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# Haptic and Audio Interaction Design

6th International Workshop, HAID 2011  
Kusatsu, Japan, August 25-26, 2011  
Proceedings

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Eric W. Cooper  
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Ritsumeikan University  
Faculty of Information Science and Engineering  
1-1-1 Noji-Higashi  
Kusatsu, Shiga, 525-8577, Japan  
E-mail: {cooper, kvvictor, ogawa}@is.ritsumei.ac.jp

Stephen Brewster  
University of Glasgow  
School of Computing Science  
Glasgow G12 8QQ, UK  
E-mail: stephen.brewster@glasgow.ac.uk

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# Preface

This volume comprises the papers presented at the 6th International Workshop on Haptic and Audio Interaction Design, HAID 2011, which took place during August 25–26 in Kusatsu, Japan.

Today's highly competitive yet saturated market of computer entertainment and mobile communication systems creates an ever-increasing demand for reconsidering the very foundations of user interfaces and information technologies. In striving to find ways to dramatically improve both the efficiency and the usability of computer systems, researchers in academia and industry have been quick to recognize the importance of multimodal interfaces and the crucial role that diverse modalities can play in user-system interactions. Since its inauguration in 2006, the International Workshop on Haptic and Audio Interaction Design (HAID) has been a notable international forum for discussing ideas, practical developments, and empirical observations related to novel aspects of the deployment of audio and haptic modalities in various user-system interaction scenarios. The succession of HAID annual conferences held in Glasgow, Seoul, Jyväskylä, Dresden, and Copenhagen delivered an impressive compilation of research results that have revealed numerous advantages and also highlighted problems associated with multi-modal interfaces. HAID 2011 continued the traditions of its five successful predecessors.

Each of the 22 full papers submitted to the workshop was carefully reviewed by at least three members of the International Program Committee. Given the interdisciplinary nature of the domain of human-machine interaction, additional reviewers had to be assigned in some cases, which resulted in several papers receiving evaluations by four or even five experts. Thirteen regular papers from institutions in six different countries were selected for presentation at HAID 2011 and, after revisions by the authors based on the reviewer comments, included in this volume. The workshop featured a keynote lecture by Hiroyuki Shinoda from the University of Tokyo on “Noncontact Haptic Interface Using Ultrasound.” A summary of the lecture is also included in this publication.

The presented papers report on the most recent advances in theory, technology, and conceptual design of multimodal human-machine interactions. In the volume, the papers are divided into four categories. The first set of articles deals with haptic user interfaces. Karljohan Lundin Palmerius discusses the problem of modeling surfaces with varying stiffness and proposes an efficient algorithm for rendering virtual objects with such characteristics. Yugo Hayashi, Eric W. Cooper, Victor V. Kryssanov, and Hitoshi Ogawa investigate subjective interpretations of tactile perceptions of basic surfaces reproduced with PHAN-ToM Omni and develop a model for semantic characterization of the parameter space of this popular haptic display. Umut Koçak, Karljohan Lundin Palmerius, Camilla Forsell, Anders Ynnerman, and Matthew Cooper present their findings

from an analysis of experiments conducted to explore various aspects of contact related to stiffness perception of virtual objects and their influences on the just noticeable difference (JND) of stiffness. Mikhail Svinin and Igor Goncharenko develop a model of human reaching movements for haptic manipulation of flexible objects and validate it via experiments. Yongjae Yoo, Inwook Hwang, and Seungmoon Choi exploit the analogy of chords in music and conduct experiments to investigate perceptual characteristics of various vibrotactile patterns and their consonance.

The next theme of audio interaction design is presented with two articles. Kota Nakano, Masanori Morise, and Takanobu Nishiura propose a real-time vocal manipulation system to improve subjective experiences of interactive karaoke and discuss the first user reactions to its implemented prototype. Antti Pirhonen and Kai Tuuri describe the novel concept of an interactive relaxation application, where interaction in the audio modality is aimed at regulating the user's breath rate, and discuss results of preliminary validation experiments.

The third category is composed of articles addressing cross- and multi-modal human-machine interactions. Sebastian Merchel, M. Ercan Altinsoy, and Maik Stamm present experimental findings related to cross-modal perception of vertical whole-body vibrations and tones from isophones. Andrea Bianchi, Ian Oakley, and Dong Soo Kwon propose an original authentication technique based on the use of simple audio or haptic cues and validate it via experiments. Marco Romagnoli, Federico Fontana, and Ratna Sarkar investigate vibrotactile recognition of musical scales produced by a harmonium in two different cultural settings and discuss their empirical results. Maik Stamm, M. Ercan Altinsoy, and Sebastian Merchel approach the problem of user orientation in a haptic virtual space and investigate whether providing acoustic localization cues in addition to haptic signals would assist the user.

While all the above studies deal with more or less well-established concepts and technologies of multimodal human-machine interaction, the last set of papers included in this volume presents new solutions that are not yet part of the domain's mainstream research. Tomasz M. Rutkowski describes the concept of the auditory brain-machine interface and also results of extensive experimentation with prototypes of its key elements. Hiroyuki Shinoda presents a novel technological solution for the creation of non-contact haptic interfaces and outlines major application areas for future deployment of such interfaces. Finally, Yusuke Kita and Yoshio Nakatani propose a system to manage and assist recollection of human memories that utilizes the olfactory modality, and discuss results of preliminary experiments with the system's prototype.

We believe that, as a whole, this compilation will be a useful source of information for researchers and developers of user interfaces and interaction systems, and we wish you interesting reading and a productive time ahead.

We would like to thank all the contributing authors, participants, and the organizers for making HAID 2011 possible in spite of the tragic consequences of the Great East Japan Earthquake that led to cancellations of many conferences in this country in 2011. Last but not least, we are grateful to the Program Committee members for their professional work in reviewing and defining the program of this workshop.

August 2011

Eric W. Cooper  
Victor V. Kryssanov  
Hitoshi Ogawa  
Stephen Brewster

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The 6th International Workshop on Haptic and Audio Interaction Design was organized by the following members, with support from Ritsumeikan University, Japan.

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