Implementation of Post-WIMP Distributed User Interfaces with ZOIL, *International Journal of Human-Computer Interaction* 28, 11 (2012), 737-47.
7. Jetter, H.C., Geyer, F., Schwarz, T., and Reiterer, H. Blended Interaction - Toward a Framework for the Design of Interactive Spaces. *DCIS 2012 (an AVI 2012 workshop)*, HCI Group, University of Konstanz (2012). http://hci.uni-konstanz.de/downloads/dcis2012_Jetter.pdf
8. Jetter, H.C., Gerken, J., Zöllner, M., Reiterer, H., and Milic-Frayling, N. Materializing the query with facet-streams: a hybrid surface for collaborative search on tabletops, *Proc. CHI '11* ACM Press (2011), 3013-22.
9. Klokmose, C.N. and Beaudouin-Lafon, M. VIGO: instrumental interaction in multi-surface environments, *Proc. CHI '09* ACM Press (2009), 869-78.
10. Spindler, M., Martsch, M., and Dachsel, R., Going beyond the surface: studying multi-layer interaction above the tabletop, *Proc. CHI '12*, ACM Press (2012), 1277-86.
11. Terrenghi, L., Quigley, A., and Dix, A. A taxonomy for and analysis of multi-person-display ecosystems, *Personal Ubiquitous Comput.* 13, 8 (2009), 583-98.
12. Weiser, M., 'The computer for the 21st century', *Scientific American*, 3 (1991), 94-104.