

## Table of Contents – Part II

### Texture and Surfaces

|                                                                                                                          |    |
|--------------------------------------------------------------------------------------------------------------------------|----|
| Fingernail-Mounted Display of Attraction Force and Texture . . . . .                                                     | 3  |
| <i>Masataka Niwa, Tomoko Nozaki, Taro Maeda, and Hideyuki Ando</i>                                                       |    |
| Contact Force and Duration Effects on Static and Dynamic Tactile Texture Discrimination . . . . .                        | 9  |
| <i>Hoi Fei Kwok, Kerry Darkins, Calogero M. Oddo, Lucia Beccai, and Alan M. Wing</i>                                     |    |
| Causality Inversion in the Reproduction of Roughness . . . . .                                                           | 17 |
| <i>Michaël Wiertlewski, José Lozada, Edwige Pissaloux, and Vincent Hayward</i>                                           |    |
| Laterotactile Rendering of Vector Graphics with the Stroke Pattern . . . . .                                             | 25 |
| <i>Vincent Lévesque and Vincent Hayward</i>                                                                              |    |
| Discrimination Capabilities of Professionals in Manual Skills in a Haptic Task Not Related to Their Expertise . . . . .  | 31 |
| <i>Marcos Hilsenrat and Miriam Reiner</i>                                                                                |    |
| Modulations in Low-Frequency EEG Oscillations in the Processing of Tactile Surfaces . . . . .                            | 37 |
| <i>Francisco Muñoz, Manuel Sebastián, José Manuel Reales, and Soledad Ballesteros</i>                                    |    |
| Power Consumption Reduction of a Controlled Friction Tactile Plate . . . . .                                             | 44 |
| <i>Frédéric Giraud, Michel Amberg, Romuald Vanbelleghem, and Betty Lemaire-Semail</i>                                    |    |
| Psychophysical Evaluation of a Low Density and Portable Tactile Device Displaying Small-Scale Surface Features . . . . . | 50 |
| <i>Nadia Vanessa Garcia-Hernandez, Nikos Tsagarakis, Ioannis Sarakoglou, and Darwin Caldwell</i>                         |    |
| Tactile Perception of a Water Surface: Contributions of Surface Tension and Skin Hair . . . . .                          | 58 |
| <i>Michi Sato, Junya Miyake, Yuki Hashimoto, and Hiroyuki Kajimoto</i>                                                   |    |
| A Force and Touch Sensitive Self-deformable Haptic Strip for Exploration and Deformation of Digital Surfaces . . . . .   | 65 |
| <i>Monica Bordegoni, Umberto Cugini, Mario Covarrubias, and Michele Antolini</i>                                         |    |

|                                                                                                              |    |
|--------------------------------------------------------------------------------------------------------------|----|
| Influence of Visual Feedback on Passive Tactile Perception of Speed and Spacing of Rotating Gratings .....   | 73 |
| <i>Anatole Lécuyer, Marco Congedo, Edouard Gentaz, Olivier Joly, and Sabine Coquillart</i>                   |    |
| Dimensional Reduction of High-Frequency Accelerations for Haptic Rendering .....                             | 79 |
| <i>Nils Landin, Joseph M. Romano, William McMahan, and Katherine J. Kuchenbecker</i>                         |    |
| Analysis of a New Haptic Display Coupling Tactile and Kinesthetic Feedback to Render Texture and Shape ..... | 87 |
| <i>Tao Zeng, Frédéric Giraud, Betty Lemaire-Semail, and Michel Amberg</i>                                    |    |
| Constraints on Haptic Short-Term Memory .....                                                                | 94 |
| <i>Catherine Monnier and Delphine Picard</i>                                                                 |    |

**Virtual Reality**

|                                                                                                                 |     |
|-----------------------------------------------------------------------------------------------------------------|-----|
| Design and Development of a Haptic Dental Training System - hapTEL .....                                        | 101 |
| <i>Brian Tse, William Harwin, Alastair Barrow, Barry Quinn, Jonathan San Diego, and Margaret Cox</i>            |     |
| Design of a Multimodal VR Platform for the Training of Surgery Skills .....                                     | 109 |
| <i>Florian Gosselin, Fabien Ferlay, Sylvain Bouchigny, Christine Mégard, and Farid Taha</i>                     |     |
| Haptic Assistance in Virtual Environments for Motor Rehabilitation .....                                        | 117 |
| <i>Jaka Ziherl, Domen Novak, Andrej Olenšek, and Marko Munih</i>                                                |     |
| Preliminary Experiment Combining Virtual Reality Haptic Shoes and Audio Synthesis .....                         | 123 |
| <i>Rolf Nordahl, Amir Berrezag, Smilen Dimitrov, Luca Turchet, Vincent Hayward, and Stefania Serafin</i>        |     |
| Two-Hand Virtual Object Manipulation Based on Networked Architecture .....                                      | 130 |
| <i>Manuel Ferre, Ignacio Galiana, Jorge Barrio, Pablo García-Robledo, Antonio Giménez, and Javier López</i>     |     |
| Validation of a Virtual Reality Environment to Study Anticipatory Modulation of Digit Forces and Position ..... | 136 |
| <i>Matteo Bianchi, Giorgio Grioli, Enzo Pasquale Scilingo, Marco Santello, and Antonio Bicchi</i>               |     |

|                                                                                                                         |     |
|-------------------------------------------------------------------------------------------------------------------------|-----|
| On Multi-resolution Point-Based Haptic Rendering of Suture . . . . .                                                    | 144 |
| <i>Wen Shi and Shahram Payandeh</i>                                                                                     |     |
| Study of Performances of “Haptic Walls” Modalities for a 3D Menu . . . . .                                              | 152 |
| <i>Antonio Capobianco and Caroline Essert</i>                                                                           |     |
| Spherical MR-Brake with Nintendo Wii Sensors for Haptics . . . . .                                                      | 160 |
| <i>Doruk Senkal and Hakan Gurocak</i>                                                                                   |     |
| FlexTorque: Exoskeleton Interface for Haptic Interaction with the Digital<br>World . . . . .                            | 166 |
| <i>Dzmitry Tsetserukou, Katsunari Sato, and Susumu Tachi</i>                                                            |     |
| Influence of Vision and Haptics on Plausibility of Social Interaction in Virtual<br>Reality Scenarios . . . . .         | 172 |
| <i>Zheng Wang, Ji Lu, Angelika Peer, and Martin Buss</i>                                                                |     |
| Haptic Feedback Increases Perceived Social Presence . . . . .                                                           | 178 |
| <i>Eva-Lotta Sallnäs</i>                                                                                                |     |
| Haptic/VR Assessment Tool for Fine Motor Control . . . . .                                                              | 186 |
| <i>Christophe Emery, Evren Samur, Olivier Lamercy,<br/>Hannes Bleuler, and Roger Gassert</i>                            |     |
| Hand and Arm Ownership Illusion through Virtual Reality Physical<br>Interaction and Vibrotactile Stimulations . . . . . | 194 |
| <i>Miguel A. Padilla, Silvia Pabon, Antonio Frisoli, Edoardo Sotgiu,<br/>Claudio Loconsole, and Massimo Bergamasco</i>  |     |

## Grasping and Moving

|                                                                                                        |     |
|--------------------------------------------------------------------------------------------------------|-----|
| Animating a Synergy-Based Deformable Hand Avatar for Haptic<br>Grasping . . . . .                      | 203 |
| <i>Sara Mulatto, Alessandro Formaglio, Monica Malvezzi, and<br/>Domenico Prattichizzo</i>              |     |
| Development of a 3 DoF MR-Compatible Haptic Interface for Pointing and<br>Reaching Movements . . . . . | 211 |
| <i>Stefan Klare, Angelika Peer, and Martin Buss</i>                                                    |     |
| Cold Objects Pop Out! . . . . .                                                                        | 219 |
| <i>Myrthe A. Plaisier and Astrid M.L. Kappers</i>                                                      |     |
| Using Haptic-Based Trajectory Following in 3D Space to Distinguish between<br>Men and Women . . . . .  | 225 |
| <i>Eleni Zarogianni, Ioannis Marras, and Nikos Nikolaidis</i>                                          |     |
| Hand-Held Object Force Direction Identification Thresholds at Rest and<br>during Movement . . . . .    | 231 |
| <i>Gabriel Baud-Bovy and Elia Gatti</i>                                                                |     |

|                                                                                                                            |     |
|----------------------------------------------------------------------------------------------------------------------------|-----|
| A New Planar 4-DOF Spring and Cable Driven Force Feedback Device .....                                                     | 237 |
| <i>Yi Yang, Yuru Zhang, and Betty Lemaire-Semail</i>                                                                       |     |
| A Laparoscopic Grasper Handle with Integrated Augmented Tactile Feedback, Designed for Training Grasp Control .....        | 243 |
| <i>Eleonora Westebring-van der Putten, Mostafa Hajian, Richard Goossens, John van den Dobbelsteen, and Jack Jakimowicz</i> |     |
| Collision Avoidance Control for a Multi-fingered Bimanual Haptic Interface .....                                           | 251 |
| <i>Takahiro Endo, Takashi Yoshikawa, and Haruhisa Kawasaki</i>                                                             |     |
| Optimization Criteria for Human Trajectory Formation in Dynamic Virtual Environments .....                                 | 257 |
| <i>Sebastian Albrecht, Carolina Passenberg, Marion Sobotka, Angelika Peer, Martin Buss, and Michael Ulbrich</i>            |     |
| Bodily Self-attribution Caused by Seeing External Body-Resembling Objects and the Control of Grasp Forces .....            | 263 |
| <i>Eleonora Westebring-van der Putten, Richard Goossens, Jenny Dankelman, and Jack Jakimowicz</i>                          |     |
| Do Changes in Movements after Tool Use Depend on Body Schema or Motor Learning? .....                                      | 271 |
| <i>Raoul M. Bongers</i>                                                                                                    |     |
| A Motion-Based Handheld Haptic Interface .....                                                                             | 277 |
| <i>Ki-Uk Kyung and Junseok Park</i>                                                                                        |     |
| A Multi-functional Rehabilitation Device to Assist Forearm/Wrist and Grasp Therapies .....                                 | 283 |
| <i>Ismail Hakan Ertas and Volkan Patoglu</i>                                                                               |     |
| Virtual Surface Discrimination via an Anisotropic-Stiffness Contact Model .....                                            | 291 |
| <i>Alessandro Formaglio, Gabriel Baud-Bovy, and Domenico Prattichizzo</i>                                                  |     |
| Embedding Tactile Feedback into Handheld Devices: An Aperture-Based Restraint for the Finger or Thumb .....                | 297 |
| <i>Brian T. Gleeson and William R. Provancher</i>                                                                          |     |
| Understanding the Haptic Experience through Bodily Engagement with Sculptural Ceramics .....                               | 303 |
| <i>Bonnie Kemske</i>                                                                                                       |     |
| Development of Haptic Microgripper for Microassembly Operation .....                                                       | 309 |
| <i>Shahzad Khan, Ton de Boer, Pablo Estevez, Hans H. Langen, and Rob H. Munnig Schmidt</i>                                 |     |

|                                                                                                                                        |     |
|----------------------------------------------------------------------------------------------------------------------------------------|-----|
| A Haptic Gearshift Interface for Cars . . . . .                                                                                        | 315 |
| <i>Eloísa García-Canseco, Alain Ayemlong-Fokem,<br/>Alex Serrarens, and Maarten Steinbuch</i>                                          |     |
| Proprioceptive Acuity Varies with Task, Hand Target, and When Memory Is<br>Used . . . . .                                              | 321 |
| <i>Stephanie A.H. Jones, Katja Fiehler, and Denise Y.P. Henriques</i>                                                                  |     |
| Size-Change Detection Thresholds of a Hand-Held Bar at Rest and during<br>Movement . . . . .                                           | 327 |
| <i>Gabriel Baud-Bovy, Valentina Squeri, and Vittorio Sanguineti</i>                                                                    |     |
| Haptic Feedback of Piconewton Interactions with Optical Tweezers . . . . .                                                             | 333 |
| <i>Cécile Pacoret, Arvid Bergander, and Stéphane Régnier</i>                                                                           |     |
| Pressure Is a Viable Controlled Output of Motor Programming for Object<br>Manipulation Tasks . . . . .                                 | 339 |
| <i>Camille Williams, Daniel Shang, and Heather Carnahan</i>                                                                            |     |
| <b>Performance and Training</b>                                                                                                        |     |
| A Comparison of the Haptic and Visual Horizontal-Vertical Illusion . . . . .                                                           | 347 |
| <i>Jacqui Howell, Mark Symmons, and Dianne Wullemijn</i>                                                                               |     |
| Setting the Standards for Haptic and Tactile Interactions:<br>ISO's Work . . . . .                                                     | 353 |
| <i>Jan B.F. van Erp, Ki-Uk Kyung, Sebastian Kassner, Jim Carter,<br/>Stephen Brewster, Gerhard Weber, and Ian Andrew</i>               |     |
| Vibrotactor-Belt on the Thigh – Directions in the Vertical Plane . . . . .                                                             | 359 |
| <i>Yael Salzer, Tal Oron-Gilad, and Adi Ronen</i>                                                                                      |     |
| Accuracy of Haptic Object Matching in Blind and Sighted Children and<br>Adults . . . . .                                               | 365 |
| <i>Ans Withagen, Astrid M.L. Kappers, Mathijs P.J. Vervloed,<br/>Harry Knoors, and Ludo Verhoeven</i>                                  |     |
| The Core Skills Trainer: A Set of Haptic Games for Practicing Key Clinical<br>Skills . . . . .                                         | 371 |
| <i>Sarah Baillie, Neil Forrest, and Tierney Kinnison</i>                                                                               |     |
| A Measuring Tool for Accurate Haptic Modeling in Industrial Maintenance<br>Training . . . . .                                          | 377 |
| <i>Paolo Tripicchio, Alessandro Filippeschi, Emanuele Ruffaldi,<br/>Franco Tecchia, Carlo Alberto Avizzano, and Massimo Bergamasco</i> |     |

|                                                                                                                                                                 |            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Control Strategies and Performance of a Magnetically Actuated Tactile<br>Micro-actuator Array . . . . .                                                         | 385        |
| <i>Jérémy Streque, Abdelkrim Talbi, Philippe Pernod, and<br/>Vladimir Preobrazhensky</i>                                                                        |            |
| Muscular Torque Can Explain Biases in Haptic Length Perception:<br>A Model Study on the Radial-Tangential Illusion . . . . .                                    | 392        |
| <i>Nienke B. Debats, Idsart Kingma, Peter J. Beek, and<br/>Jeroen B.J. Smeets</i>                                                                               |            |
| The Effect of Coulomb Friction in a Haptic Interface on Positioning<br>Performance . . . . .                                                                    | 398        |
| <i>Koen Crommentuijn and Dik J. Hermes</i>                                                                                                                      |            |
| Is the Touch-Induced Illusory Flash Distinguishable from a Real<br>Flash? . . . . .                                                                             | 406        |
| <i>Tom G. Philippi, Jan B.F. van Erp, and Peter Werkhoven</i>                                                                                                   |            |
| Haptic Recognition of Non-figurative Tactile Pictures in the Blind: Does<br>Life-Time Proportion without Visual Experience Matter? . . . . .                    | 412        |
| <i>Samuel Lebaz, Delphine Picard, and Christophe Jouffrais</i>                                                                                                  |            |
| Preliminary Evaluation of a Haptic Aiding Concept for Remotely Piloted<br>Vehicles . . . . .                                                                    | 418        |
| <i>Samantha M.C. Alaimo, Lorenzo Pollini, Alfredo Magazzù,<br/>Jean Pierre Bresciani, Paolo Robuffo Giordano, Mario Innocenti, and<br/>Heinrich H. Bühlhoff</i> |            |
| Haptic Adjustment of Cylinder Radius . . . . .                                                                                                                  | 426        |
| <i>Astrid M.L. Kappers</i>                                                                                                                                      |            |
| The Effects of 3D Collocated Presentation of Visuo-haptic Information on<br>Performance in a Complex Realistic Visuo-motor Task . . . . .                       | 432        |
| <i>Dror David Lev, Roman Rozengurt, Tami Gelfeld, Alex Tarkhnishvili, and<br/>Miriam Reiner</i>                                                                 |            |
| Visuo-haptic Length Judgments in Children and Adults . . . . .                                                                                                  | 438        |
| <i>Knut Drewing and Bianca Jovanovic</i>                                                                                                                        |            |
| Presentation of Positional Information by Heat Phantom Sensation . . . . .                                                                                      | 445        |
| <i>Jun Oohara, Hiroshi Kato, Yuki Hashimoto, and Hiroyuki Kajimoto</i>                                                                                          |            |
| Haptic Playback: Better Trajectory Tracking during Training Does Not Mean<br>More Effective Motor Skill Transfer . . . . .                                      | 451        |
| <i>Maxim Kolesnikov and Miloš Žefran</i>                                                                                                                        |            |
| <b>Author Index . . . . .</b>                                                                                                                                   | <b>457</b> |

# Table of Contents – Part I

## Mass, Force, and Elasticity

|                                                                                                                                            |    |
|--------------------------------------------------------------------------------------------------------------------------------------------|----|
| Efficient Bimodal Haptic Weight Actuation . . . . .                                                                                        | 3  |
| <i>Gunter Hannig and Barbara Deml</i>                                                                                                      |    |
| The Contribution of Proprioceptive and Cutaneous Cues in Weight Perception:<br>Early Evidence for Maximum-Likelihood Integration . . . . . | 11 |
| <i>Christos Giachritsis, Rachel Wright, and Alan Wing</i>                                                                                  |    |
| The Shape-Weight Illusion . . . . .                                                                                                        | 17 |
| <i>Mirela Kahrimanovic, Wouter M. Bergmann Tiest, and<br/>Astrid M.L. Kappers</i>                                                          |    |
| Force-Based Calibration of a Particle System for Realistic Simulation of<br>Nonlinear and Viscoelastic Soft Tissue Behavior . . . . .      | 23 |
| <i>Bektas Baybora Baran and Cagatay Basdogan</i>                                                                                           |    |
| Haptic Perception of Viscosity . . . . .                                                                                                   | 29 |
| <i>Wouter M. Bergmann Tiest, Anne C.L. Vrijling, and<br/>Astrid M.L. Kappers</i>                                                           |    |
| Multi-sensorial Interface for 3D Teleoperations at Micro and<br>Nanoscale . . . . .                                                        | 35 |
| <i>Nicolas Venant, Antoine Niguès, Florence Marchi, Michal Hrouzek,<br/>Fabio Comin, Joël Chevrier, and Jean-Loup Florens</i>              |    |
| Classifying Torque, Normal Force and Direction Using Monkey Afferent<br>Nerve Spike Rates . . . . .                                        | 43 |
| <i>Stephen James Redmond, Ingvars Birznieks, Nigel H. Lovell, and<br/>Antony W. Goodwin</i>                                                |    |
| A New Coupling Scheme for Haptic Rendering of Rigid Bodies Interactions<br>Based on a Haptic Sub-world Using a Contact Graph . . . . .     | 51 |
| <i>Loeiz Glondu, Maud Marchal, and Georges Dumont</i>                                                                                      |    |
| A New Multi-DOF Haptic Device Using a Redundant Parallel<br>Mechanism . . . . .                                                            | 57 |
| <i>Jumpei Arata, Norio Ikedo, and Hideo Fujimoto</i>                                                                                       |    |
| Estimation of Normal and Tangential Manipulation Forces by Using Contact<br>Force Sensors . . . . .                                        | 65 |
| <i>Ignacio Galiana, Marta Bielza, and Manuel Ferre</i>                                                                                     |    |

|                                                                                                                                           |     |
|-------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Modeling and Experimental Studies of a Novel 6-DOF Haptic Device . . . . .                                                                | 73  |
| <i>Zhouming Tang and Shahram Payandeh</i>                                                                                                 |     |
| Inertial Force Display to Represent Content Inside the Box . . . . .                                                                      | 81  |
| <i>Yuichiro Sekiguchi, Satoru Matsuoka, and Koichi Hirota</i>                                                                             |     |
| Perception of Stiffness during Interaction with Delay-Like Nonlinear Force<br>Field . . . . .                                             | 87  |
| <i>Raz Leib, Ilana Nisky, and Amir Karniel</i>                                                                                            |     |
| Improving the Prediction of Haptic Impression User Ratings Using<br>Perception-Based Weighting Methods: Experimental Evaluation . . . . . | 93  |
| <i>Christian Hatzfeld, Thorsten A. Kern, and Roland Werthschützky</i>                                                                     |     |
| Vibrotactile Force Perception Thresholds at the Fingertip . . . . .                                                                       | 99  |
| <i>Christian Hatzfeld and Roland Werthschützky</i>                                                                                        |     |
| Optimum Design of 6R Passive Haptic Robotic Arm for Implant<br>Surgery . . . . .                                                          | 105 |
| <i>Serter Yilmaz, E. Ilhan Konukseven, and Hakan Gurocak</i>                                                                              |     |
| Creating Virtual Stiffness by Modifying Force Profile of Base Object . . . . .                                                            | 111 |
| <i>Atsutoshi Ikeda, Yuichi Kurita, Takeshi Tamaki,<br/>Kazuyuki Nagata, and Tsukasa Ogasawara</i>                                         |     |
| Extended Rate-Hardness: A Measure for Perceived Hardness . . . . .                                                                        | 117 |
| <i>Gabjong Han and Seungmoon Choi</i>                                                                                                     |     |
| Using a Fingertip Tactile Device to Substitute Kinesthetic Feedback in Haptic<br>Interaction . . . . .                                    | 125 |
| <i>Domenico Prattichizzo, Claudio Pacchierotti, Stefano Cenci,<br/>Kouta Minamizawa, and Giulio Rosati</i>                                |     |
| The Effect of Bimanual Lifting on Grip Force and Weight Perception . . . . .                                                              | 131 |
| <i>Christos Giachritsis and Alan Wing</i>                                                                                                 |     |
| How to Build an Inexpensive 5-DOF Haptic Device Using Two Novint<br>Falcons . . . . .                                                     | 136 |
| <i>Aman V. Shah, Scott Teuscher, Eric W. McClain, and Jake J. Abbott</i>                                                                  |     |
| Revisiting the Effect of Velocity on Human Force Control . . . . .                                                                        | 144 |
| <i>Manikantan Nambi, William R. Provancher, and Jake J. Abbott</i>                                                                        |     |

**Teleoperation**

|                                                                                                  |     |
|--------------------------------------------------------------------------------------------------|-----|
| A Coordinating Controller for Improved Task Performance in Multi-user<br>Teleoperation . . . . . | 155 |
| <i>Hiroyuki Tanaka, Thomas Schauf, Kouhei Ohnishi,<br/>Angelika Peer, and Martin Buss</i>        |     |

|                                                                                                                                                      |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Mechatronic Design Optimization of a Teleoperation System Based on Bounded Environment Passivity .....                                               | 161 |
| <i>Bert Willaert, Brecht Corteville, Herman Bruyninckx, Hendrik Van Brussel, and Emmanuel B. Vander Poorten</i>                                      |     |
| On the Impact of Haptic Data Reduction and Feedback Modality on Quality and Task Performance in a Telepresence and Teleaction System .....           | 169 |
| <i>Verena Nitsch, Julius Kammerl, Berthold Faerber, and Eckehard Steinbach</i>                                                                       |     |
| Stability Analysis of Mobile Robot Teleoperation with Variable Force Feedback Gain .....                                                             | 177 |
| <i>Ildar Farkhatdinov and Jee-Hwan Ryu</i>                                                                                                           |     |
| Transparency of the Generalized Scattering Transformation for Haptic Telepresence .....                                                              | 183 |
| <i>Iason Vittorias and Sandra Hirche</i>                                                                                                             |     |
| VerroTouch: High-Frequency Acceleration Feedback for Telerobotic Surgery .....                                                                       | 189 |
| <i>Katherine J. Kuchenbecker, Jamie Gewirtz, William McMahan, Dorsey Standish, Paul Martin, Jonathan Bohren, Pierre J. Mendoza, and David I. Lee</i> |     |
| A Turing-Like Handshake Test for Motor Intelligence .....                                                                                            | 197 |
| <i>Amir Karniel, Ilana Nisky, Guy Avraham, Bat-Chen Peles, and Shelly Levy-Tzedek</i>                                                                |     |
| The Influence of Different Haptic Environments on Time Delay Discrimination in Force Feedback .....                                                  | 205 |
| <i>Markus Rank, Zhuanghua Shi, Hermann J. Müller, and Sandra Hirche</i>                                                                              |     |
| Perception and Action in Simulated Telesurgery .....                                                                                                 | 213 |
| <i>Ilana Nisky, Assaf Pressman, Carla M. Pugh, Ferdinando A. Mussa-Ivaldi, and Amir Karniel</i>                                                      |     |
| Parallel Kinematics for Haptic Feedback in Three Degrees of Freedom: Application in a Handheld Laparoscopic Telemanipulation System .....            | 219 |
| <i>Sebastian Kassner and Roland Werthschützky</i>                                                                                                    |     |
| Mechanical Impedance: A Cobotic and Haptic Actuators Performance Criterion .....                                                                     | 225 |
| <i>Jonathan Van Rhijn, Alain Riwan, Ziad Jabbour, and Vigen Arakelyan</i>                                                                            |     |
| Online Intention Recognition in Computer-Assisted Teleoperation Systems .....                                                                        | 233 |
| <i>Nikolay Stefanov, Angelika Peer, and Martin Buss</i>                                                                                              |     |

|                                                                                                             |     |
|-------------------------------------------------------------------------------------------------------------|-----|
| Evaluation of a Coordinating Controller for Improved Task Performance in Multi-user Teleoperation . . . . . | 240 |
| <i>Thomas Schauß, Raphaela Groten, Angelika Peer, and Martin Buss</i>                                       |     |
| Effects of Force Feedback and Arm Compliance on Teleoperation for a Hygiene Task . . . . .                  | 248 |
| <i>Chih-Hung King, Marc D. Killpack, and Charles C. Kemp</i>                                                |     |
| Telepresence Technology for Production: From Manual to Automated Assembly . . . . .                         | 256 |
| <i>Marwan Radi, Andrea Reiter, Michael F. Zäh, Thomas Müller, and Alois Knoll</i>                           |     |
| High Fidelity Haptic Rendering for Deformable Objects Undergoing Topology Changes . . . . .                 | 262 |
| <i>Hoeryong Jung, Stephane Cotin, Christian Duriez, Jeremie Allard, and Doo Yong Lee</i>                    |     |

## Novel Approaches

|                                                                                             |     |
|---------------------------------------------------------------------------------------------|-----|
| Basic Properties of Phantom Sensation for Practical Haptic Applications . . . . .           | 271 |
| <i>Hiroshi Kato, Yuki Hashimoto, and Hiroyuki Kajimoto</i>                                  |     |
| Evaluation of Transmission System for Spatially Distributed Tactile Information . . . . .   | 279 |
| <i>Katsunari Sato and Susumu Tachi</i>                                                      |     |
| Electro-tactile Display with Real-Time Impedance Feedback . . . . .                         | 285 |
| <i>Hiroyuki Kajimoto</i>                                                                    |     |
| Life Log System Based on Tactile Sound . . . . .                                            | 292 |
| <i>Yasutoshi Makino, Masakazu Murao, and Takashi Maeno</i>                                  |     |
| What Is It Like to Be a Rat? Sensory Augmentation Study . . . . .                           | 298 |
| <i>Avraham Saig, Amos Arieli, and Ehud Ahissar</i>                                          |     |
| Innovative Real-Time Communication System with Rich Emotional and Haptic Channels . . . . . | 306 |
| <i>Dzmitry Tsetserukou and Alena Neviarouskaya</i>                                          |     |
| Tactile vs Graphical Authentication . . . . .                                               | 314 |
| <i>Ravi Kuber and Wai Yu</i>                                                                |     |
| Haptics Can “Lend a Hand” to a Bionic Eye . . . . .                                         | 320 |
| <i>Barry Richardson and George Van Doorn</i>                                                |     |
| Analysis of Active Handrest Control Methods . . . . .                                       | 326 |
| <i>Mark A. Fehlberg, Brian T. Gleeson, and William R. Provancher</i>                        |     |

|                                                                                                        |            |
|--------------------------------------------------------------------------------------------------------|------------|
| Roly-poly: A Haptic Interface with a Self-righting Feature . . . . .                                   | 332        |
| <i>Seung-Chan Kim, Byung-Kil Han, Soo-Chul Lim, Andrea Bianchi,<br/>Ki-Uk Kyung, and Dong-Soo Kwon</i> |            |
| HaptiHug: A Novel Haptic Display for Communication of Hug over a<br>Distance . . . . .                 | 340        |
| <i>Dzmitry Tsetserukou</i>                                                                             |            |
| Physical Contact of Devices: Utilization of Beats for Interpersonal<br>Communication . . . . .         | 348        |
| <i>Soo-Chul Lim, Seung-Chan Kim, Jung-Hoon Hwang, and<br/>Dong-Soo Kwon</i>                            |            |
| Tremor Suppression Control for a Meal-Assist Robot . . . . .                                           | 354        |
| <i>Ken'ichi Yano, Kenji Nishiwaki, and Shota Hiramatsu</i>                                             |            |
| Reflective Haptics: Enhancing Stylus-Based Interactions on Touch<br>Screens . . . . .                  | 360        |
| <i>Götz Wintergerst, Ron Jagodzinski, Fabian Hemmert,<br/>Alexander Müller, and Gesche Joost</i>       |            |
| A Novel Tactile Sensor for Detecting Lumps in Breast Tissue . . . . .                                  | 367        |
| <i>Mehmet Ayyildiz, Burak Guclu, Mustafa Z. Yildiz, and<br/>Cagatay Basdogan</i>                       |            |
| Tactile Sensation Imaging for Artificial Palpation . . . . .                                           | 373        |
| <i>Jong-Ha Lee, Chang-Hee Won, Kaiguo Yan, Yan Yu, and Lydia Liao</i>                                  |            |
| Improving Vehicular Window Control with Haptic and Visual<br>Feedback . . . . .                        | 379        |
| <i>David Racine, John Holmen, Mehrdad Hosseini Zadeh, and<br/>Mark Thompson</i>                        |            |
| Gesture Recognition in the Haptic Creature . . . . .                                                   | 385        |
| <i>Jonathan Chang, Karon MacLean, and Steve Yohanan</i>                                                |            |
| <b>Author Index . . . . .</b>                                                                          | <b>393</b> |