Contents – Part I

Perception of Hardness and Softness

What is the Hardness Perceived by Tapping? ................. 3
  Kosuke Higashi, Shogo Okamoto, and Yoji Yamada

Haptics-1: Preliminary Results from the First Stiffness JND Identification Experiment in Space ........................................ 13
  André Schiele, Manuel Aiple, Thomas Krüger, Frank van der Hulst,
  Stefan Kimmer, Jan Smisek, and Emiel den Exter

Haptic Aftereffect of Softness .................................... 23
  Anna Metzger and Knut Drewing

Fingertip Recovery Time Depending on Viscoelasticity .......... 33
  Maria Laura D’Angelo, Darwin G. Caldwell, and Ferdinando Cannella

Haptic Devices

Rendering Moving Tactile Stroke on the Palm Using a Sparse 2D Array .... 47
  Jaeyoung Park, Jaeha Kim, Yonghwan Oh, and Hong Z. Tan

High Spatial Resolution Midair Tactile Display Using 70 kHz Ultrasound ... 57
  Mitsuru Ito, Daisuke Wakuda, Seki Inoue, Yasutoshi Makino,
  and Hiroyuki Shinoda

Mid-Air Ultrasonic Pressure Control on Skin by Adaptive Focusing ...... 68
  Seki Inoue, Yasutoshi Makino, and Hiroyuki Shinoda

Characterization of Ultrasound Tactile Display ....................... 78
  Georgios Korres and Mohamad Eid

Pneumatic Feedback for Wearable Lower Limb Exoskeletons
Further Explored .................................................. 90
  Heidi Muijzer-Witteveen, Francisco Guerra, Victor Sluiter,
  and Herman van der Kooij

Haptics and Motor Control

A Versatile Robotic Haptic Stimulator to Study the Influence of Pain
on Human Motor Control and Learning ............................ 101
  Maxime Jeanneret, Carlo Bagnato, Alessandro Gabriele Allievi,
  and Etienne Burdet
Weight and Weightlessness Effects on Sensorimotor Performance During Manual Tracking
   Bernhard Weber, Simon Schätzle, Cornelia Riecke, Bernhard Brunner,
   Sergey Tarassenko, Jordi Artigas, Ribin Balachandran,
   and Alin Albu-Schäffer  

Individuals with Chronic Hemiparetic Stroke Correctly Match Forearm Position Within a Single Arm: Preliminary Findings  
   Erik J. Euving, Netta Gurari, Justin M. Drogos, Stuart Traxel,
   Arno H.A. Stienen, and Julius P.A. Dewald  

Shape Features of the Search Target Modulate Hand Velocity, Posture and Pressure During Haptic Search in a 3D Display  
   Kathrin Krieger, Alexandra Moringen, Robert Haschke,
   and Helge Ritter  

Haptic SLAM: An Ideal Observer Model for Bayesian Inference of Object Shape and Hand Pose from Contact Dynamics  
   Feryal M. P. Behbahani, Guillem Singla–Buxarrais, and A. Aldo Faisal  

The Influence of Motor Task on Tactile Suppression During Action  
   Nienke B. Debats, Marieke Rohde, Catharina Glowania,
   Anna Oppenborn, and Marc O. Ernst  

Tactile Cues  

Ultrasonic Friction Modulation While Pressing Induces a Tactile Feedback  
   Jocelyn Monnoyer, Emmanuelle Diaz, Christophe Bourdin,
   and Michaël Wiertlewski  

Perception of Skin Stretch Applied to Palm: Effects of Speed and Displacement  
   Ahmet Guzereler, William R. Provancher, and Cagatay Basdogan  

Effect of Waveform in Haptic Perception of Electrovibration on Touchscreens  
   Yasemin Vardar, Burak Güçlü, and Cagatay Basdogan  

Temporal Integration of Tactile Inputs from Multiple Sites  
   Sarah McIntyre, Ingvars Birznieks, Robin Andersson, Gabriel Dicander,
   Paul P. Breen, and Richard M. Vickery  

Control of Haptic Interfaces  

Improved Control Methods for Vibrotactile Rendering  
   Ha-Van Quang and Matthias Harders
Co-actuation: Achieve High Stiffness and Low Inertia in Force Feedback Device. 
\textit{Jian Song, Yuru Zhang, Hongdong Zhang, and Dangxiao Wang} \hfill 229

Comparing Series Elasticity and Admittance Control for Haptic Rendering. 
\textit{Takamasa Horibe, Emma Treadway, and R. Brent Gillespie} \hfill 240

Texture Rendering Strategies with a High Fidelity - Capacitive Visual-Haptic Friction Control Device. 
\textit{Eric Vezzoli, Thomas Sednaoui, Michel Amberg, Frédéric Giraud, and Betty Lemaire-Semail} \hfill 251

Successive Stiffness Increment Approach for High Stiffness Haptic Interaction. 
\textit{Harsimran Singh, Aghil Jafari, and Jee-Hwan Ryu} \hfill 261

\textbf{Thermal Perception}

A Century Later, the Hue-Heat Hypothesis: Does Color Truly Affect Temperature Perception? \textit{Mounia Ziat, Carrie Anne Balcer, Andrew Shirtz, and Taylor Rolison} \hfill 273

Influence of Object Material Properties and Geometry on Skin Temperature Responses During Contact. \textit{Hsin-Ni Ho} \hfill 281

Space-Time Dependencies and Thermal Perception. \textit{Anshul Singhal and Lynette Jones} \hfill 291

\textbf{Posters 1}

A Study on Control of a Phantom Sensation by Visual Stimuli. \textit{Arinobu Niijima and Takefumi Ogawa} \hfill 305

Integrating Measured Force Feedback in Passive Multilateral Teleoperation. \textit{Michael Panzirsch, Thomas Hulin, Jordi Artigas, Christian Ott, and Manuel Ferre} \hfill 316

Enhancement of Virtual Simulator for Marine Crane Operations via Haptic Device with Force Feedback. \textit{Yingguang Chu, Houxiang Zhang, and Wei Wang} \hfill 327

A Novel Haptic Stylus for Mobile Terminal. \textit{Lei Tian, Aiguo Song, and Dapeng Chen} \hfill 338
Texture Rendering on a Tactile Surface Using Extended Elastic Images
and Example-Based Audio Cues ........................................... 350

Julien Fleureau, Yoan Lefevre, Fabien Danieau, Philippe Guillotel,
and Antoine Costes

An IMU and RFID-based Navigation System Providing Vibrotactile
Feedback for Visually Impaired People .................................... 360

Claudio Loconsole, Maryam Banitalebi Dehkordi, Edoardo Sotgiu,
Marco Fontana, Massimo Bergamasco, and Antonio Frisoli

Illusion of Wet Sensation by Controlling Temperature and Softness
of Dry Cloth ................................................................. 371

Mai Shibahara and Katsunari Sato

How Attention Is Allocated When Using Haptic Touch: Shape Feature
Distinction and Discrimination Strategy ............................... 380

Torø Graven

It’s All About the Subject - Options to Improve Psychometric
Procedure Performance ..................................................... 394

Christian Hatzfeld, Viet Quoc Hoang, and Mario Kupnik

Does Haptic Feedback Improve Learning and Recall of Spatial
Information? A Study Using a Virtual Reality Nasendoscopy Simulation .... 404

Greg S. Ruthenbeck, Michael Tlauka, and Andria Tan

Perceived Intensity of Vibrotactile Stimuli: Do Your Clothes Really Matter? ... 412

Valérie Duthoit, Jean-Marc Sieffermann, Eric Enrègle,
and David Blumenthal

Affordable Wideband Sensor Coupled Vibrotactile Actuator Systems
for Psychophysical Experiments ........................................... 419

Abhijit Biswas, Muniyandi Manivannan, and Mandayam A. Srinivasan

Going Against the Grain – Texture Orientation Affects Direction
of Exploratory Movement ................................................... 430

Alexandra Lezkan and Knut Drewing

An Adaptive Strategy for an Immersive Visuo-Haptic Attention
Training Game ............................................................... 441

Xiaoxiao Yang, Dangxiao Wang, and Yuru Zhang

Deaf-Blind Can Practise Horse Riding with the Help of Haptics ............... 452

Matjaž Ogrinc, Ildar Farkhatdinov, Rich Walker, and Etienne Burdet

Perceptual Force on the Wrist Under the Hanger Reflex and Vibration ........ 462

Takuto Nakamura, Narihiko Nishimura, Taku Hachisu, Michi Sato,
Vibol Yem, and Hiroyuki Kajimoto
A Pocket-Size Alphabet Display with Letter Trajectories Presented to Fingers ............................................................... 472
  Koji Tanaka, Keisuke Hasegawa, Yasutoshi Makino, and Hiroyuki Shinoda

Haptic Rendering of Thin, Deformable Objects with Spatially Varying Stiffness ................................................. 483
  Priyadarshini Kumari and Subhasis Chaudhuri

An Eight-Legged Tactile Sensor to Estimate Coefficient of Static Friction: Improvements in Design and Evaluation .................. 493
  Wei Chen, Han Wen, Heba Khamis, and Stephen J. Redmond

Tactile Vision Substitution with Tablet and Electro-Tactile Display ................................................................. 503
  Haruya Uematsu, Masaki Suzuki, Yonezo Kanno, and Hiroyuki Kajimoto

Augmentation of Thermal Sensation on Finger Pad Using Stimuli for Finger Side ............................................. 512
  Katsunari Sato

Modal Superimposition for Multi-fingers Variable Friction Tactile Device ......................................................... 521
  Sofiane Ghenna, Christophe Giraud-Audine, Frederic Giraud, Michel Amberg, and Betty Lemaire-Semail

Author Index ................................................................................. 531
Contents – Part II

Robotics and Sensing

Hands-On Learning with a Series Elastic Educational Robot......................... 3
Ata Otaran, Ozan Tokatli, and Volkan Patoglu

Investigating Tactile Sensation in the Hand Using a Robot-Based Tactile Assessment Tool.............................................................................................................. 17
Elisabeth Wilhelm, Michael Mace, Atsushi Takagi, Ildar Farkhatdinov,
Sarah Guy, and Etienne Burdet

Design Principles for Building a Soft, Compliant, High Spatial Resolution Tactile Sensor Array........................................................................................................ 25
Heba Khamis, Stephen J. Redmond, Robert Tripodi, Artis Linarts,
Juris Zavickis, Maris Knite, and Ingvars Birznieks

Basic Study on a Soft Tactile Sensor Based on Subcutaneous Tissue with Collagen Fibers............................................................................................................. 35
Yuto Sonoi, Yoshihiro Tanaka, Masayoshi Hashimoto, Motoaki Fukasawa,
Nobuteru Usuda, Yoshito Otake, Manabu Fukumoto, and Akihito Sano

Applications

Haptic Feedback to Compensate for the Absence of Horizon Cues During Landing......................................................................................................................... 47
Mounia Ziat, Samantha Wagner, and Ilja Frissen

Localized Magnification in Vibrotactile HMDs for Accurate Spatial Awareness................................................................................................................................. 55
Victor Adriel de Jesus Oliveira, Luciana Nedel, Anderson Maciel,
and Luca Brayda

Multipoint Vibrotactile Stimuli Based on Vibration Propagation Enhance Collision Sensation.............................................................................................................. 65
Shunya Sakata, Hikaru Nagano, Masashi Konyo, and Satoshi Tadokoro

How Geometrical Descriptors Help to Build Cognitive Maps of Solid Geometry with a 3DOF Tactile Mouse.............................................................................. 75
Mariacarla Memeo and Luca Brayda

Thimble End Effector for Palpation Skills Training........................................... 86
Arthur Loisillier, Alejandro Granados, Alastair Barrow,
and Fernando Bello
Posters 2

Both Fingers and Head are Acceptable in Sensing Tactile Feedback of Gaze Gestures. .......................................................... 99
Jari Kangas, Jussi Rantala, Deepak Akkil, Poika Isokoski,
Päivi Majaranta, and Roope Raisamo

A Reconfigurable Haptic Joystick Based on Magneto-Rheological Elastomers - System Design and First Evaluation .................. 109
Christian Hatzfeld, Johannes Bilz, Tobias Fritzche, and Mario Kupnik

Brain Responses to Errors During 3D Motion in a Hapto-Visual VR. ........ 120
Boris Yazmir, Miriam Reiner, Hillel Pratt, and Miriam Zacksenhouse

Investigation of Human Subjective Feelings for Different Surface Textures of Slipping Objects Based on the Analysis of Contact Conditions .... 131
Tsuyoshi Arakawa, Akira Nakahara, Kiyotaka Yarimizu, Masato Takahashi,
Michiko Ohkura, Toshio Tsuji, and Yuichi Kurita

Reconsideration of Ouija Board Motion in Terms of Haptics Illusions ...... 139
Takahiro Shitara, Yuriko Nakai, Haruya Uematsu, Yem Vibol,
Hiroyuki Kajimoto, and Satoshi Saga

Method of Observing Finger Skin Displacement on a Textured Surface Using Index Matching ............................................. 147
Seitaro Kaneko and Hiroyuki Kajimoto

Frequency-Specific Masking Effect by Vibrotactile Stimulation to the Forearm .............................................................. 156
Yoshihiro Tanaka, Shota Matsuoka, Wouter M. Bergmann Tiest,
Astrid M.L. Kappers, Kouta Minamizawa, and Akihito Sano

The Roughness Display with Pen-like Tactile Device for Touchscreen Device ............................................................. 165
Peng Deng, Juan Wu, and Xingjian Zhong

ViSecure: A Haptic Gesture Authentication System ....................... 177
Steven Strachan and Sabrina Panéels

Accuracy Improvement of Torque Estimation Between a Surgical Robot Instrument and Environment in Single-DOF Motion .......... 187
Suhwan Park, Cheongjun Kim, and Doo Yong Lee

Observing Touch from Video: The Influence of Social Cues on Pleasantness Perceptions .................................................. 196
Christian J.A.M. Willemse, Gijs Huisman, Merel M. Jung,
Jan B.F. van Erp, and Dirk K.J. Heylen
Low-Amplitude Textures Explored with the Bare Finger: Roughness Judgments Follow an Inverted U-Shaped Function of Texture Period Modified by Texture Type ........................................... 206

Knut Drewing

A Linear Optimization Procedure for an EMG-driven NeuroMusculoSkeletal Model Parameters Adjusting: Validation Through a Myoelectric Exoskeleton Control ......................... 218

Domenico Buongiorno, Francesco Barone, Massimiliano Solazzi, Vitoantonio Bevilacqua, and Antonio Frisoli

Data-Driven Modeling of Anisotropic Haptic Textures: Data Segmentation and Interpolation ............................................................. 228

Arsen Abdulali and Seokhee Jeon

Simulating Affective Touch: Using a Vibrotactile Array to Generate Pleasant Stroking Sensations ............................................. 240

Gijs Huisman, Aduén Darriba Frederiks, Jan B.F. van Erp, and Dirk K.J. Heylen

Design and Development of a Multimodal Vest for Virtual Immersion and Guidance ................................................................. 251

Gonzalo García-Valle, Manuel Ferre, Jose Breñosa, Rafael Aracil, Jose M. Sebastian, and Christos Giachritsis

Reducing Visual Dependency with Surface Haptic Touchscreens ......... 263

Yu-Jen Lin and Sile O’Modhrain

Tension-Based Wearable Vibroacoustic Device for Music Appreciation . . . 273

Yusuke Yamazaki, Hironori Mitake, and Shoichi Hasegawa

At-Home Computer-Aided Myoelectric Training System for Wrist Prosthesis ................................................................. 284

Anastasios Vilouras, Hadi Heidari, William Taube Navaraj, and Ravinder Dahiya

Textile Fabrics’ Texture: From Multi-level Feature Extraction to Tactile Simulation ................................................................. 294

Wael Ben Messaoud, Marie-Ange Bueno, and Betty Lemaire-Semail

Electrovibration Signal Design: A Simulative Approach ....................... 304

Zlatko Vidrih and Eric Vezzoli

Posters 3

Low-Frequency Vibration Actuator Using a DC Motor ....................... 317

Vibol Yem, Ryuta Okazaki, and Hiroyuki Kajimoto
Enabling Wearable Soft Tactile Displays with Electroactive Smart Elastomers ........................................... 326
   Gabriele Frediani, Hugh Boys, Stefan Poslad, and Federico Carpi

Individual Differences in Skin Vibration and Contact Force During Active Touch ........................................... 335
   Makiko Natsume, Yoshihiro Tanaka, and Akihito Sano

An Attempt to Induce a Strong Rubber Hand Illusion Under Active-Hand Movement with Tactile Feedback and Visuotactile Stimulus ......................... 346
   Ken Itoh, Shogo Okamoto, Masayuki Hara, and Yoji Yamada

Psychophysical Power Optimization of Friction Modulation for Tactile Interfaces ........................................ 354
   Thomas Sednaoui, Eric Vezzoli, David Gueorguiev, Michel Amberg, Cedrick Chappaz, and Betty Lemaire-Semail

End Effector for a Kinesthetic Haptic Device Capable of Displaying Variable Size and Stiffness ......................... 363
   Nathan S. Usevitch, Rohan Khanna, Robert M. Carrera, and Allison M. Okamura

Tactile Apparent Movement as a Modality for Lower Limb Haptic Feedback ................................................. 373
   Daniel K.Y. Chen, Junkai Xu, Peter B. Shull, and Thor F. Besier

Toward Non-visual Graphics Representations on Vibratory Touchscreens: Shape Exploration and Identification ......... 384
   Jennifer L. Tennison and Jenna L. Gorlewicz

Studying One and Two-Finger Perception of Tactile Directional Cues ...................................................... 396
   Yoren Gaffary, Maud Marchal, Adrien Girard, Marine Pellan, Anouk Asselin, Benoit Peigne, Mathieu Emily, Florian Gosselin, Anthony Chabrier, and Anatole Lécuyer

Computational Assessment of Mechanical Triggers for Spiking Activity During Surface Exploration: From Finite Element Analysis to Firing-Rate .......... 406
   Teja Vodlak, Zlatko Vidrih, Primož Sustaric, Tomaz Rodic, Johan Wessberg, and Djordje Peric

Impact of Combined Stimuli on the Perception of Transient Forces ......................................................... 416
   Connie Wu, Erica D. Chin, Michael Fanton, and Allison M. Okamura

   Gordon Minaker, Oliver Schneider, Richard Davis, and Karon E. MacLean
Mind the Bump: Effect of Geometrical Descriptors on the Perception of Curved Surfaces with a Novel Tactile Mouse

*Mariacarla Memeo and Luca Brayda*

On Generation of Active Feedback with Electrostatic Attraction

*Ugur Alican Alma, Gholamreza Ilkhani, and Evren Samur*

A Novel Approach for Upper Limb Robotic Rehabilitation for Stroke Patients

*Michele Barsotti, Edoardo Sotgiu, Daniele Leonardis, Mine Sarac, Giada Sgherri, Giuseppe Lamola, Fanciullacci Chiara, Caterina Procopio, Carmelo Chisari, and Antonio Frisoli*

Calibration Method of Thermal-Radiation-Based Haptic Display

*Satoshi Saga*

Milliseconds Matter: Temporal Order of Visuo-tactile Stimulation Affects the Ownership of a Virtual Hand

*Ioannis Dimitrios Zoulias, William Seymour Harwin, Yoshikatsu Hayashi, and Slawomir Jaroslaw Nasuto*

Automatic Visualization and Graphical Editing of Virtual Modeling Networks for the Open-Source Synth-A-Modeler Compiler

*Edgar Berdahl, Peter Vasil, and Andrew Pfalz*

Acceptable Mismatch Between Scaled 3D Images and Tactile Stimulation

*Ryota Arai, Yasutoshi Makino, and Hiroyuki Shinoda*

**Author Index**
Haptics: Perception, Devices, Control, and Applications
10th International Conference, EuroHaptics 2016,
London, UK, July 4-7, 2016, Proceedings, Part I
Bello, F.; Kajimoto, H.; Visell, Y. (Eds.)
2016, XXIII, 534 p. 298 illus., Softcover
ISBN: 978-3-319-42320-3