Advances in Affective and Pleasurable Design

Proceedings of the AHFE 2017 International Conference on Affective and Pleasurable Design, July 17–21, 2017,
The Westin Bonaventure Hotel, Los Angeles, California, USA
Advances in Human Factors and Ergonomics 2017

AHFE 2017 Series Editors
Tareq Z. Ahram, Florida, USA
Waldemar Karwowski, Florida, USA

8th International Conference on Applied Human Factors and Ergonomics and the Affiliated Conferences


| Advances in Affective and Pleasurable Design | WonJoon Chung and Cliff (Sungsoo) Shin |
| Advances in Neuroergonomics and Cognitive Engineering | Carryl Baldwin |
| Advances in Design for Inclusion | Giuseppe Di Bucchianico and Pete Kercher |
| Advances in Ergonomics in Design | Francisco Rebelo and Marcelo Soares |
| Advances in Human Error, Reliability, Resilience, and Performance | Ronald L. Boring |
| Advances in Human Factors and Ergonomics in Healthcare and Medical Devices | Vincent G. Duffy and Nancy Lightner |
| Advances in Human Factors in Simulation and Modeling | Daniel N. Cassenti |
| Advances in Human Factors and System Interactions | Isabel L. Nunes |
| Advances in Human Factors in Cybersecurity | Denise Nicholson |
| Advances in Human Factors, Business Management and Leadership | Jussi Kantola, Tibor Barath and Salman Nazir |
| Advances in Human Factors in Robots and Unmanned Systems | Jessie Chen |
| Advances in Human Factors in Training, Education, and Learning Sciences | Terence Andre |
| Advances in Human Aspects of Transportation | Neville A. Stanton |

(continued)
<table>
<thead>
<tr>
<th>Title</th>
<th>Editors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advances in Human Factors, Software, and Systems Engineering</td>
<td>Tareq Z. Ahram and Waldemar Karwowski</td>
</tr>
<tr>
<td>Advances in Human Factors in Energy: Oil, Gas, Nuclear and Electric Power Industries</td>
<td>Paul Fechtelkotter and Michael Legatt</td>
</tr>
<tr>
<td>Advances in Human Factors, Sustainable Urban Planning and Infrastructure</td>
<td>Jerzy Charytonowicz</td>
</tr>
<tr>
<td>Advances in the Human Side of Service Engineering</td>
<td>Louis E. Freund and Wojciech Cellary</td>
</tr>
<tr>
<td>Advances in Physical Ergonomics and Human Factors</td>
<td>Ravindra Goonetilleke and Waldemar Karwowski</td>
</tr>
<tr>
<td>Advances in Human Factors in Sports, Injury Prevention and Outdoor Recreation</td>
<td>Tareq Z. Ahram</td>
</tr>
<tr>
<td>Advances in Safety Management and Human Factors</td>
<td>Pedro Arezes</td>
</tr>
<tr>
<td>Advances in Social &amp; Occupational Ergonomics</td>
<td>Richard Goossens</td>
</tr>
<tr>
<td>Advances in Ergonomics of Manufacturing: Managing the Enterprise of the Future</td>
<td>Stefan Trzcielinski</td>
</tr>
<tr>
<td>Advances in Usability and User Experience</td>
<td>Tareq Ahram and Christianne Falcão</td>
</tr>
<tr>
<td>Advances in Human Factors in Wearable Technologies and Game Design</td>
<td>Tareq Ahram and Christianne Falcão</td>
</tr>
<tr>
<td>Advances in Communication of Design</td>
<td>Amic G. Ho</td>
</tr>
<tr>
<td>Advances in Cross-Cultural Decision Making</td>
<td>Mark Hoffman</td>
</tr>
</tbody>
</table>
This book focuses on a positive emotional approach in product, service, and system design and emphasizes aesthetics and enjoyment in user experience. This book provides dissemination and exchange of scientific information on the theoretical and practical areas of affective and pleasurable design for research experts and industry practitioners from multidisciplinary backgrounds, including industrial designers, emotion designer, ethnographers, human–computer interaction researchers, human factors engineers, interaction designers, mobile product designers, and vehicle system designers.

This book is organized into ten sections which focus on the following subjects:

1. Product Development and Design Process
2. Emotional Engineering
3. Emotion and the Qualitative Side of Experience
4. Material and Texture Exploration
5. Designing Affective and Pleasurable Design Interactions
6. Affective Value and Kawaii Engineering
7. Kansei Engineering
8. Integrated Design
9. Implication of User Behavior in Design Process
10. Affective and Emotional Aspects of Design

Sections 1 through 3 of this book cover new approaches in affective and pleasurable design with emphasis on product development and emotional engineering. Sections 4 through 7 focus on material and design issues in product, service, and system development, human interface, emotional aspect in UX, and methodological issues in design and development. Sections 8 through 10 cover Kansei engineering and user behavior in design process. Overall structure of this book is organized to move from special interests in design, design and development issues, to novel approaches for emotional design.

All papers in this book were either reviewed or contributed by the members of editorial board. For this, I would like to appreciate the board members listed below:
Améziane Aoussat, France
Sangwoo Bahn, Korea
Carole Bouchard, France
Lin-Lin Chen, Taiwan
Kwangsu Cho, Korea
Sooshin Choi, USA
Denis A. Coelho, Portugal
Oya Demirbilek, Australia
Magnus Feil, USA
Andy Freivalds, USA
Shuichi Fukuda, USA
Qin Gao, China
Ravi Goonetilleke, Hong Kong
Brian Henson, UK
Amic G. Ho, Hong Kong
Wonil Hwang, Korea
Yong Gu Ji, Korea
Eui-Chul Jung, Korea
Jieun Kim, Korea
Kyungdoh Kim, Korea
Kentaro Kotani, Japan
Stéphanie Minel, France
Kazunari Morimoto, Japan
Michiko Ohkura, Japan
Taezoon Park, Korea
P.L. Patrick Rau, China
Simon Schutte, Sweden
Dosun Shin, USA
Anders Warell, Sweden
Myung Hwan Yun, Korea

This book is the first step in covering diverse topics including design and development of practices in affective and pleasurable design. I hope this book is informative and helpful for the researchers and practitioners in developing more emotional products, services, and systems.

July 2017

WonJoon Chung
Cliff Sungsoo Shin
Contents

Product Development and Design Process

Exploring Two Design Processes: Slow and Fast ......................... 3
Cliff Shin and Joyce Thomas

Rematerializing the User Interface of a Digitized Toy Through Tokens: A Comparative User Study with Children Aged Five to Six ..... 16
Marieke Van Camp, Lukas Van Campenhout, and Guido De Bruyne

Analysis of Emotion and Cultural Background on Affective Design Process .......................................................... 25
Amic G. Ho

Design and Validation of Affective Warning Pictorials on Alcohol Container Labels .............................................. 34
Waratta Authayarat, Papawee Kasornsuwan, and Arisara Jiamsanguanwong

Design Changing a Traditional Product in a Contemporary Way ...... 43
Isabel Bieger, Cristina Carvalho, and Gianni Montagna

Emotional Engineering

Semantic Influence of the Radiator Grille on Vehicle Front Design in the Course of Current EV-Design ................................. 53
Daniel Holder, Tobias Benz, and Thomas Maier

A Mahalanobis Taguchi Approach to Human Motion Control .......... 65
Shuichi Fukuda

Eye-Tracking Analysis of User Behavior with an Active Display Interface .......................................................... 72
Teruaki Ito and Tomio Watanabe
Experimental Study on Color Preference and Visual Fatigue against LED Lighting .................................................. 78
Keiichi Muramatsu, Kazunori Kaede, Eiichiro Tanaka, and Keiichi Watanuki

Emotional Responses of the Disabled Towards Wheelchairs ............. 86
Mohamed Mokdad, Bouhafs Mebarki, Lahcene Bouabdellah, and Ibrahim Mokdad

Emotional Values of Ceramic Material for Product Design .............. 97
Dosun Shin and Samuel Chung

Research on the Space-Leaving Technique in Web Design .............. 106
Huaxiang Yuan and Xuewen Ji

Emotion and the Qualitative Side of Experience

The Pain and Pleasure of Autonomy: The Role of Negative Emotion in Serviced Reality Storytelling ............................. 117
Miso Kim and Youngsoo Lee

Soma-Deep as a Marker for Idealized Experience .......................... 127
Stephen Neely

Design for Dignity and Procedural Justice ................................ 135
Margaret Hagan and Miso Kim

Ritual Design: Crafting Team Rituals for Meaningful Organizational Change .................................................. 146
Fatih Kursat Ozenc and Margaret Hagan

Material and Texture Exploration

New Typographic Experience in the Post-digital Age with 3D Printing and Ceramics .................................................. 161
Taekyeom Lee

The Black Color of Product Design and Packaging Research ........... 171
Lung-Wen Kuo and Chih-Chun Lai

Research on the Application of User Experience Design in Agricultural Product Packaging Design .......................... 182
Lvhuayang Feng, Xiao Zhang, and Delai Men

Analysis of Affective Evaluation for Material Perception of Resin Surfaces: Combined Effect of Tactile Sensation and Hue .......... 190
Michiko Ohkura, Wataru Morishita, Ryuji Miyazaki, Masato Takahashi, Hiroko Sakurai, Kiyotaka Yarimizu, and Akira Nakahara
Designing Affective and Pleasurable Design Interactions

Influence of Individual Fashion Item Images on the Image of Coordinates .......................................................... 201
Miu Sato and Toshikazu Kato

Estimation of Unconscious Preference Judgment with Near-Infrared Spectroscopy ................................................. 208
Haruka Tanida and Toshikazu Kato

Analysis of Change in Purchasing Motivation by Tone of Product-Recommendation Agent in Electronic Commerce Site .... 215
Masanari Toriba and Toshikazu Kato

Interference Thermal Sensation Simulation Using Visual and Auditory Stimuli ......................................................... 221
Tatsuya Amano, Takashi Sakamoto, Toru-nakata, and Toshikazu Kato

Effectiveness of Communicating Personalized Values Related to Physical Exercise to Enhance Motivation .................. 227
Hitoshi Urata, Takashi Sakamoto, and Toshikazu Kato

Research on Memory Factors of City Souvenir ................................. 234
Ziheng Zhang, Jianxin Chengl, Wei Ding, Junnan Ye, Tengye Li, and Zhiye Yu

Affective Value and Kawaii Engineering

Relationship Between Physical Attributes of Spoon Designs and Eye Movements Caused by Kawaii Feelings .................. 245
Tipporn Laohakangvalvit and Michiko Ohkura

Are Kawaii Products Valuable to Chinese Customers? ..................... 258
Pei-Luen Patrick Rau, Nan Qie, and Chien-Wen Tung

How to Model Value-Creating Communication: Coaching Process as an Example ....................................................... 266
Yuri Hamada and Hiroko Shoji

Participation in a Virtual Reality Concert via Brainwave and Heartbeat ................................................................. 276
Ryota Horie, Minami Wada, and Eri Watanabe

Evaluation of Immersive Feeling in VR System with HMD by fNIRS Measurement .................................................. 285
Kazuki Miyamoto, Yoshiki Koinuma, Shinichiro Kanoh, and Michiko Ohkura
Evaluation of “Feelings of Excitement” Caused by a VR Interactive System with Unknown Experience Using ECG. 292
Kodai Ito, Shigeki Usuda, Kiryu Yasunaga, and Michiko Ohkura

Kansei Engineering

Measurement of Surface and Virtual Prototyping for Kansei Engineering 305
Tatsuro Matsubara, Shigekazu Ishihara, Yukihiro Matsubara, and Mitsuo Nagamachi

Kansei Ergonomic Study of Body Brush Development 318
Keiko Ishihara, Kosuke Morinaga, Masayuki Booka, Shigekazu Ishihara, and Akira Katayama

Development and Evaluation of Ankle Mobility VR Rehabilitation Game 325
Atsushi Kanbe, Shigekazu Ishihara, and Mitsuo Nagamachi

Persuasive Semantics of Aging Health Products Based on AHP and Kansei Engineering 337
Yongyan Guo, Minggang Yang, and Meiyu Zhou

Development of Remote Control Unit of Domestic Water Heater by Kansei Engineering 347
Toshio Tsuchiya

History of Kansei Engineering and Application of Artificial Intelligence 357
Mitsuo Nagamachi

A Study on the Approach of Redesign Based on Consumer Awareness of Traditional Handicrafts, with Longevity Lock, as an Example 369
Zhiye Yu, Wei Yu, Tengye Li, Zhang Zhang, and Ziheng Zhang

Integrated Design

Modeling the Relationship Between Stress and Appetite to Create a Dish Recommendation System Based on Desired Nutrients 379
Hiroya Kato, Toru Nakata, and Toshikazu Kato

Assessing Symptoms of Excessive SNS Usage Based on User Behavior and Emotion: Analysis of Log Data 387
Ploypailin Intapong, Saromporn Charoenpit, Tiranee Achalakul, and Michiko Ohkura

Transformable Camping Cart Design for a Jack Company 398
Myungjin Kim, Haebin Lee, Muhammad Tufail, and KwanMyung Kim
Contents

Haebin Lee, Muhammad Tufail, Myungjin Kim, and KwanMyung Kim

The Design of Personal Protective Garments for Workplace:
An Ergonomic Radiation Protection Design Practice ......................... 416
Muhammad Tufail, Haebin Lee, Myungjin Kim, and KwanMyung Kim

Implication of User Behavior in Design Process
Memory Recall of Nouns and Adjectives Expressing Two-Color Combinations .................................................. 429
Saki Tomita, Takashi Sakamoto, and Toshikazu Kato

Determination of the Optimal Timing for a Relaxing Stimulus .......... 434
Yusuke Kishine, Toshikazu Kato, and Toru Nakata

Research on Attitude Accessibility in Product Design Evaluation:
Cognitive Features and Memory Network ................................... 443
Tengye Li, Jianxin Cheng, Tao Xiong, Junnan Ye, and Ziheng Zhang

Affective and Emotional Aspects of Design
Research on the Information Transmission Design of OTC Medicine
Packaging Graphic for the Elderly .................................................. 453
Xinyi Xie and Delai Men

Musical Preferences Are Influenced by Changes in Heart Rate:
A Trial Study Using Step Aerobics ............................................... 462
Takuma Oishi, Takashi Sakamoto, and Toshikazu Kato

Fitting School Buildings to the Requirements of Physically Disabled Students in Algeria: An Ergonomic Study ...................... 470
Lahcine Bouabdellah, Houda Kharbache, Mohamed Mokdad, and Bouhafs Mebarki

Categorization of Aesthetic Pleasure Derived Attributes:
A Cultural Perspective ................................................................. 479
Angela Henao

Research on User Experience Design Applications in Detail Designs of Elders’ Garment Products .................................... 489
Xiaoping Hu, Xiao Zhang, and Lyuhuayang Feng

Author Index .................................................................................. 499