

Commenced Publication in 1973

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison

Lancaster University, Lancaster, UK

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA, USA

Josef Kittler

University of Surrey, Guildford, UK

Jon M. Kleinberg

Cornell University, Ithaca, NY, USA

Friedemann Mattern

ETH Zurich, Zürich, Switzerland

John C. Mitchell

Stanford University, Stanford, CA, USA

Moni Naor

Weizmann Institute of Science, Rehovot, Israel

C. Pandu Rangan

Indian Institute of Technology, Madras, India

Bernhard Steffen

TU Dortmund University, Dortmund, Germany

Demetri Terzopoulos

University of California, Los Angeles, CA, USA

Doug Tygar

University of California, Berkeley, CA, USA

Gerhard Weikum

Max Planck Institute for Informatics, Saarbrücken, Germany

More information about this series at <http://www.springer.com/series/7409>

Vincent G. Duffy (Ed.)

Digital Human Modeling

Applications in Health, Safety, Ergonomics and Risk Management

7th International Conference, DHM 2016
Held as Part of HCI International 2016
Toronto, ON, Canada, July 17–22, 2016
Proceedings

Editor
Vincent G. Duffy
Purdue University
West Lafayette, IN
USA

ISSN 0302-9743 ISSN 1611-3349 (electronic)
Lecture Notes in Computer Science
ISBN 978-3-319-40246-8 ISBN 978-3-319-40247-5 (eBook)
DOI 10.1007/978-3-319-40247-5

Library of Congress Control Number: 2016940816

LNCS Sublibrary: SL3 – Information Systems and Applications, incl. Internet/Web, and HCI

© Springer International Publishing Switzerland 2016

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made.

Printed on acid-free paper

This Springer imprint is published by Springer Nature
The registered company is Springer International Publishing AG Switzerland

Foreword

The 18th International Conference on Human-Computer Interaction, HCI International 2016, was held in Toronto, Canada, during July 17–22, 2016. The event incorporated the 15 conferences/thematic areas listed on the following page.

A total of 4,354 individuals from academia, research institutes, industry, and governmental agencies from 74 countries submitted contributions, and 1,287 papers and 186 posters have been included in the proceedings. These papers address the latest research and development efforts and highlight the human aspects of the design and use of computing systems. The papers thoroughly cover the entire field of human-computer interaction, addressing major advances in knowledge and effective use of computers in a variety of application areas. The volumes constituting the full 27-volume set of the conference proceedings are listed on pages IX and X.

I would like to thank the program board chairs and the members of the program boards of all thematic areas and affiliated conferences for their contribution to the highest scientific quality and the overall success of the HCI International 2016 conference.

This conference would not have been possible without the continuous and unwavering support and advice of the founder, Conference General Chair Emeritus and Conference Scientific Advisor Prof. Gavriel Salvendy. For his outstanding efforts, I would like to express my appreciation to the communications chair and editor of *HCI International News*, Dr. Abbas Moallem.

April 2016

Constantine Stephanidis

HCI International 2016 Thematic Areas and Affiliated Conferences

Thematic areas:

- Human-Computer Interaction (HCI 2016)
- Human Interface and the Management of Information (HIMI 2016)

Affiliated conferences:

- 13th International Conference on Engineering Psychology and Cognitive Ergonomics (EPCE 2016)
- 10th International Conference on Universal Access in Human-Computer Interaction (UAHCI 2016)
- 8th International Conference on Virtual, Augmented and Mixed Reality (VAMR 2016)
- 8th International Conference on Cross-Cultural Design (CCD 2016)
- 8th International Conference on Social Computing and Social Media (SCSM 2016)
- 10th International Conference on Augmented Cognition (AC 2016)
- 7th International Conference on Digital Human Modeling and Applications in Health, Safety, Ergonomics and Risk Management (DHM 2016)
- 5th International Conference on Design, User Experience and Usability (DUXU 2016)
- 4th International Conference on Distributed, Ambient and Pervasive Interactions (DAPI 2016)
- 4th International Conference on Human Aspects of Information Security, Privacy and Trust (HAS 2016)
- Third International Conference on HCI in Business, Government, and Organizations (HCIBGO 2016)
- Third International Conference on Learning and Collaboration Technologies (LCT 2016)
- Second International Conference on Human Aspects of IT for the Aged Population (ITAP 2016)

Conference Proceedings Volumes Full List

1. LNCS 9731, Human-Computer Interaction: Theory, Design, Development and Practice (Part I), edited by Masaaki Kurosu
2. LNCS 9732, Human-Computer Interaction: Interaction Platforms and Techniques (Part II), edited by Masaaki Kurosu
3. LNCS 9733, Human-Computer Interaction: Novel User Experiences (Part III), edited by Masaaki Kurosu
4. LNCS 9734, Human Interface and the Management of Information: Information, Design and Interaction (Part I), edited by Sakae Yamamoto
5. LNCS 9735, Human Interface and the Management of Information: Applications and Services (Part II), edited by Sakae Yamamoto
6. LNAI 9736, Engineering Psychology and Cognitive Ergonomics, edited by Don Harris
7. LNCS 9737, Universal Access in Human-Computer Interaction: Methods, Techniques, and Best Practices (Part I), edited by Margherita Antona and Constantine Stephanidis
8. LNCS 9738, Universal Access in Human-Computer Interaction: Interaction Techniques and Environments (Part II), edited by Margherita Antona and Constantine Stephanidis
9. LNCS 9739, Universal Access in Human-Computer Interaction: Users and Context Diversity (Part III), edited by Margherita Antona and Constantine Stephanidis
10. LNCS 9740, Virtual, Augmented and Mixed Reality, edited by Stephanie Lackey and Randall Shumaker
11. LNCS 9741, Cross-Cultural Design, edited by Pei-Luen Patrick Rau
12. LNCS 9742, Social Computing and Social Media, edited by Gabriele Meiselwitz
13. LNAI 9743, Foundations of Augmented Cognition: Neuroergonomics and Operational Neuroscience (Part I), edited by Dylan D. Schmorrow and Cali M. Fidopiastis
14. LNAI 9744, Foundations of Augmented Cognition: Neuroergonomics and Operational Neuroscience (Part II), edited by Dylan D. Schmorrow and Cali M. Fidopiastis
15. LNCS 9745, Digital Human Modeling and Applications in Health, Safety, Ergonomics and Risk Management, edited by Vincent G. Duffy
16. LNCS 9746, Design, User Experience, and Usability: Design Thinking and Methods (Part I), edited by Aaron Marcus
17. LNCS 9747, Design, User Experience, and Usability: Novel User Experiences (Part II), edited by Aaron Marcus
18. LNCS 9748, Design, User Experience, and Usability: Technological Contexts (Part III), edited by Aaron Marcus
19. LNCS 9749, Distributed, Ambient and Pervasive Interactions, edited by Norbert Streitz and Panos Markopoulos
20. LNCS 9750, Human Aspects of Information Security, Privacy and Trust, edited by Theo Tryfonas

21. LNCS 9751, HCI in Business, Government, and Organizations: eCommerce and Innovation (Part I), edited by Fiona Fui-Hoon Nah and Chuan-Hoo Tan
22. LNCS 9752, HCI in Business, Government, and Organizations: Information Systems (Part II), edited by Fiona Fui-Hoon Nah and Chuan-Hoo Tan
23. LNCS 9753, Learning and Collaboration Technologies, edited by Panayiotis Zaphiris and Andri Ioannou
24. LNCS 9754, Human Aspects of IT for the Aged Population: Design for Aging (Part I), edited by Jia Zhou and Gavriel Salvendy
25. LNCS 9755, Human Aspects of IT for the Aged Population: Healthy and Active Aging (Part II), edited by Jia Zhou and Gavriel Salvendy
26. CCIS 617, HCI International 2016 Posters Proceedings (Part I), edited by Constantine Stephanidis
27. CCIS 618, HCI International 2016 Posters Proceedings (Part II), edited by Constantine Stephanidis

Digital Human Modeling and Applications in Health, Safety, Ergonomics and Risk Management

Program Board Chair: **Vincent G. Duffy, USA**

- Norman I. Badler, USA
- Elsbeth de Korte, The Netherlands
- H. Onan Demirel, USA
- Afzal A. Godil, USA
- Ravindra Goonetilleke, Hong Kong, China
- Akihiko Goto, Japan
- Hiroyuki Hamada, Japan
- Dan Högberg, Sweden
- Satoshi Kanai, Japan
- Min Soon Kim, USA
- Noriaki Kuwahara, Japan
- Byung Cheol Lee, USA
- Kang Li, USA
- Tim Marler, USA
- Hamid Mcheick, Canada
- Ezutah Udony Ologu, Malaysia
- Caterina Rizzi, Italy
- Beatriz Sousa Santos, Portugal
- Leonor Teixeira, Portugal
- Renran Tian, USA
- Mihaela Vorvoreanu, USA
- Anita Woll, Norway
- Kuan Yew Wong, Malaysia
- James Yang, USA

The full list with the program board chairs and the members of the program boards of all thematic areas and affiliated conferences is available online at:

<http://www.hci.international/2016/>



HCI International 2017

The 19th International Conference on Human-Computer Interaction, HCI International 2017, will be held jointly with the affiliated conferences in Vancouver, Canada, at the Vancouver Convention Centre, July 9–14, 2017. It will cover a broad spectrum of themes related to human-computer interaction, including theoretical issues, methods, tools, processes, and case studies in HCI design, as well as novel interaction techniques, interfaces, and applications. The proceedings will be published by Springer. More information will be available on the conference website: <http://2017.hci.international/>.

General Chair

Prof. Constantine Stephanidis

University of Crete and ICS-FORTH

Heraklion, Crete, Greece

E-mail: general_chair@hcie2017.org

<http://2017.hci.international/>



Contents

Anthropometry, Ergonomics, Design and Comfort

Experimental Research of Range of Motion About Wrist Joint	3
<i>Wen-Yu Fu, Guang Cheng, Yu-Feng Ma, and Ai-Ping Yang</i>	
The Study of Design of Children's Anti-lost Clothing Based upon Ergonomics	13
<i>Xiaoping Hu and Jiying Zhong</i>	
Study on Somatotype Characteristics and Differences of Female Youth from Liaoning Province and Guangdong Province in China	22
<i>Xiaoping Hu and Jing Zhou</i>	
Research on the Comfortable and Maximum Pedaling Forces of Chinese Population	32
<i>Huiyu Luo, Chang Liu, Jing Zhang, Qing Ye, and Li Ding</i>	
The Ten Characteristics of the Critical Task: Ergonomic Analysis of Vitality Requirements in Aortic Valve Surgery	42
<i>René Patesson and Eric Brangier</i>	
Experimental Validation of a New Dynamic Muscle Fatigue Model	54
<i>Deep Seth, Damien Chablat, Sophie Sakka, and Fouad Bennis</i>	
Experimental Study on Discrimination Thresholds for Haptic Perception of Size in Manual Operation.	66
<i>Ai-ping Yang, Guang Cheng, Wen-yu Fu, Hui-min Hu, Xin Zhang, and Chau-Kuang Chen</i>	

Physiology and Anatomy Models

Automatic Below-Knee Prosthesis Socket Design: A Preliminary Approach . . .	75
<i>Giorgio Colombo, Giancarlo Facchetti, and Caterina Rizzi</i>	
Development of Musculoskeletal Model to Estimate Muscle Activities During Swallowing	82
<i>Takuya Hashimoto, Atsuko Murakoshi, Takahiro Kikuchi, Yukihiro Michiwaki, and Takuji Koike</i>	

Combination of Non Invasive Medical Imaging Technologies and Virtual Reality Systems to Generate Immersive Fetal 3D Visualizations	92
<i>Jorge Roberto Lopes dos Santos, Heron Werner, Gerson Ribeiro, and Simone Leticia Belmonte</i>	
Computational Modeling for Simulating Obstructive Lung Diseases Based on Geometry Processing Methods	100
<i>Stavros Nousias, Aris S. Lalos, and Konstantinos Moustakas</i>	
Bone Structure Monitoring Systems Applied to Physiotherapy of Children with Cerebral Palsy	110
<i>Danilo Saravia and Victor M. Gonzalez</i>	
Motion Prediction and Recognition	
Exploring Rhythmic Patterns in Dance Movements by Video Analysis	123
<i>Camilo Argüello and Marcela Iregui</i>	
Study on Braiding Skills by Comparing Between Expert and Non-experts with Eye’s Movement Measurement	132
<i>Tadashi Uozumi, Shuhei Yasuda, Kontawat Chottikampon, Suchalinee Mathurosemontri, Akihiko Goto, and Hiroyuki Hamada</i>	
Visual Representation of Dynamic Pressure Map on the Digital Human Model of Patient with a Lower Limb Prosthesis	140
<i>Giorgio Colombo, Claudio Comotti, Daniele Regazzoni, Caterina Rizzi, and Andrea Vitali</i>	
Research on the Motion Technique of Japanese Tea Ceremony.	150
<i>Soutatsu Kanazawa, Zelong Wang, Yuka Takai, Akihiko Goto, Tomoko Ota, and Hiroyuki Hamada</i>	
Performance Analysis of Professional Sewing Scissors Using the “So-Hizukuri” Forging Process	159
<i>Yasuko Kitajima, Akihiko Goto, and Hiroyuki Hamada</i>	
Synaesthesia Design Research of Motion Game in Order to Cure the White-Collar’s Cervical Spondylosis	170
<i>Yuan Liu, Shiguo Li, and Baisong Liu</i>	
Introducing a Language for Human Stance Description	179
<i>Antônio C. Mabilia, Antonio W. Sousa, Norton T. Roman, João L. Bernardes Jr., Marcelo M. Antunes, Enrique M. Ortega, Luciano A. Digiampietri, Luis M. del Val Cura, Valdinei F. da Silva, and Clodoaldo A.M. Lima</i>	

Process Analysis of Expert and Non-expert Engineers in Quartz Glass Bending Process 191
Masamichi Suda, Toru Takahashi, Akio Hattori, Akihiko Goto, and Hiroyuki Hamada

Quality and Safety in Healthcare

Assessing the Use of Communication Robots for Recreational Activities at Nursing Homes Based on Dementia Care Mapping (DCM). 203
Teruko Doi, Noriaki Kuwahara, and Kazunari Morimoto

Improving the Palatability of Nursing Care Food Using a Pseudo-chewing Sound Generated by an EMG Signal 212
Hiroshi Endo, Shuichi Ino, and Waka Fujisaki

Setting the Degree of Defocus for Video Images in a Monitoring System . . . 221
Yukiya Horie and Nobuji Tetsutani

Qualitative Analysis of the Customer Satisfaction at the Dental Clinics 229
Yuko Kamagahara, Tomoya Takeda, Shanshan Jin, Xiaodan Lu, Tomoko Ota, Tadayuki Hara, and Noriyuki Kida

Movement Analysis of Transfer Assistance Using a Slide Board. 243
Xiaodan Lu, Mengyuan Liao, Zelong Wang, Yuki Miyamoto, Hiroyuki Hamada, Tomoko Ota, Kengo Yano, Yoshihiko Tokumoto, Takashi Yoshikawa, Yuka Takai, and Akihiko Goto

Health Promotion Community Support for Vitality and Empathy: Visualize Quality of Motion (QoM). 253
Takuichi Nishimura, Zilu Liang, Satoshi Nishimura, Tomoka Nagao, Satoko Okubo, Yasuyuki Yoshida, Kazuya Imaizumi, Hisae Konosu, Hiroyasu Miwa, Kanako Nakajima, and Ken Fukuda

Design of Face Tracking System Using Environmental Cameras and Flying Robot for Evaluation of Health Care 264
Veerachart Srisamosorn, Noriaki Kuwahara, Atsushi Yamashita, Taiki Ogata, and Jun Ota

Towards Person-Centered Anomaly Detection and Support System for Home Dementia Care 274
Kazunari Tamamizu, Seiki Tokunaga, Sachio Saiki, Shinsuke Matsumoto, Masahide Nakamura, and Kiyoshi Yasuda

Physicians’ Code of Conduct and Further Requirements for a Productive Patient Physician Relationship Exemplified in the Area of Orthognathic Surgery 286
Luisa Vervier and Martina Ziefle

AtHoCare: An Intelligent Elder Care at Home System 298
Tao Xu, Yun Zhou, and Zhe Ma

The Transfer of Expertise in Conducting a Participatory Music Therapy
 During a Combined Rehabilitation-Recreational Program in an Elderly Care
 Facility 306
*Akiyoshi Yamamoto, Henry Cereno Barrameda Jr., Tatsunori Azuma,
 Hideaki Kasasaku, Kayoko Hirota, Momo Jinno, Maki Sumiyama,
 Tomoko Ota, Akihiko Goto, Noriyuki Kida, Noriaki Kuwahara,
 and Hiroyuki Hamada*

Videophone Conversation of Two Individuals with Dementia Using
 an Anime Agent System 317
*Kiyoshi Yasuda, Masao Fuketa, Kazuhiro Morita, Jun-ich Aoe,
 and Noriaki Kuwahara*

Design for Health

MEDEDUC: An Educational Medical Serious Game 329
*Vitor Manuel Fragoso Ferreira, Rosa Maria E. Moreira da Costa,
 and Vera M.B. Werneck*

Analysis of CS Survey and NPS Numbers in Japanese Wedding Market 338
Shigeyuki Takami, Nobuyuki Kitada, and Tomoko Ota

Integrating Human Factors in Information Systems Development: User
 Centred and Agile Development Approaches 345
*Leonor Teixeira, Vasco Saavedra, Beatriz Sousa Santos,
 and Carlos Ferreira*

Implementation and Evaluation of Interactive Memory-Aid Agent Service
 for People with Dementia. 357
*Seiki Tokunaga, Hiroyasu Horiuchi, Hiroki Takatsuka, Sachio Saiki,
 Shinsuke Matsumoto, Masahide Nakamura, and Kiyoshi Yasuda*

Designing for STEM Faculty: The Use of Personas for Evaluating
 and Improving Design 369
*Mihaela Vorvoreanu, Krishna Madhavan,
 Kanrawi Kitkhachonkunlaphat, and Liang Zhao*

Redesign Based on Card Sorting: How Universally Applicable are Card
 Sort Results? 381
Jobke Wentzel, Nienke Beerlage de Jong, and Thea van der Geest

Work Design and Support

Comparison Knitting Skills Between Experts and Non-experts by
Measurement of the Fabric Quality 391
*Kontawat Chottikampon, Shunyu Tang, Suchaline Mathurosemontri,
Porakoch Sirisuwan, Miyako Inoda, Hiroyuki Nishimoto,
and Hiroyuki Hamada*

Modern Human-Robot Interaction in Smart Services and Value Co-creation . . . 399
Vincent G. Duffy

Interactive Gestures for Liver Angiography Operation 409
*Dina A. Elmanakhly, Ayman Atia, Essam A. Rashed,
and Mostafa-Samy M. Mostafa*

Analyzing the Difference Between Floral Materials Water Potential When
Cut by Ikebana Experts and Inexperienced Persons 422
Yuki Ikenobo, Yuko Hanba, Noriaki Kuwahara, and Akihiko Goto

Exploring Risk-Benefit Factors of Electronic Clinical Pathways Regarding
Nursing Communication 432
*Tadashi Kanehira, Taro Sugihara, Muneou Suzuki, Akio Gofuku,
and Kenji Araki*

A Study on Development of a Wide Elegant Textile by Using Japanese
Traditional Textile Technology of Nishijin-Ori 440
Masashi Kano, Hiro Akaji, Akiko Kato, and Noriaki Kuwahara

The Analysis of Polishing Process of Cold Forging Die in Axial Symmetric
Form and Axial Non-symmetric Form 449
*Hidehito Kito, Hiroyuki Nishimoto, Akihiko Goto, Yuka Takai,
and Hiroyuki Hamada*

Comparative Study of Design and Type of Work When Assembling
Cardboard Beds for Shelters 458
*Yoshihiro Mizutani, Naoya Yamada, Noriaki Kuwahara,
Kazunari Morimoto, and Hiroyuki Hamada*

The Difference in Micro-deburring Finish Produced by Groove Cutting
Method 466
Mitsunori Mori, Tatsuro Nagasuna, and Hiroyuki Hamada

A Piano Lesson Method Where User Plays the Piano Laying His or Her
Hands on the Image of a Model Performer’s Hands 475
*Chika Oshima, Kimie Machishima, Katsuki Yamaguchi,
and Koichi Nakayama*

The Load Measurement of the Beating Brush in the Second Lining Procedure.	484
<i>Yasuhiro Oka, Yuka Takai, Akihiko Goto, and Kozo Oka</i>	
A Comparative Study of Instructing Methods Regarding Japanese Bowing. . .	494
<i>Tomoya Takeda, Yuko Kamagahara, Xiaodan Lu, Noriyuki Kida, Tadayuki Hara, and Tomoko Ota</i>	
The Perception of the Beneficiary for Japanese Bowing in Different Situations at the Reception.	506
<i>Tomoya Takeda, Yuko Kamagahara, Xiaodan Lu, Noriyuki Kida, Tadayuki Hara, Yoichiro Ogura, and Tomoko Ota</i>	
Difference of Proficiency in Wooden Tub Manufacturing.	518
<i>Shuhei Yasuda, Keisuke Ono, Ryo Takematsu, Mayuko Toyooka, Masakazu Aoshima, Takeshi Ueshiba, and Hiroyuki Hamada</i>	
Modelling Human Behaviour and Cognition	
A Novel Visualization Environment to Support Modelers in Analyzing Data Generated by Cellular Automata	529
<i>Philippe J. Giabbanelli, Guru Jagadeesh Babu, and Magda Baniukiewicz</i>	
Changes in Perception of Induced Motion Based on Voluntary Eye Movements in an Attentional Task	541
<i>Akihisa Hosoya, Hiroto Inoue, and Nobuji Tetsutani</i>	
A Comparison of Processing Time and Strike Position Between Experts and Non-experts of Sheet-Metal Repair	549
<i>Shigeru Ikemoto, Hiroyuki Hamada, and Yuka Takai</i>	
Analysis of the Thought Process for Choosing a Suitable Kimono for a Customer by an Expert	559
<i>Kumiko Komizo, Noriaki Kuwahara, Kazunari Morimoto, and Takashi Furukawa</i>	
A Fundamental Study on Differences in Heart Rates During Creative Work and Non-creative Work	568
<i>Tatsuo Nakagawa, Hiroto Inoue, and Shigeomi Koshimizu</i>	
A Study of Eye Movement Analysis for Investigating Learning Efficiency by Using a Highlighter Pen	576
<i>Hiroki Nishimura, Kazumasa Shibata, Yuki Inazuka, and Noriaki Kuwahara</i>	
The Research of Airport Operational Risk Alerting Model	586
<i>Mei Rong, Min Luo, and Yanqiu Chen</i>	

Eye Movement Analysis for Expert and Non-expert in Japanese Traditional Culture of Tea Ceremony - From the View Point of Japanese Hospitality, “Omotenashi” 596
Tomoya Takeda, Yuki Miyamoto, Xiaodan Lu, Kayo Okuhira, Noriyuki Kida, and Tomoko Ota

Automatic Imagery Data Analysis for Diagnosing Human Factors in the Outage of a Nuclear Plant 604
Pingbo Tang, Cheng Zhang, Alper Yilmaz, Nancy Cooke, Ronald Laurids Boring, Allan Chasey, Timothy Vaughn, Samuel Jones, Ashish Gupta, and Verica Buchanan

Constructing a Decision-Support System for Safe Ship-Navigation Using a Bayesian Network 616
Ruolan Zhang and Masao Furusho

Author Index 629