

Parallel Object Oriented Simulation with Lagrangian Particle Methods



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Shaker Verlag Mrz 2010, 2010. Buch. Condition: Neu. Neuware - For applications that involve non-continuous matter, such as granulates, or free surface fluid flows, meshbased discretization methods are hardly applicable and more appropriate methods are required. Whenever a simulated matter disjoints or if its shape is a-priori unknown, or in case of large deformations or rotations, meshfree particle methods can be superior to their meshbased relatives. In this work two specimens of the ample field of Lagrangian meshfree particle methods are investigated with respect to their applicability in mechanical engineering. As a representative of a group of methods that allow for the simulation of disjoint solids, the Discrete Element Method is selected. The other method, Smoothed Particle Hydrodynamics, is mainly used for the simulation of fluids, but recently it has revealed its strengths also as a means to simulate visco-elastic-plastic solids. Simulations with meshfree particle methods are highly demanding in terms of CPU and memory consumption. The simulation of millions of particles is only possible if simulation programs are parallelized. This requires the respective algorithms to be modified in a way that makes them suitable for an efficient use in parallel environments. The volatility of particle interactions thereby requires special techniques to guarantee a homogeneous work distribution, so called dynamic load balancing. In this thesis a new hierarchical controller based load balancing scheme is presented that is designed to be used in multi-user environments, such as university clusters. The viability of the approach is demonstrated by means of several benchmark simulations. 143 pp. Englisch.

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