Real-Time Simulation and Visualization of Deformable Objects

By Joachim Georgii

GRIN Verlag. Paperback. Condition: New. 204 pages. Dimensions: 8.6in. x 5.9in. x 0.8in.Doctoral Thesis Dissertation from the year 2007 in the subject Computer Science - Applied, grade: 1, 0, Technical University of Munich (Institut fr Informatik), 169 entries in the bibliography, language: English, abstract: In this thesis, I present a framework for physical simulation and visualization of deformable volumetric bodies in real time. Based on the implicit finite element method a multigrid approach for the efficient numerical simulation of elastic materials has been developed. Due to the optimized implementation of the multigrid scheme, 200, 000 elements can be simulated at a rate of 10 time steps per second. The approach enables realistic and numerically stable simulation of bodies that are described by tetrahedral or hexahedral grids. It can efficiently simulate heterogeneous bodies-i. e. , bodies that are composed of material with varying stiffness-and includes linear as well as non-linear material laws. To visualize deformable bodies, a novel rendering method has been developed on programmable graphics hardware. It includes the efficient rendering of surfaces as well as interior volumetric structures. Both the physical simulation framework and the rendering approach have been integrated into a single simulation support system. Thereby, available communication...

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