

**Proceedings of the 6th Workshop on Interacting with
Smart Objects**

**Florian Müller, Dirk Schnelle-Walka, Sebastian Günther, Markus
Funk**

Co-located with ACM Conference on Human Factors in Computing Systems (CHI '18)

Montreal, Canada

April 2018

Table of Contents

Preface	ii
Program Committee	iii
External Reviewers	iii
Author Index	iv
Keyword Index	vi
<hr/>	
Interactive Experiences	
<hr/>	
Enabling the Fabrication of Smart Devices	1
<i>Carlos Tejada, Osamu Fujimoto, Zhiyuan Li and Daniel Ashbrook</i>	
Beyond Math Manipulatives: Smart Tangible Objects for Algebra Learning	9
<i>Anke V. Reinschluessel, Tanja Döring, Dmitry Alexandrovsky, Danny Thieme and Rainer Malaka</i>	
Integrating Smart Objects into Self- Guided Exhibitions: Challenges of Supporting Self-Guided Exhibitions through Non-idiomatic Technologies	17
<i>Rameshnath Krishnasamy</i>	
An End-User Development Approach for Crafting Smart Interactive Experiences	23
<i>Carmelo Ardito, Paolo Buono, Maria Francesca Costabile, Giuseppe Desolda, Rosa Lanzilotti, Maristella Matera and Antonio Piccinno</i>	
<hr/>	
The Future of IoT	
<hr/>	
Designing the Fog: Towards an Intranet of Things	31
<i>Mathias Funk</i>	
<hr/>	
Smart Home	
<hr/>	
Control, Intervention, or Autonomy? Understanding the Future of Smart Home Interaction	39
<i>Jonas Auda, Sarah Faltaous and Stefan Schneegass</i>	
Adaptable Utterances in Voice User Interfaces to Increase Learnability	44
<i>Chelsea Myers, Anushay Furqan and Jichen Zhu</i>	
Energy Efficient Thermostats for Room Level Air Conditioning	50
<i>Milan Jain</i>	
<hr/>	
AR in the Industry	
<hr/>	
Design Recommendations for HMD-based Assembly Training Tasks	58
<i>Stefan Werrlich, Phuc-Anh Nguyen, Austino-Davis Daniel, Carlos Emilio Franco Yanez, Carolin Lorber and Gunther Notni</i>	
Comparison of Scan-Mechanisms in Augmented Reality-Supported Order Picking Processes	69
<i>Nela Murauer, Nerina Pflanz and Cecilia von Hassel</i>	

Preface

These are the proceedings of the 6th Workshop on Interacting with Smart Objects (SmartObjects '18) in conjunction with CHI'18 held on April 21, 2018, in Montreal, Canada. This volume contains the ten accepted papers. Each submission was reviewed by three program committee members.

Objects that we use in our everyday life are ever-expanding their interaction capabilities and provide functionalities that go far beyond their original functionality. They feature computing capabilities and are, thus, able to capture, process and store information and interact with their environments, turning them into smart objects. Their wide range was covered by the submissions to this workshop. Smart objects know something about their users and, thus, allow for natural interaction. Natural interaction, in contrast, does not imply smartness. Smartness requires interaction with users and provides help. There are already commercialized products available that expose their properties and interaction capabilities. To enrich their potential and to lower affordances, they need to communicate to each other. Making sense out of the available data in this field is still an open research question. The overall goal should be to build an interactive ecosystem that (i) seamlessly discovers, connects and talks to its environment, (ii) is ubiquitous and (iii) allows the user to be in control.

The workshop examined these issues with regards to the following aspects:

- Interactive Experiences
- The Future of IoT
- Smart Home
- AR in the Industry

Putting together SmartObjects '18 was a team effort. We would like to send out our thanks to everybody who has helped us to organize this event:

- The authors, who have written and submitted their papers to the workshop.
- The program committee and the external reviewers, for their time and effort to write substantial and constructive review reports.

We hope that you will find this program interesting and thought-provoking and that the workshop will provide you with a valuable opportunity to share ideas with other researchers and practitioners from institutions around the world.

April 2018
Darmstadt

Florian Müller

Program Committee

Bo Begole	Apple, CA, USA
Marco Blumendorf	smartB, Germany
Oliver Brdiczka	Stella.ai, CA, USA
Jingyuan Chen	TU Braunschweig, Germany
Aba-Sah Dadzie	The Open University, United Kingdom
Boris Deruyter	Philips Research, Netherlands
Niloofar Dezfuli	TU Darmstadt, Germany
Markus Funk	TU Darmstadt, Germany
Tobias Grosse-Puppenthal	Porsche, Germany
Sebastian Günther	TU Darmstadt, Germany
Alexander Kröner	TH Nuernberg, Germany
Kris Luyten	Hasselt University, Belgium
Karola Marky	TU Darmstadt, Germany
German Montoro	Universidad Autónoma de Madrid, Spain
Max Mühlhäuser	TU Darmstadt, Germany
Florian Müller	TU Darmstadt, Germany
Patrick Reignier	Inria, France
Dirk Schnelle-Walka	Harman International, USA
Geert Vanderhulst	Alcatel-Lucent Bell Laboratories, Belgium
Raphael Wimmer	University of Regensburg, Germany
Massimo Zancanaro	Fondazione Bruno Kessler, Italy

External Reviewers

Alexandre Demeure	Universités de Grenoble, France
Jan Riemann	TU Darmstadt, Germany
Martin Schmitz	TU Darmstadt, Germany

Author Index

Alexandrovsky, Dmitry	9
Ardito, Carmelo	23
Ashbrook, Daniel	1
Auda, Jonas	39
Buono, Paolo	23
Costabile, Maria Francesca	23
Daniel, Austino-Davis	58
Desolda, Giuseppe	23
Döring, Tanja	9
Faltaous, Sarah	39
Fujimoto, Osamu	1
Funk, Mathias	31
Furqan, Anushay	44
Jain, Milan	50
Krishnasamy, Rameshnath	17
Lanzilotti, Rosa	23
Li, Zhiyuan	1
Lorber, Carolin	58
Malaka, Rainer	9
Matera, Maristella	23
Murauer, Nela	69
Myers, Chelsea	44
Nguyen, Phuc-Anh	58
Notni, Gunther	58
Pflanz, Nerina	69
Piccinno, Antonio	23
Reinschluessel, Anke V.	9
Schneegass, Stefan	39
Tejada, Carlos	1
Thieme, Danny	9

von Hassel, Cecilia	69
Werrlich, Stefan	58
Yanez, Carlos Emilio Franco	58
Zhu, Jichen	44

Keyword Index

3D-printing	1
Acoustic Interaction	1
Adaptable	44
Adaptive	44
Adaptive System	9
Air Conditioning	50
Assembly	58
Augmented Reality	39, 58
Collaborative Learning	9
Context Aware Technologies	17
Cultural Heritage	23
Design Idioms	17
Digital Fabrication	1
Embodied Interaction	9
Emerging Technology	17
Evaluation	58
Exhibition Sites	17
Fault Detection	50
Feedback	50
Head-Mounted Displays	58
Interaction Design	31
Internet of Things	23, 31
Intervention User Interface	39
Learnability	44
Mobile User Experience	17
Multimodal Feedback	9
Open User Models	44
Self-Guided	17
Smart Devices	1
Smart Home	39
Smart Object Modelling	23
Smart Objects	9
Smart Thermostat	50

Smart Things	31
Smart Visit Experience	23
Systems Design	31
Tabletop Interaction	9
Tangible user interface	9
Training	58
Usability	58
User Comfort	50
User Experience	44
Voice User Interface	44