



Yasaman Sedaghat

Combined static-dynamic deformations with haptic rendering



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Combined Static Dynamic Deformations With Haptic Rendering

Kamran Ghaffari Toiserkan



Combined Static Dynamic Deformations With Haptic Rendering:

Combined Static-dynamic Deformations with Haptic Rendering Yasaman Sedaghat,2013 **Combined Static-Dynamic Deformations with Haptic Rendering** Yasaman Sedaghat,2013 We present a real time physically based simulation method for animating high resolution elastic deformations with a focus on haptic interaction To achieve interactive rates without losing accuracy the reduced material stiffness matrix is precomputed by removing the equations that correspond to the internal nodes of the system In addition we employ linear modal analysis to precompute the natural vibration modes of the system We introduce a deformation coupling technique in order to achieve the reduced dynamic behaviour while keeping the high resolution local deformations To explore the implications of the coupling system we describe different integration techniques to time step the reduced dynamic solution in addition to evaluating the force feedback Moreover we show how we handle multiple contact points for non sticky materials To improve the contact handling procedure we employ our sliding technique to include friction We compare our proposed method to the previously existing techniques in terms of run time complexity and deformation properties using 3D meshes embedded in finite elements

Medicine Meets Virtual Reality 02/10 James D. Westwood,Helene M. Hoffman,Richard A. Robb,D. Stredney,2006-01-15 The book offers papers on many aspects of electronic technology in healthcare Core areas are imaging simulation visualization data networks sensors robotics and displays Medical applications include information guided surgery education and procedural training telemedicine immersive environments stereoscopic projection diagnostic tools rehabilitation and augmented reality The papers describe both completed projects and recent developments in ongoing research The book is a the collection of papers of the 10th annual Medicine Meets Virtual Reality conference January 2002 This volume is a resource for computer scientists working in medical context and for creators of data focused products for clinical care medical education and procedural training The Biomechanics of the Tactile Perception of Friction Laurence Willemet,2022-10-31 Humans rely on their sense of touch to perceive subtle movements and micro slippages to manipulate an impressive range of objects This incredible dexterity relies on fast and unconscious adjustments of the grip force that holds an object strong enough to avoid a catastrophic fall yet gentle enough not to damage it The Biomechanics of the Tactile Perception of Friction covers how the complex mechanical interaction is perceived by the nervous system to quickly infer the state of the contact for a swift and precise regulation of the grip The first part focuses on how humans assess friction at the contact initialization and the second part highlights an efficient coding strategy that the nervous system might use to continuously adjust the grip force to keep a constant safety margin before slippage Taken together these results reveal how the perception of frictional information is encoded in the deformation of our skin The findings are useful for designing bio inspired tactile sensors for robotics or prosthetics and for improving haptic human machine interactions **IEEE ... Workshop on Multimedia Signal Processing** ,2004 **Haptic Rendering** Ming C. Lin,Miguel Otaduy,2008-07-25 For a

long time human beings have dreamed of a virtual world where it is possible to interact with synthetic entities as if they were real It has been shown that the ability to touch virtual objects increases the sense of presence in virtual environments This book provides an authoritative overview of state of the art haptic rendering algorithms Manufacturing Automation S. T. Tan, I. Gibson, Ye-Hwa Chen, Y. H. Chen, 2003 This collection of 58 papers from the December 2002 conference presents recent developments in manufacturing automation with an emphasis on rapid product development and manufacturing The researchers explore new approaches to design systems and methodologies machining technology intelligent systems technology management and Internet based systems Topics include CAD methods for additive fabrication of truss structures radial force and hole oversize prediction in drilling a hierarchical approach to assembly sequence planning and rapid prototyping of a differential housing using 3D printing technology No subject index is provided Distributed by ASME Annotation copyrighted by Book News Inc Portland OR Surgery Simulation and Soft Tissue Modeling Nicholas Ayache, Hervé Delingette, 2003-08-03 This book constitutes the refereed proceedings of the International Symposium on Surgery Simulation and Soft Tissue Modeling IS4TM 2003 held in Juan Les Pins France in June 2003 The 33 revised full papers presented together with 3 invited papers were carefully reviewed and selected from 45 submissions The papers are organized in topical sections on soft tissue models haptic rendering cardiac modeling and patient specific simulators **VRST**, 2006 *IEEE/ACM SIGGRAPH Symposium on Volume Visualization and Graphics 2002*, 2002 *Dissertation Abstracts International*, 2007 **Proceedings**, 2002 **Proceedings of the ASME Dynamic Systems and Control Division**, 1994 Experimental Robotics VIII Bruno Siciliano, Paolo Dario, 2003-09-05 This book collects papers on the state of the art in experimental robotics Experimental Robotics is at the core of validating robotics research for both its systems science and theoretical foundations Because robotics experiments are carried out on physical complex machines whose controllers are subject to uncertainty devising meaningful experiments and collecting statistically significant results pose important and unique challenges in robotics Robotics experiments serve as a unifying theme for robotics system science and algorithmic foundations These observations have led to the creation of the International Symposia on Experimental Robotics The papers of the book were presented at the 2002 International Symposium on Experimental Robotics **International Aerospace Abstracts**, 1999 **Annual Index/abstracts of SAE Technical Papers**, 2006 A Unified Haptic Framework for Rendering Stiff and Dynamic Virtual Environments Kamran Ghaffari Toiserkan, 2015 Recent years have witnessed a growing demand for high performance controllers for complex haptic simulation applications Haptic simulation employs a robotic device to render interaction forces with a remote environment or with an environment which only virtually exists as computer simulation Such implementation inspires a vast area of applications from education medical and military fields to industrial gaming and social interaction An ideal haptic controller should provide the user with realistic sense of touch creating an immersive perception of reality However in practice the process involves a number of non ideal factors which

embark various undesirable haptic artifacts destroying the illusion of reality The non idealities are originated from a combination of factors namely time discretization sampling timedelay quantization and discontinuities hold functions and noise These factors are tightly interconnected and together can reshape the dynamics of the system leading to instability chatter and other problematic artifacts Overcoming these effects is particularly challenging when rendering high impedance interactions with highly dynamic virtual systems Currently a growing gap exists between the requirements of complex applications and the performance and functionality of most available rendering methods which motivates further efforts toward developing high performance force feedback controllers This thesis proposes a unified haptic framework comprising several multi level solutions in order to mitigate the non ideal effects and deliver high performance and realistic haptic rendering The dynamics of the interacting virtual system is also taken into account in the provided solutions allowing for high fidelity interactions with a wide range of dynamic systems Developing a high performance force feedback system requires a solid understanding of the underlying processes and their multidisciplinary nature For this reason the fundamental processes in impedance control based haptic simulation are investigated in the forthcoming chapters Various sources of the non ideal effects are identified and appropriate solutions are provided to tackle the associated problems These solutions incorporate a significant amount of novelties contributing to the existing body of knowledge in haptics This work is supported by extensive simulation and experimental results for different types of haptic scenarios

Haptic Rendering for Simulation of Fine Manipulation Dangxiao Wang, Jing Xiao, Yuru Zhang, 2014-10-17 This book introduces the latest progress in six degrees of freedom 6 DoF haptic rendering with the focus on a new approach for simulating force torque feedback in performing tasks that require dexterous manipulation skills One of the major challenges in 6 DoF haptic rendering is to resolve the conflict between high speed and high fidelity requirements especially in simulating a tool interacting with both rigid and deformable objects in a narrow space and with fine features The book presents a configuration based optimization approach to tackle this challenge Addressing a key issue in many VR based simulation systems the book will be of particular interest to researchers and professionals in the areas of surgical simulation rehabilitation virtual assembly and inspection and maintenance

Haptics Rendering and Applications Abdulmotaleb El Saddik, 2012-01-27 There has been significant progress in haptic technologies but the incorporation of haptics into virtual environments is still in its infancy A wide range of the new society's human activities including communication education art entertainment commerce and science would forever change if we learned how to capture manipulate and reproduce haptic sensory stimuli that are nearly indistinguishable from reality For the field to move forward many commercial and technological barriers need to be overcome By rendering how objects feel through haptic technology we communicate information that might reflect a desire to speak a physically based language that has never been explored before Due to constant improvement in haptics technology and increasing levels of research into and development of haptics related algorithms protocols and devices there is a belief that haptics technology has a promising

future *Physically Accurate Haptic Rendering with Dynamic Effects* Qi Luo, 2003 Haptic force and moment rendering with physical accuracy is critical to a number of applications including virtual assembly virtual prototyping and teleoperation When a held object interacts with another object in a task such as assembly the force and moment felt by the operator at any instant depends not only on the current contact state of the held object but also on the dynamic effects caused by the motion and contact states of the held object prior to reaching the current contact configuration especially in the presence of friction In this thesis we present a novel and efficient method of modeling and rendering such haptic force and moment resulting from the interaction between two rigid objects taking into account friction gravity and dynamic effects in real time We have implemented the method and successfully tested it on several rigid curved objects

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