

Editorial

Florian Echtler*, Michaela Honauer, Valérie Maquil, and Bernard Robben

Editorial

<https://doi.org/10.1515/icom-2018-0039>

„The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.” [7] Digitalization – the weaving of computer technology into everyday life – determines today’s reality. Terms such as Tangible Interfaces, Tangible Surfaces or Embodied Interaction refer to an aspect of this development in which virtual and physical realities combine and merge in a novel way.

Tangible Interaction (in German: Be-greifbare Interaktion) takes place at the overlap of the physical and the digital world, and increasingly gains significance for application fields such as education and assistive living. Researchers, designers, engineers, and artists have been exploring this topic for many years now, and investigated theoretical foundations, working prototypes or high fidelity applications for end users that make the digital world perceivable through physical objects. This approach is characterized by interaction paradigms which go beyond the desktop and graphical user interfaces. We are humans living in physical world and contemporary technologies can support us with applications and devices that go beyond just a two-dimensional small-scale screen interface. Ishii and Ullmer describe the fundamental concept as follows: “Tangible Bits allows users to ‘grasp & manipulate’ bits in the center of users’ attention by coupling the bits with everyday physical objects and architectural surfaces. Tangible Bits also enables users to be aware of background bits at the periphery of human perception using ambient display media such as light, sound, airflow, and water movement in an augmented space” [3].

Being guided by the concept of tangible interaction with digital media means exploring the tangible and ex-

periential space of the digital media and researching the relationship between the senses – each in their special relation to the data. Demanding the quality of “be-greifbar” (graspable) is not identical with the romantic demand to combat the supremacy of the visual in the digital media domain and to regain sensuality through grasping. This would mean to misunderstand the properties of the medial and semiotic. Digital media are always bound to the material, but they only generate information through detachment, through difference and form formation [6].

In 2008, the German working group on tangible interaction (*Arbeitskreis Be-greifbare Interaktion in gemischten Wirklichkeiten*) was founded in Bonn. In April 2012 it became a special interest group of the *Informatics Society* in the chapter of *Human Computer Interaction* (Fachgruppe der Gesellschaft für Informatik im Fachbereich MCI). Researchers in computer science, psychology, sociology, engineering, as well as designers and artists collaborate in this circle. The working group organizes semi-annual workshops. One workshop a year is dedicated to the development and exchange of scientific concepts and takes place at the *Mensch und Computer* conference of the German Informatics Society. Another annual event is the so-called “Inventor’s Workshop” where current methods and tools are explored in a more practical and *hands-on* manner. In joint publications (e. g. [1] [2]) and in cooperation with related working groups in other European countries (e. g. [4]), the topic of tangible interaction is being worked on in a lively and controversial-productive way. Furthermore, Preim and Dachsel dedicate a whole chapter to tangible interaction in their handbook of interactive systems [5].

On the occasion of the 10th anniversary of the special interest group, we collect current projects in this special issue under the umbrella topic “Tangible Interaction and its Applications”.

In the context of education, tangible digital media form a field of research that raises a number of theoretical and practical questions: How to learn with interactive media, through body and space? How can e-learning scenarios be made tangible? Such questions become fundamental and case studies in various fields, such as school, extracurricular or university, are treated. Lahure et al. investigate in a case study how design mechanisms might be

*Corresponding author: Florian Echtler, Bauhaus-Universität Weimar, Fakultät Medien, Bauhausstr. 11, 99423 Weimar, Germany, e-mail: florian.echtler@uni-weimar.de

Michaela Honauer, Bauhaus-Universität Weimar, Fakultät Medien, Bauhausstr. 11, 99423 Weimar, Germany, e-mail: michaela.honauer@uni-weimar.de

Valérie Maquil, Luxembourg Institute of Science and Technology (LIST), 5, av des Hauts Fourneaux, L-4362 Esch/Alzette, Luxembourg, e-mail: valerie.maquil@list.lu

Bernard Robben, Universität Bremen DiMeB, FB3, Bibliotheksstraße 1, 28334 Bremen, Germany, e-mail: robben@uni-bremen.de

integrated in a problem solving activity on a tangible tabletop in order to slow down interactions and avoid pure trial-and-error solving approaches. Reinschlüssel et al. investigate the potential of using tangible user interfaces for algebra learning. They experiment with smart objects. These objects are based on traditional algebra tiles, which are passive mathematical manipulatives. The authors present their resulting system and discuss design implications for tangible user interfaces in this context. Finally, Robben et al. present their thoughts about how interaction design may allow us to create “begreifbare” learning spaces, i. e. environments where knowledge is constructed through reflective experience during design activities. They propose a framework of Interaction Design for Reflective Experience (RED) based on the categories of space, experience, model and reflection.

Our other articles primarily focus on a workspace context: How can tangible interaction be employed in everyday office tasks? How could future interactions with artificial assistants be made tangible? Which tasks are suited for interaction with elastic displays? Based on a needs assessment study, and the subsequent design of two tangible systems supporting awareness among working colleagues, Matviienko et al. present interesting considerations related to the design space of metaphor-based ambient tangible systems. Hemmert et al. present a design fiction imagining a future workplace in which interaction with intelligent assistants is made tangible through a variety of interfaces. These include a ritual sacrifice place for phones, or a data logger made from concrete, and lead to a collection of design principles for tangible interaction with AI. Last but not least, Kammer et al. discuss the tangible aspects of elastic displays and their relation to other novel display types such as flexible or deformable displays. Based on this analysis, the authors contribute a

task taxonomy for elastic displays to classify underlying technologies, content types, and interaction styles.

We are confident that this special issue will provide some insight into the diverse ongoing research and discourse about tangible interaction in Europe today, and hope our readers will enjoy reading.

References

- [1] Eva Hornecker, Marius Brade, Dietrich Kammer und Johann Habakuk Israel (Eds.) 2012. *Be-greifbare Interaktion*. i-com Band 11, Heft 2.
- [2] Informatik-Spektrum October 2014, Volume 37, Issue 5. *Interaction Beyond the Desktop*. Springer-Verlag Berlin Heidelberg.
- [3] Hiroshi Ishii and Brygg Ullmer. 1997. Tangible bits: towards seamless interfaces between people, bits and atoms. In: CHI'97 Proceedings of the ACM SIGCHI Conference on Human factors in computing systems, pp. 234–241.
- [4] Sophie Lepreux, Julien Castet, Nadine Couture, Emmanuel Dubois, Christophe Kolski, Valérie Maquil, Guillaume Rivière. 2017. *Interaction Tangible sur Table, un cadre fédérateur illustré*. Journal d'Interaction Personne-Systeme (JIPS), AFIHM 2017, Volume 5, Number 1, pp. 23–59.
- [5] Bernhard Preim, Raimund Dachsel. 2015. *Interaktive Systeme. Band 2: User Interface Engineering, 3D-Interaktion, Natural Interfaces*. Springer Vieweg Berlin u. a. (Kapitel 12: Tangible User Interfaces).
- [6] Bernard Robben 2012. *Die Bedeutung der Körperlichkeit für be-greifbare Interaktion mit dem Computer*. In: Bernard Robben and Heidi Scheilhowe (Eds.), 2012. *Be-greifbare Interaktionen. Der allgegenwärtige Computer: Touchscreens, Wearables, Tangibles und Ubiquitous Computing*. Transcript Verlag Bielefeld.
- [7] Mark Weiser. 1999. *The Computer for the 21st century*. ACM SIGMOBILE Mobile Computing and Communications Review – Special issue dedicated to Mark Weiser Homepage archive, Volume 3, Issue 3, July 1999, pp. 3–11.