

The 8th ACM SIGCHI Symposium on

# **Engineering Interactive Computing Systems**



Sponsored by













The Association for Computing Machinery 2 Penn Plaza, Suite 701
New York New York 10121-0701

ACM COPYRIGHT NOTICE. Copyright © 2016 by the Association for Computing Machinery, Inc. Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, to republish, to post on servers, or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from Publications Dept., ACM, Inc., fax +1 (212) 869-0481, or permissions@acm.org.

For other copying of articles that carry a code at the bottom of the first or last page, copying is permitted provided that the per-copy fee indicated in the code is paid through www.copyright.com.

#### **Notice to Past Authors of ACM-Published Articles**

ACM intends to create a complete electronic archive of all articles and/or other material previously published by ACM. If you have written a work that was previously published by ACM in any journal or conference proceedings prior to 1978, or any SIG Newsletter at any time, and you do NOT want this work to appear in the ACM Digital Library, please inform <a href="mailto:permissions@acm.org">permissions@acm.org</a>, stating the title of the work, the author(s), and where and when published.

**ACM ISBN:** 978-1-4503-4322-0

# **Table of Contents**

Keyr	otes
------	------

Can Computers Design Interaction?	
Language Engineering: Challenges, Opportunities and Potential  Disasters for Interactive Systems	
Model-Driven Development	
Rule-Enhanced Task Models for Increased Expressiveness and	
Compactness	
Werner Gaulke, Jürgen Ziegler	_
Adding Custom Widgets to Model-driven GUI Generation	6
Customizable Dynamic User Interface Distribution	7
Marco Manca, Fabio Paternò	•
Ubiquitous Computing	
Bluewave: Enabling Opportunistic Context Sharing via	
Bluetooth Device Names	8
Adrian A. de Freitas, Michael Nebeling, Akshaye Shreenithi Kirupa	
Karthikeyan Ranithangam, Junrui Yang, Anind K. Dey	
ProxemicUI: Object-Oriented Middleware and Event Model for	
Proxemics-Aware Applications on Large Displays	0
Mohammed Alnusayri, Gang Hu, Elham Alghamdi, Derek Reilly	
Gesture Seg: Developing a Gesture Segmentation System using	1
Gesture Execution Phase Labeling by Crowd Workers	ı
Sven Kratz, Jason Wiese  FusionKit: A Generic Toolkit for Skeleton, Marker and Rigid-Body	
Tracking	3
Michael Rietzler, Florian Geiselhart, Janek Thomas, Enrico Rukzio	_
- , - ·· - · - · · · · · · · · · · · · ·	

### **Process and Frameworks**

DocTr: A Unifying Framework for Tracking Physical Documents and	
Organisational Structures	. 85
Sandra Trullemans, Ayrton Vercruysse, Beat Signer	
A Case-based Assessment of the FLUIDE Framework for Specifying	
Emergency Response User Interfaces	. 97
Erik G. Nilsson, Ketil Stølen	
Engineering mixed-criticality interactive applications	. 108
Camille Fayollas, Célia Martinie, David Navarre, Philippe Palanque	
Experiences From Developing Networked Public Display Applications	
on 3rd Party Infrastructures	. 120
Nemanja Memarovic	
Evaluation and Testing I	
Using Formal Models to Cross Check an Implementation	126
Raquel Oliveira, Sophie Dupuy-Chessa, Gaëlle Calvary, Daniele Dadolle	
Systematic Automation of Scenario-Based Testing of User Interfaces	. 138
José C. Campos, Camille Fayollas, Célia Martinie, David Navarre,	
Philippe Palanque, Miguel Pinto	
Improving Repeatability and Reproducibility of Mobile Tests for Inertial	
Measurement Units	149
Nils Büscher, Lars Middendorf, Christian Haubelt, Rainer Dorsch,	
Frederik Wegelin	
Using Testing Techniques to Classify User Interface Designs	159
Informed Design and Prototyping	
Faceted Search on Coordinated Tablets and Tabletop: a Comparison	165
Sven Charleer, Joris Klerkx, Erik Duval, Tinne De Laet, Katrien Verbert	
PANDA: Prototyping using ANnotation and Decision Analysis	171
Jean-Luc Hak, Marco Winckler, David Navarre	
A design pattern for multimodal and multidevice user interfaces	177
Alessandro Carcangiu, Gianni Fenu, Lucio Davide Spano	

## **Modelling and Analysis**

Measuring Interaction Design before Building the System:
a Model-Based Approach
Giorgio Brajnik, Simon Harper
Modelling information resources and their salience in medical
device design
Michael D. Harrison, José C. Campos, Rimvydas Rukšenas, Paul Curzon
A Language-based Model for Specifying and Staging Mixed-initiative
<b>Dialogs</b>
Saverio Perugini, Joshua W. Buck
Design Spaces
SEPIA, a Support for Engineering Persuasive Interactive Applications:
Properties and Functions
Yann Laurillau, Gaëlle Calvary, Anthony Foulonneau, Eric Villain
A Semi-Formal Framework for Describing Interaction Design Spaces
Judy Bowen, Anke Dittmar
A Design Space for Engineering Graphical Adaptive Menus
Sara Bouzit, Gaëlle Calvary, Denis Chêne, Jean Vanderdonckt
Make it ISI: Interactive Systems Integration Tool
José Luís Silva, Jorge Diogo Ornelas, João Carlos Silva
Evaluation and Testing II
Is a Framework Enough? Cross-Device Testing and Debugging
Maria Husmann, Nina Heyder, Moira C. Norrie
Automatic Detection of GUI Design Smells: The Case of Blob Listener 263
Valéria Lelli, Arnaud Blouin, Benoit Baudry, Fabien Coulon, Olivier Beaudoux
Using Gherkin to extract Tests and Monitors for Safer Medical Device
Interaction Design
Abigail Cauchi, Christian Colombo, Adrian Francalanza, Mark Micallef,
Gordon Pace
Users' Preference Share as a Criterion for Hierarchical Menu Optimization 305
Mikhail Goubko, Alexander Varnavsky

### Post-WIMP Interfaces

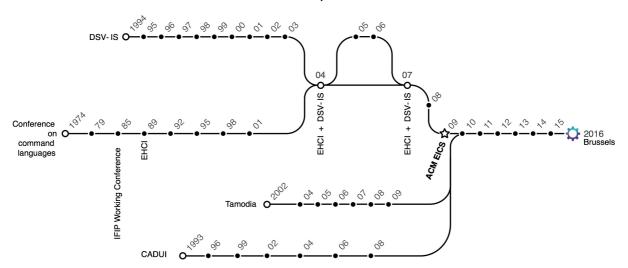
### Welcome to EICS 2016

The ACM SIGCHI Symposium on Engineering Interactive Computing Systems (EICS) is a yearly international conference devoted to engineering usable and reliable interactive computing systems. Research presented at EICS revolves around methods, processes, techniques and tools that support specifying, designing, developing, deploying and verifying interactive systems. This 8th ACM SIGCHI Symposium on Engineering Interactive Computing Systems (EICS'16) took place in Brussels, Belgium (21-24 June 2016) – at the heart of Europe.

EICS gathers researchers that aim to improve the ways we build interactive systems. Building interactive systems is a multi-faceted and challenging activity, involving a plethora of different actors and roles. This is particularly true in the domain of HCI, where we continuously push the edge of what is possible, where there is a crucial need for adequate processes, tools and methods to build reliable, useful and usable systems that help people cope with the ever increasing complexity of work and life. The primary goal of the EICS conference series is to provide a venue for novel and high quality contributions in this direction.

EICS is probably the longest running HCI conference in the field. Its starting point in history goes back as far as 1974. Although it only has been an ACM SIGCHI sponsored conference since 2009, EICS is a continuation and merge of a set of series of conferences, symposiums and workshops —most notably the IFIP WG 2.7/13.4 conference on Engineering HCI (EHCI)— that shared a common interest: the engineering aspects of HCI. The annual workshops on Design, Specification and Verification of Interactive Systems (DSV-IS) and on Task, Models and Diagrams for UI Design (TaMoDia) were also merged into the EICS conference series, as well as the International Conference on Computer-Aided Design of User Interfaces (CADUI).

#### The history of EICS



EICS 2016 received 64 full paper and 21 Late-Breaking Results and Demo (LBR) submissions. A revised reviewing process was put in place with 12 senior PC members selecting reviewers from a set of expert program committee members to ensure high quality and insightful reviews for all papers. A physical program committee meeting with the senior PC members and paper chairs to discuss the various submissions in

person was organized on March 23 in Toulouse. 20 full papers and 12 LBR papers were accepted, resulting in respectively ~30% acceptance rate for full papers and ~57% for LBR papers. Some authors were given the opportunity to rework and improve parts of their full paper submission in a "revise and resubmit" phase, for which they received shepherding and guidance by a senior PC member. This shows the commitment of the EICS community to not only ensure high quality contributions at the conference, but also to educate and enable authers to write down and present their best work for this conference.

In addition to the 32 papers, the EICS'16 program includes three pre-conference workshops and a doctoral consortium. The workshops provide a more focused venue on a topic of interest for engineering interactive computing systems. This year the workshops cover SCXML, recommender systems and end-user development for cross-device user interfaces.

EICS'16 features two keynote speakers that can challenge the EICS community with their perspectives on engineering interactive computing systems. Prof. dr. Antti Oulasvirta is a cognitive scientist researching human-computer interaction and will tackle the question on whether computers can design interaction. Prof. dr. Richard Paige researches the theory and application of modelling and agile methods in software and systems engineering, and will talk about the challenges, opportunities and potential disasters of language engineering for interactive systems.

We would like to thank all who contributed to EICS'16, PC and senior PC members, chairs of the various conference tracks, the local organization, our sponsors; especially ACM SIGCHI for their continuous support, and iMinds and Hasselt University for contributing to the organization of EICS'16.

Finally, we would like to invite you to submit your work for EICS 2017, and attend the conference that will be held in Lisbon (Portugal) at the end of June 2017.

Kris Luyten and Philippe Palanque, general conference chairs José Creissac Campos and Albrecht Schmidt, full paper chairs Beat Signer and Nicolas Roussel, Late-Breaking Results and Demo chairs

# EICS 2016 Organization

#### General conference chairs

Kris Luyten (EDM, Hasselt University - iMinds, Belgium) Philippe Palanque (IRIT, University Paul Sabatier, France)

#### **Full paper chairs**

José Creissac Campos (HASLab/INESC TEC & University of Minho, Portugal) Albrecht Schmidt (Universität Stuttgart, Germany)

#### **Late-Breaking Results and Demo chairs**

Nicolas Roussel (Inria Lille - Nord Europe, France) Beat Signer (Vrije Universiteit Brussel, Belgium)

#### **Workshop and Tutorial chairs**

Judy Bowen (University of Waikato, New Zealand)
Bruno Dumas (University of Namur, Belgium)
Jan Van den Bergh (EDM, Hasselt University - iMinds, Belgium)

#### **Doctoral Consortium**

Marco Winckler (IRIT, University Paul Sabatier, France) Nicholas Graham (Queen's University, Canada) Karin Coninx (EDM, Hasselt University - iMinds, Belgium)

#### Social Media Chair

Arnaud Blouin (INSA and Inria/IRISA, Rennes, France)

#### **Local Organisation Team**

Mieke Haesen (EDM, Hasselt University - iMinds, Belgium) Davy Vanacken (EDM, Hasselt University - iMinds, Belgium) Ingrid Konings (EDM, Hasselt University - iMinds, Belgium) Benny Daems (EDM, Hasselt University - iMinds, Belgium)

#### Website

Supraja Sankaran (EDM, Hasselt University - iMinds, Belgium) Karel Robert (Design) (EDM, Hasselt University - iMinds, Belgium)

#### **Senior Program Committee**

Michael Nebeling (Carnegie Mellon University, US) Carmen Santoro (ISTI-CNR, Italy) Célia Martinie (University of Toulouse 3, France) Michael D. Harrison (Newcastle University, UK) Peter Forbrig (University of Rostock, Germany)

Jean Vanderdonckt (Université Catholique de Louvain-la-Neuve, Belgium)

Jürgen Ziegler (University of Duisburg-Essen, Germany)

Orit Shaer (Wellesley College, US)

Laurence Nigay (Université Joseph Fourier, France)

Christian Kray (University of Münster, Germany)

Nicolai Marquardt (University College Londong, UK)

Jeffrey Nichols (Google, USA)

#### **Expert Program Committee**

Fabio Paternò Keith Cheverst Jan Van den Bergh Bruno Dumas Gaëlle Calvary

Piyawadee Sukaviriya Marco Winckler Nuno Nunes Emmanuel Dubois

Jose Macias Simone Barbosa Anke Dittmar Judy Bowen Lewis Chaung

Prasun Dewan Herman Kaindl Steve Reeves

Emmanuel Pietriga Paolo Bottoni Beat Signer Bashar Altakrouri Gerrit Meixner Jakob Bardram Stéphane Chatty Karin Coninx

Karin Coninx Davy Vanacken Benjamin Weyers William Delamare María Lozano Pierre Akiki

José Luís Silva Paolo Masci Nicolas Roussel

Sophie Dupuy-Chessa Matera Maristella Sergio Firmenich Sven Casteleyn Philippe Palanque Kris Luyten

Lucio Davide Spano David Navarre Hans Gellersen Nataliya Kosmyna Lotte Fabien

Radu-Daniel Vatavu Heinz Ulricht Hoppe Narseo Vallina-Rodriguez

Ann Blandford Denis Javaux Jennifer Mankoff Nick Gillian Florian Echtler Steven Houben

Rui José Yann Laurillau José Macías Vivian Motti Roman Popp Michael Rohs Dirk Schnelle-Walka

Noi Sukaviriya
Eric Tobias
Max Pfeiffer
Anna Loparev
Johanna Okerlund
Suzanne Kieffer

Jorge Luis Perez-Medina

Dimitar Valkov Frederik Brudy

# **EICS 2016 Supporters**





Advancing Computing as a Science & Profession







