Tangibles for Children, the Challenges

Bieke Zaman

IBBT/CUO, KULeuven
Parkstraat 45 bus 3605
3000, Leuven, Belgium
vero@groept.be

Vero Vanden Abeele

eMedialab, Group T Leuven, CUO
Vesaliusstraat 13. 3000, Leuven,
Belgium
vero@groept.be

Panos Markopoulos

Eindhoven University of Technology
Den Dolech 2 5600 MB Eindhoven,
The Netherlands
P.Markopoulos@tue.nl

Paul Marshall

Dept. Computing Open University,
Walton Hall Milton Keynes, MK7 6AA,
UK p.marshall@open.ac.uk

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Abstract

A significant proportion of research in the field of tangible interaction involves children. A common aspiration is to offer benefits through tangibility, related to ease of use and overall user experience while also support learning and developmental processes. However, evaluation results are often equivocal, and expectations of researchers not always verified. This workshop aims to attract researchers who approach this topic of tangibility and children from an empirical or design perspective. The purpose is to obtain a good picture of what benefits we expect tangibility to provide (including novel and future applications), establish what is the current empirical evidence to support such claims (or what is missing), and motivate appropriate evaluation methodologies for children.

Keywords

Tangible and embedded interaction, child-computer interaction, evaluation methods

ACM Classification Keywords

H.5.2.3 [User Interfaces]: Theory and Methods

Introduction

In recent years, publications on tangible interaction have mushroomed. Academic researchers are inspired by the possibilities that tangible interaction offers, especially in relation to children [2,13,24,25]. A central

tenet for such works is that physical manipulation is embodied, and thus more natural, more fun [9,14].

Many research papers report on the details of tangible interface construction and the (anticipated) benefits that these tangibles (might) bring to young users in terms of usability, learning and user experience [12,4,19, etc.]. Unfortunately, a large proportion of evaluation studies are characterized by a low number of participants, the absence of comparative conditions, confounded designs with hidden variables. As a result, they often claim little reliability or validity. While exploratory user studies of this kind are necessary, the time seems right to validate the strong claims put forward regarding usability, fun and learning. We [25,18] and other researchers [23] have argued that research on tangible interaction lacks empirical validation of the alleged positive effects. In order to support the development of the field, it is necessary that empirical studies closely match the design and technological innovations. As the field expands and addresses new challenges, it is important to be clear about the main motivations and assumptions regarding the benefits of tangible interaction and to seek empirical evidence for these. In this abstract, we first discuss the evolving perspective on tangible interaction and why this is complicating empirical validation. We then discuss the methodological problems of involving young children in the evaluation of tangibles. We conclude with a description of the contributions invited to the workshop.

The evolving field of tangible interaction: the challenge of empirical validation

When we go back to the roots of tangible interaction, the first articles offer a data centered view, focusing on

the coupling between digital and physical information [22]. This research stems from engineering and cognitive psychology; researchers have built onto this vision of tangible interaction and provide formal models, taxonomies and ontologies that describe the relation of these couplings [22,16]. As the field on tangible interaction grew, the vision on tangibility broadened. Building on theories of phenomenology and ethnomethodology, Hornecker et al, broadened the definition [14]. Fernaeus [11] frames this 'practice turn' within a larger philosophical context and argues for an embodied, situated understanding of tangible interaction that avoids dualist notions of cognitive knowledge and bodily action, and does not reduce interaction to input and output. We embrace this view on tangible interaction that emphasizes the physical and social world. However, as a result of this broadening view, it has become less clear where the boundaries lie [13], and consequently, what the effects of tangibility on user interaction can be and how they should be measured. Scientific validation of tangible interaction is made difficult by the fact that the epistemological status of tangibility is not clear.

Young children and tangibles: the methodological challenges

Within the field of Child-Computer Interaction (CCI), researchers stress the importance of involving children in the design and evaluation of technologies [5,8]. However, the methodological knowledge of how they can successfully become research participants remains limited [13]. More 'traditional' research methods such as individual and group semi structured interviews are possible with children older than seven years old. However, less structured or alternative methods are needed for younger children [7]; this is especially true

when new interactive technologies are investigated (see [17]). In general, young children should not be underestimated as test participants and as a result, not all methods should be written off. Interviewers can ask children as young as four and five year old to describe an object to a listener. The This-or-That interview method for instance is a good alternative to the more traditional interview methods [1,25]. Some researchers use hand puppets [e.g. 6] to give children a more child friendly and familiar 'interviewer'. Focus groups are not so unusual for children who are used to discuss things in class [8]. Surveys can be drawn up if they contain closed ended questions [15]. Specialized survey tools have been developed to help solicit self reports by children regarding fun [20]. Practical recommendations have been published on involving children as informants and design partners [10]. In our search for appropriate methods to investigate the effects of tangible interaction with young children, we do not have to start from scratch. Educators and child psychologists have a tradition in examining learning effects with children. However, the number of cases in which children younger than six are involved, are limited [21]. As for usability evaluations, the CCI community has published many articles on the appropriateness of usability methods for young children [17,3]. Nevertheless, there is still a large gap in methodology relating to younger children. Especially when toddlers or preschoolers are involved, researchers often do not go further than reporting on children's enthusiastic reactions. In addition, methods that can be used for 'traditional' interfaces are not necessarily appropriate for validating the claims often associated with tangibility.

Contributions invited to this workshop

The proposed workshop aims to bring together design researchers pushing for innovation in the field of tangible interaction with researchers with experience of evaluation methodologies. The aim then is to make explicit some of the motivations and assumptions underlying current developments in tangible interfaces for children and to draw links to appropriate evaluation methodologies that exists or needs to be developed. This workshop will attempt to chart developments in the following areas:

- Empirical research on tangible interfaces or children
- Methods that are suitable for the evaluation of tangible interactive products for children
- Novel design concepts that extend the boundaries of what tangibility can offer to children

The workshop will aim to identify and classify current developments in the field, expected benefits from tangibility versus the empirical evidence of these benefits. It will further assess the extent to which current methodologies are suited for evaluating the benefits of tangibility. Finally, the workshop will produce a summary of related findings and identify directions for future research. The examples on this and following pages should help you get a feel for how screen-shots and other figures should be placed in the template. *Be sure to make images large enough so the important details are legible and clear.*

Your document may use color figures, which are included in the page limit; the figures must be usable when printed in black and white.

References

- [1] Abeele, V. and Zaman, B. The Unlikeability of a cuddle toy interface. In Proc. FnG (2008).
- [2] Antle, A. N. The CTI framework: informing the design of tangible systems for children. In Proc. TEI '07 (2007).
- [3] Barendregt, W., and Bekker, M. Extended guidelines for usability (and fun) testing with children. In Proc. of SIGCHI. NL Conference (2005).
- [4] Bonanni, L., Vaucelle, C., Lieberman, J., and Zuckerman, O. PlayPals: tangible interfaces for remote communication and play. In Proc. CHI '06 (2006).
- [5] Bruckman, A., and Bandlow, A. Human-Computer Interaction for Kids. In J. Jacko, and A. Sears (reds.), Handbook of Human Computer Interaction. London: Lawrence Erlbaum Associates Inc., 2003.
- [6] Cassidy, J. Child mother attachment and the self in six-year-olds. Child Development, 59 (1988), 121-134.
- [7] Christensen, P., and James, A. Conducting research with children. London: Routledge Falmer, 2000
- [8] Darbyshire, P., MacDougall, C., and Schiller, W. Multiple methods in qualitative research with children: More insight or just more? Qualitative Research 5,4 (2005), London: Sage Publications, 417-436.
- [9] Dourish, P. Where the Action Is: the Foundations of Embodied Interaction. MIT Press, 2001.
- [10] Druin, A. The Design of Children's technology. Morgan Kaufmann, 1998.
- [11] Fernaeus, Y., Tholander, J., and Jonsson, M. Towards a new set of ideals: consequences of the practice turn in tangible interaction. In Proc. TEI '08, ACM Press (2008), 223-230.
- [12] Frederking, J. Collaborative Play Through Digital and Physical Interaction. In Proc. IUI (2007).
- [13] Hengeveld, B., Hummels, C., Overbeeke, K., Voort, R., van Balkom, H., and de Moor, J. Let me actuate you. In Proc. TEI '08., 2008.
- [14] Hornecker, E. and Buur, J. Getting a grip on tangible interaction. In Proc. CHI 2006, ACM Press (2006), 437-446.
- [15] Irwin, L., and Johnson, J. Interviewing Young Children: Explicating Our Practices and Dilemmas. Qualitative Health Research 15, 6 (2005), Sage Publications, 821-831.
- [16] Koleva, B., Benford, S., Kher Hui Ng and Rodden, (2003). A Framework for Tangible User Interfaces, Physical Interaction. In Proc. Mobile HCI, (2003).
- [17] Markopoulos, P., Read, J., MacFarlane, S. and Hoysniemi, J. Evaluating children's interactive products. Morgan Kaufman 2008.
- [18] Marshall, P. Do tangible interfaces enhance learning? In Proc. TEI '07, (2007).
- [19] Raffle, H., Ishii, H., and Yip, L. Remix and Robo. In Proc IDC '07, (2007).
- [20] Read, J.C., and MacFarlane, S. Using the Fun Toolkit and Other Survey Methods to Gather Opinions in CCI. In Proc. IDC 2006, (2006), 81-88.
- [21] Staksrud, E., Livingstone, L., and Haddon, L. What do we know about children's use of online technologies? Report for EU kids online, 2007.
- [22] Ullmer, B. and Ishii, H. Emerging frameworks for tangible user interfaces. IBM Syst. J. 39, 34 (Jul. 2000), 915-931.
- [23] Xie, L., Antle, A. N., and Motamedi, N. Are tangibles more fun. In Proc. TEI '08 (2008).
- [24] Xu, D. Design and evaluation of tangible interfaces for primary school children. In Proc IDC '07 , (2007).
- [25] Zaman, B., and Abeele, V. How to Measure the Likeability of Tangible Interaction with Preschoolers. In Proc. CHI Nederland (2007), 57-59.