Haptics

Hasti Seifi,Astrid M. L. Kappers,Oliver Schneider,Alireza Abbasimoshaei,Knut Drewing,Claudio Pacchierotti,Gijs Huisman,Thorsten A. Kern

Haptics Lynette Jones,2018-09-04 An accessible, nontechnical overview of active touch sensing, from sensory receptors in the skin to tactile surfaces on flat screen displays. Haptics, or haptic sensing, refers to the ability to identify and perceive objects through touch. This is active touch, involving exploration of an object with the hand rather than the passive sensing of a vibration or force on the skin. The development of new technologies, including prosthetic hands and tactile surfaces for flat screen displays, depends on our knowledge of haptics. In this volume in the MIT Press Essential Knowledge series, Lynette Jones offers an accessible overview of haptics, or active touch sensing, and its applications. Jones explains that haptics involves integrating information from touch and kinesthesia—that is, information both from sensors in the skin and from sensors in muscles, tendons, and joints. The challenge for technology is to reproduce in a virtual world some of the sensations associated with physical interactions with the environment. Jones maps the building blocks of the tactile system, the receptors in the skin and the skin itself, and how information is processed at this

interface with the external world. She describes haptic perception, the processing of haptic information in the brain; haptic illusions, or distorted perceptions of objects and the body itself; tactile and haptic displays, from braille to robotic systems; tactile compensation for other sensory impairments; surface haptics, which creates virtual haptic effects on physical surfaces such as touch screens; and the development of robotic and prosthetic hands that mimic the properties of human hands.

Haptics Technologies Abdulmotaleb El Saddik,Mauricio Orozco,Mohamad Eid,Jongeun Cha,2011-09-15 The term "haptics" refers to the science of sensing and manipulation through touch. Multiple disciplines such as biomechanics, psychophysics, robotics, neuroscience, and software engineering converge to support haptics, and generally, haptic research is done by three communities: the robotics community, the human computer interface community, and the virtual reality community. This book is different from any other book that has looked at haptics. The authors treat haptics as a new medium rather than just a domain within one of the above areas. They describe human haptic perception and interfaces and present fundamentals in haptic rendering and modeling in virtual

environments. Diverse software architectures for standalone and networked haptic systems are explained, and the authors demonstrate the vast application spectrum of this emerging technology along with its accompanying trends. The primary objective is to provide a comprehensive overview and a practical understanding of haptic technologies. An appreciation of the close relationship between the wide range of disciplines that constitute a haptic system is a key principle towards being able to build successful collaborative haptic environments. Structured as a reference to allow for fast accommodation of the issues concerned, this book is intended for researchers interested in studying touch and force feedback for use in technological multimedia systems in computer science, electrical engineering, or other related disciplines. With its novel approach, it paves the way for exploring research trends and challenges in such fields as interpersonal communication, games, or military applications.

The Senses of Touch Mark Paterson,2020-06-07 Touch is the first sense to develop in the womb, yet often it is overlooked. The Senses of Touch examines the role of touching and feeling as part of

the fabric of everyday, embodied experience. How can we think about touch? Problems of touch and tactility run as a continuous thread in philosophy, psychology, medical writing and representations in art, from Ancient Greece to the present day. Picking through some of these threads, the book 'feels' its way towards writing and thinking about touch as both sensory and affective experience. Taking a broadly phenomenological framework that traces tactility from Aristotle through the Enlightenment to the present day, the book examines the role of touch across a range of experiences including aesthetics, digital design, visual impairment and touch therapies. The Senses of Touch thereby demonstrates the varieties of sensory experience, and explores the diverse range of our 'senses' of touch.

Advances in Haptics Mehrdad Hosseini Zadeh,2010-04-01 Haptic interfaces are divided into two main categories: force feedback and tactile. Force feedback interfaces are used to explore and modify remote/virtual objects in three physical dimensions in applications including computer-aided design, computer-assisted surgery, and computer-aided assembly. Tactile interfaces deal with surface

properties such as roughness, smoothness, and temperature. Haptic research is intrinsically multi-disciplinary, incorporating computer science/engineering, control, robotics, psychophysics, and human motor control. By extending the scope of research in haptics, advances can be achieved in existing applications such as computer-aided design (CAD), tele-surgery, rehabilitation, scientific visualization, robot-assisted surgery, authentication, and graphical user interfaces (GUI), to name a few. Advances in Haptics presents a number of recent contributions to the field of haptics. Authors from around the world present the results of their research on various issues in the field of haptics.

Personalizing Haptics Hasti Seifi,2019-06-15 This monograph presents a vision for haptic personalization tools and lays the foundations for achieving it. Effective haptic personalization requires a suite of tools unified by one underlying conceptual model that can easily be incorporated into users' workflows with various applications. Toward this vision, the book introduces three mechanisms for haptic personalization and details development of two of them into: 1) an efficient interface for choosing from a large haptic library, and 2) three emotion controls for adjusting haptic signals. A series

of quantitative experiments identifies five schemas (engineering, sensation, emotion, metaphor, and usage examples) for how end-users think and talk about haptic sensations and characterizes them as the underlying model for the personalization tools. Personalizing Haptics highlights the need for scalable haptic evaluation methodologies and presents two methodologies for large-scale in-lab evaluation and online crowdsourcing of haptics. While the work focuses on vibrotactile signals as the most mature and accessible type of haptic feedback for end-users, the concepts and findings extend to other categories of haptics. Taking haptics to the crowds will require haptic design practices to go beyond the current one-size-fits-all approach to satisfy users' diverse perceptual, functional, and hedonic needs reported in the literature. This book provides a starting point for students, researchers, and practitioners in academia or industry who aim to adapt their haptic and multisensory designs to the needs and preferences of a wide audience.

Archaeologies of Touch David Parisi,2018-02-27 A material history of haptics technology that raises new questions about the relationship between touch and media Since the rise of radio and

television, we have lived in an era defined increasingly by the electronic circulation of images and sounds. But the flood of new computing technologies known as haptic interfaces—which use electricity, vibration, and force feedback to stimulate the sense of touch—offering an alternative way of mediating and experiencing reality. In Archaeologies of Touch, David Parisi offers the first full history of these increasingly vital technologies, showing how the efforts of scientists and engineers over the past three hundred years have gradually remade and redefined our sense of touch. Through lively analyses of electrical machines, videogames, sex toys, sensory substitution systems, robotics, and human–computer interfaces, Parisi shows how the materiality of touch technologies has been shaped by attempts to transform humans into more efficient processors of information. With haptics becoming ever more central to emerging virtual-reality platforms (immersive bodysuits loaded with touch-stimulating actuators), wearable computers (haptic messaging systems like the Apple Watch's Taptic Engine), and smartphones (vibrations that emulate the feel of buttons and onscreen objects), Archaeologies of Touch offers a timely and provocative engagement with the long history of touch

technology that helps us confront and question the power relations underpinning the project of giving touch its own set of technical media.

Haptics: Neuroscience, Devices, Modeling, and Applications Malika Auvray,Christian Duriez,2014-10-09 The two-volume set LNCS 8618 and 8619 constitutes the refereed proceedings of the 9th International Conference EuroHaptics 2014, held in Versailles, France, in June 2014. The 118 papers (36 oral presentations and 82 poster presentations) presented were carefully reviewed and selected from 183 submissions. Furthermore, 27 demos were exhibited, each of them resulting in a short paper included in the volumes. These proceedings reflect the multidisciplinary nature of EuroHaptics and cover topics such as human-computer interaction, human-robot interactions, neuroscience, perception and psychophysics, biomechanics and motor control, modelling and simulation; and a broad range of applications in medicine, rehabilitation, art, and design.

Pervasive Haptics Hiroyuki Kajimoto,Satoshi Saga,Masashi Konyo,2016-04-27 This book examines the state of the art in diverse areas of haptics (touch)-related research, including the

psychophysics and neurophysiology of haptics, development of haptics displays and sensors, and applications to a wide variety of fields such as industry, education, therapy, medicine, and welfare for the visually impaired. It also discusses the potential of future haptics interaction, such as haptics for emotional control and remote haptics communication. The book offers a valuable resource not only for haptics and human interface researchers, but also for developers and designers at manufacturing corporations and in the entertainment industries.

Ultrasound Mid–Air Haptics for Touchless Interfaces Orestis Georgiou,William Frier,Euan Freeman,Claudio Pacchierotti,Takayuki Hoshi,2022-09-16 Over the last decade, ultrasound mid-air haptic technology has emerged and rapidly advanced to engage multidisciplinary scientific communities within and adjacent to the haptics and HCI fields. Additionally, this haptic technology has been adopted by a number of industry sectors (e.g., automotive, virtual reality, digital signage, neuroscience research) who appear keen to exploit its unique value proposition: the ability to deliver rich haptic sensations from a distance, without the need to touch, wear or hold anything in order to

enhance touchless interfaces, novel applications, and experiences. This book is the first, and currently the only one, that provides a comprehensive description of the technology, encapsulating almost all aspects relating to electronic prototyping, acoustics, haptics, psychology and perception, user experience and end-user HCI applications. Through its 18 chapters written by 30 expert co-authors, this book is therefore an excellent introduction to the technology for anyone coming from any of those fields. Specifically, the reader will benefit by getting a unique and multi-dimensional perspective on the state-of-the-art of this enabling haptic technology while also understanding its history, relevant best research practices, and an overview of the various open challenges and opportunities.

The Sense of Touch and Its Rendering Antonio Bicchi,Martin Buss,Marc O. Ernst,Angelika Peer,2008-05-23 Sense of Touch and its Rendering presents a unique and interdisciplinary approach highlighting the field of haptic research from a neuropsychological as well as a technological point of view. This edited book is the outcome of the TOUCH-HapSys European research project and provides an important contribution towards a new generation of high-fidelity haptic display technologies. The

book is structured in two parts: A. Fundamental Psychophysical and Neuropsychological Research and B. Technology and Applications. The two parts are not however separated, and the many connections and synergies between the two complementary domains of research are highlighted in the text. The eleven chapters discuss the recent advances in the study of human haptic (kinaesthetic, tactile, temperature) and multimodal (visual, auditory, haptic) perception mechanisms. Besides the theoretical advancement, the contributions survey the state of the art in the field, report a number of practical applications to real systems, and discuss possible future developments.

Haptic Interfaces for Accessibility, Health, and Enhanced Quality of Life Troy McDaniel,Sethuraman Panchanathan,2019-12-18 This book is the first resource to provide in-depth coverage on topical areas of assistive, rehabilitative, and health-related applications for haptic (touch-based) technologies. Application topics are grouped into thematic areas spanning haptic devices for sensory impairments, health and well-being, and physical impairments which are illustrated in this book. A diverse group of experts in the field were invited to contribute different chapters to provide

complementary and multidisciplinary perspectives. Unlike other books on haptics, which focus on human haptic perception, specific modalities of haptics (e.g., realistic haptic rendering), or broadly cover the subfields of haptics, this book takes an application-oriented approach to present a tour of how the field of haptics has been advanced with respect to important, impactful thematic focuses. Under Theme 1 "Sensory Impairments", haptics technologies to support individuals with sensory impairments is presented which includes: Spatial awareness in sensory impairments through touch; Haptically-assisted interfaces for persons with visual impairments; and Enabling learning experiences for visually impaired children by interaction design. Under Theme 2 "Haptics for Health and Well-Being", haptics technologies aimed at supporting exercise and healthy aging will be covered including: Haptics in rehabilitation, exergames and health; Therapeutic haptics for mental health and well-being; and Applications of haptics in medicine. Under Theme 3 "Haptics for Physical Impairments", haptics technologies for enhancing the quality of life for individuals with weakened/impaired limbs or neurological diseases impacting movement is targeted including: Assistive soft exoskeletons with

pneumatic artificial muscles; Haptics for accessibility in rehabilitative hardware; and intelligent robotics and immersive displays for enhancing haptic interaction in physical rehabilitation environments. Engineers, scientists, and researchers working in the areas of haptics, multimedia, virtual/augmented/mixed-reality, human-computer interaction, assistive technologies, rehabilitative technologies, healthcare technologies, and/or actuator design will want to purchase this book. Advanced level students and hobbyists interested in haptics will also be interested in this book.

Haptic Interaction Hiroyuki Kajimoto,Hideyuki Ando,Ki-Uk Kyung,2015-06-29 This book is aimed not only at haptics and human interface researchers, but also at developers and designers from manufacturing corporations and the entertainment industry who are working to change our lives. This publication comprises the proceedings of the first International AsiaHaptics conference, held in Tsukuba, Japan, in 2014. The book describes the state of the art of the diverse haptics- (touch-) related research, including scientific research into haptics perception and illusion, development of haptics devices, and applications for a wide variety of fields such as education, medicine,

telecommunication, navigation, and entertainment.

Making Sense of Haptics Femke Elise van Beek,2018-01-05 Tele operation systems, in which robots are controlled remotely, are a potential solution to performing tasks in remote, small, and hazardous environments. However, there is a big disadvantage to these systems; as the direct connection between the human and the environment is lost and operators are deprived of their sense of touch. The recreation of touch feedback through haptic devices is a possible solution, however haptic devices are far from perfect and improving their design is usually a slow trial-and-error process. This book describes 7 scientific studies that try to break this slow loop by using a deductive approach. Through investigating fundamental properties of human haptic perception using psychophysical paradigms, general knowledge on haptic perception of force, position, movement and hardness was gained. The resulting information can be applied to many different haptic devices. Consequently haptic systems can be more easily designed in an intuitive, human-centered way.

Haptics for Virtual Reality and Teleoperation Matja□ Mihelj,Janez Podobnik,2012-12-14 This book

covers all topics relevant for the design of haptic interfaces and teleoperation systems. The book provides the basic knowledge required for understanding more complex approaches and more importantly it introduces all issues that must be considered for designing efficient and safe haptic interfaces. Topics covered in this book provide insight into all relevant components of a haptic system. The reader is guided from understanding the virtual reality concept to the final goal of being able to design haptic interfaces for specific tasks such as nanomanipulation. The introduction chapter positions the haptic interfaces within the virtual reality context. In order to design haptic interfaces that will comply with human capabilities at least basic understanding of human sensors-motor system is required. An overview of this topic is provided in the chapter related to human haptics. The book does not try to introduce the state-of-the-art haptic interface solutions because these tend to change quickly. Only a careful selection of different kinematic configurations is shown to introduce the reader into this field. Mathematical models of virtual environment, collision detection and force rendering topics are strongly interrelated and are described in the next two chapters. The interaction with the virtual

environment is simulated with a haptic interface. Impedance and admittance based approaches to haptic robot control are presented. Stability issues of haptic interaction are analyzed in details and solutions are proposed for guaranteeing stable and safe operation. Finally, haptic interaction is extended to teleoperation systems. Virtual fixtures which improve the teleoperation and human-robot cooperation in complex environments are covered next and the last chapter presents nanomanipulation as one specific example of teleoperation.

Musical Haptics Stefano Papetti,Charalampos Saitis,2018-05-02 This Open Access book offers an original interdisciplinary overview of the role of haptic feedback in musical interaction. Divided into two parts, part I examines the tactile aspects of music performance and perception, discussing how they affect user experience and performance in terms of usability, functionality and perceived quality of musical instruments. Part II presents engineering, computational, and design approaches and guidelines that have been applied to render and exploit haptic feedback in digital musical interfaces. Musical Haptics introduces an emerging field that brings together engineering, human-computer

interaction, applied psychology, musical aesthetics, and music performance. The latter, defined as the complex system of sensory-motor interactions between musicians and their instruments, presents a well-defined framework in which to study basic psychophysical, perceptual, and biomechanical aspects of touch, all of which will inform the design of haptic musical interfaces. Tactile and proprioceptive cues enable embodied interaction and inform sophisticated control strategies that allow skilled musicians to achieve high performance and expressivity. The use of haptic feedback in digital musical interfaces is expected to enhance user experience and performance, improve accessibility for disabled persons, and provide an effective means for musical tuition and guidance.

Haptic Interaction Hiroyuki Kajimoto,Dongjun Lee,Sang-Youn Kim,Masashi Konyo,Ki-Uk Kyung,2019-05-13 This book constitutes the proceedings of the third international conference AsiaHaptics 2018, held in Songdo, Korea. It presents the state-of-the-art of the diverse haptics (touch)-related research, including perception and illusion, development of haptics devices, and applications to a wide variety of fields such as education, medicine, telecommunication, navigation and entertainment.

This book is a valuable resource not only for active haptics researchers, but also for general readers wishing to understand the status quo in this interdisciplinary area of science and technology.

Haptic Interaction Shoichi Hasegawa,Masashi Konyo,Ki-Uk Kyung,Takuya Nojima,Hiroyuki Kajimoto,2017-07-06 This book comprises the proceedings of the second International Conference, AsiaHaptics 2016, held in Kashiwanoha, Japan. The book treats the state of the art of the diverse haptics (touch)-related research, including scientific research of haptics perception and illusion, development of haptics devices, and applications to a wide variety of fields such as education, medicine, telecommunication, navigation, and entertainment. This work helps not only active haptic researchers, but also general readers to understand what is going on in this interdisciplinary area of science and technology.

Haptics for Human–Computer Interaction Mounia Ziat,2023-03 In recent years haptics has received considerable attention from the field of Human-Computer Interactions (HCI) for its potential to provide more tangible and immersive interfaces. So much of what we call experience relies on our

sense of touch and our sense of where our bodies are in the environment. So much so that we long for a technology that could help us share those feelings. Haptic interfaces are the devices that communicate with our sense of touch and proprioception. From the mild resistance built in to the volume knob on your car stereo that allows you to know how many degrees you are turning it without looking at it, to the full body suit that may soon come to your home gaming system, haptics is a vital and growing part of the world around us and has the potential to augment many aspects of our lives.In this monograph, the author presents a selected review of research in haptics to provide HCI and other fields a framework for understanding haptics that will help design better interfaces and, ultimately, new and better experiences for those who interact with technology every day. This collection of essays exposes the reader to the haptics field, the haptic sense, and some examples of haptic technology. They cover over 50 years of research and terminology, and thus will be a handy reference for any researcher.

Haptics: Science, Technology, Applications Hasti Seifi,Astrid M. L. Kappers,Oliver

Schneider,Alireza Abbasimoshaei,Knut Drewing,Claudio Pacchierotti,Gijs Huisman,Thorsten A. Kern,2022 This open access book constitutes the proceedings of the 13th International Conference on Human Haptic Sensing and Touch Enabled Computer Applications, EuroHaptics 2022, held in Hamburg, Germany, in May 2022. The 36 regular papers included in this book were carefully reviewed and selected from 129 submissions. They were organized in topical sections as follows: haptic science; haptic technology; and haptic applications. .

  Touch in Virtual Environments Margaret L. McLaughlin,João P. Hespanha,2002 Haptics: The state-of-the-art in building touch-based interfaces for virtual environments. -- Key research issues: model acquisition, contact detection, force feedback, compression, capture, and collaboration. -- Understanding the role of human factors in haptic interfaces. -- Applications: medical training, telesurgery, biological and scientific interfaces, military applications, sign language, museum display, and more. Haptics -- touch-based interface design -- is the exciting new frontier in research on virtual and immersive environments. In Touch in Virtual Environments, the field's leading researchers bring

together their most advanced work and applications. They identify the key challenges facing haptic

interface developers, present today's best solutions, and outline a clear research agenda for the future.

This book draws upon work first presented at the breakthrough haptics conference held recently at

USC's Integrated Media Systems Center. The editors and contributors begins by reviewing key haptics

applications and the challenges of effective haptic rendering, presenting new insights into model

acquisition, contact detection, force feedback, compression, capture, collaboration, and other key

issues. Next, they focus on the complex human factors associated with successful haptic interfaces,

examining questions such as: How can we make haptic displays more usable for blind and visually

impaired users? What are the differences between perceiving texture with the bare skin and with a

probe? In the book's final section, several of today's leading haptic applications are introduced,

including telesurgery and surgical simulation; scientific visualization.

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