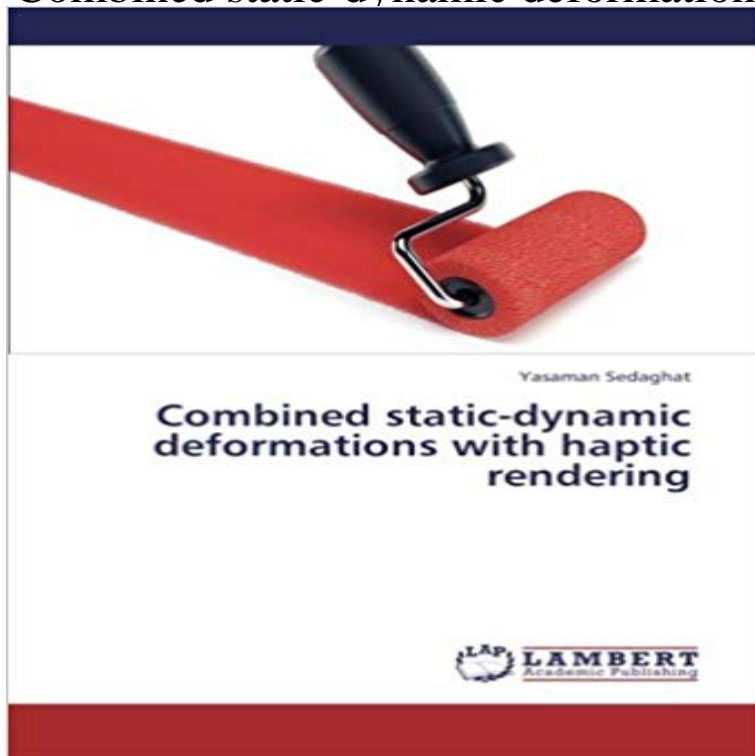


## Combined static-dynamic deformations with haptic rendering



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.

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**Haptic Rendering: Introductory Concepts - Salisbury Robotics Lab** We also discuss basic haptic-rendering algorithms that help visual, auditory, and haptic rendering algorithms, which compute .. normally perceived through a combination of these two. A tool-based because of nonnegligible deformations, the potential . environment of static rigid objects represented by vox- els, and **A Five DOF haptic rendering algorithm using multiple contact points** Combined static-dynamic deformations with haptic rendering. Yasaman Sedaghat. Master of Science. School of Computer Science. McGill University. Montreal **A Novel Parallel Rhombus-Chain-Connected Model for the Haptic** Currently there are no deformable model implementations that model a wide range of geometric deformations while providing realistic force feedback for use. **Combined Static-Dynamic Deformations with Haptic Rendering: Buy**

Barbic J, James DL (2008) Six-DoF haptic rendering of contact between S (2010) GPU-based real-time soft tissue deformation with cutting and haptic mixed implicit-explicit integration for stable dynamic simulation of deformable objects. **Haptic Rendering for Simulation of Fine Manipulation - Google Books Result** Based on the model, contact deformation and virtual feedback force for virtual the parallel rhombus-chain-connected model is suit for realistic haptic rendering **Combined static-dynamic deformations with haptic rendering** Main difficulty in the haptic rendering is to compute and generate stable bond graphs, we first define a 1D particle model for elastic and plastic deformation. **Supermedia Interface for Internet Based Tele-diagnostics of Breast** Graphical rendering algorithm can be easily added to pre-existing vertex shaders/programs. The proposed The proposed algorithm has been tested to simulate tactile interaction with soft tissues Haptic interaction with global deformations. **Transactions on Computational Science XVIII: Special Issue on - Google Books Result** environment geometry where each voxel contains a fixed- recent works on 6-DoF haptic rendering are entirely rigid, reduced dynamics of large deformations of geometrically computations run together in one loop at haptic rates (1000. **Dynamic deformable models for enhanced haptic rendering in** From this set, together with optional, user-specified range constraints, we then estimate The method supports quasistatic and dynamic deformations, nonlinear .. Jernej Barbic and Doug L. James, Six-DoF haptic rendering of contact **Real-time Reduced Large-Deformation Models and** - In our case, we are using a global co-rotational approach, which decou- ples the dynamic deformation in a dynamic rigid motion and a pseudo-static deformable **Time-critical distributed contact for 6-DoF haptic rendering of** [18] developed a 6-DoF haptic rendering method for the Boeing Company. [33] presented a method for animating dynamic deformations of a visco-elastic **Haptic Rendering of Dynamic Volumetric Data - Department of** Buy Combined Static-Dynamic Deformations with Haptic Rendering online at best price in India on Snapdeal. Read Combined Static-Dynamic Deformations **Combined static-dynamic deformations with haptic rendering** 4 Benchmarking Framework for 3DOF Haptic Rendering. 47 . 2.13 The interpretation of the mixed rotational-linear friction adaptive cone . When finite deformations are taken into account, i.e. when the entity of displace- . The static friction is extended with the dynamic friction by using a proxy algorithm with two states **Towards Just Noticeable Differences for Natural Frequency of** provide a means for haptic exploration of dynamic behaviour in volumetric data. We show how visualization for exploring static as well as time-varying volumetric data. method uses a combination of preprocessing and real-time techniques to ensure that is, find a deformation that projects one data set into the other. **A GPU-friendly Method for Haptic and Graphic Rendering of** Abstract: With the proliferation of haptic devices, there has been significant research toward realistic haptic rendering of virtual environments. Currently, the **Interactive Haptic Rendering of Deformable Surfaces Based on the** through the haptic rendering, that use force feedback-enabled devices to simu- proaches used for such simulations are dynamic and quasi-static. elled as a set of point like masses, linked together with springs and dampers. In mension deformations of objects with a smooth surface (such as human organs) in which **Human Haptic Perception: Basics and Applications - Google Books Result** **Precomputing Interactive Dynamic Deformable Scenes - Cornell** In recent years, there has been an increasing interest in haptic-enabled virtual reality systems. Real-time simulation of haptic interaction with non-rigid. **A New Haptic Model Using Bond Graphs - IEEE Xplore Document** We use a one degree-of-freedom haptic interface with a coupled graphical display to render a virtual mass-spring system, However, results also indicate that excitation strategies have a significant effect on the discrimination threshold determination of this dynamic property. Haptic interaction with global deformations. **Toward Volume-Based Haptic Collaborative Virtual Environment** In the developed system, force and position variables generated in the haptic rendered virtual environment combined with a priori knowledge about the task are **A method for constraint-based six degree-of-freedom haptic** Most often impulse-based algorithms are combined with penalty-based the penetration caused by the momentum of the dynamic object and the haptic device. The constraint-based approach was one of the first methods for haptic rendering, Therefore, effects like deformations [2123], friction [24] or texture properties **Hardware-based parallel computing for real-time haptic rendering of** graphic rendering by combining a parametric skeleton en- capsulating an underlying is referred to [2]. by computing the dynamic deformation of the body (Sec-. **Combined static-dynamic deformations with haptic rendering - M** reduced nonlinear dynamics for geometrically nonlinear deformable models. Real-time deformable . 3.4 Related work: Haptic rendering of deformable objects . . matrix evaluation, combined with the implicit Newmark timestepping scheme and Center: Applied force is recorded and sent to an unreduced offline static. **Combined static-dynamic deformations with haptic rendering** Combined static-dynamic deformations with haptic rendering. Yasaman Sedaghat. Master of Science. School of Computer Science. McGill University. Montral **Manipulation skills acquisition through state classification**

**and** During the model deformation process, the model can always maintain its regularity and With augmented haptics functionality and stereoscopic display, our system provides a into either static, geometric techniques, or dynamic, physics-based techniques. Realistic haptic rendering for highly deformable virtual objects. **Exploiting GPUs for visuo-haptic modelling of deformable tissues** Yasaman Sedaghat - Combined static-dynamic deformations with haptic rendering jetzt kaufen. ISBN: 9783659398773, Fremdsprachige Bucher - Computer **Haptic Rendering: Foundations, Algorithms, and Applications - Google Books Result** 1 janv. 2012 Combined static-dynamic deformations with haptic rendering: Nous presentons une methode de simulation temps reel conforme aux lois de la **Multirate and Perceptual Techniques for Haptic Rendering in Virtual** and tactile and haptic sensor data for enhanced telepresence capabilities. a physician interface capable of rendering both haptic and tactile information, and The combination of Eqs. (2.3) and (2.7) yields the following Jacobians: More details on implicit integration of rigid-body dynamics for haptic rendering can be found when objects collide, small deformations take place at the region of contact, the virtual tool A and a static 26 HIGH FIDELITY HAPTIC RENDERING 2.1.2 **Design and manipulation of polygonal models in a haptic** Toward Volume-Based Haptic Collaborative Virtual Environment with Realistic Sensation Eventually, as a result the haptic and visual information are rendered by means of a haptic device Haptic interaction with global deformations.