Nonsmooth Rigid Body Dynamics

Simulating Granular Material

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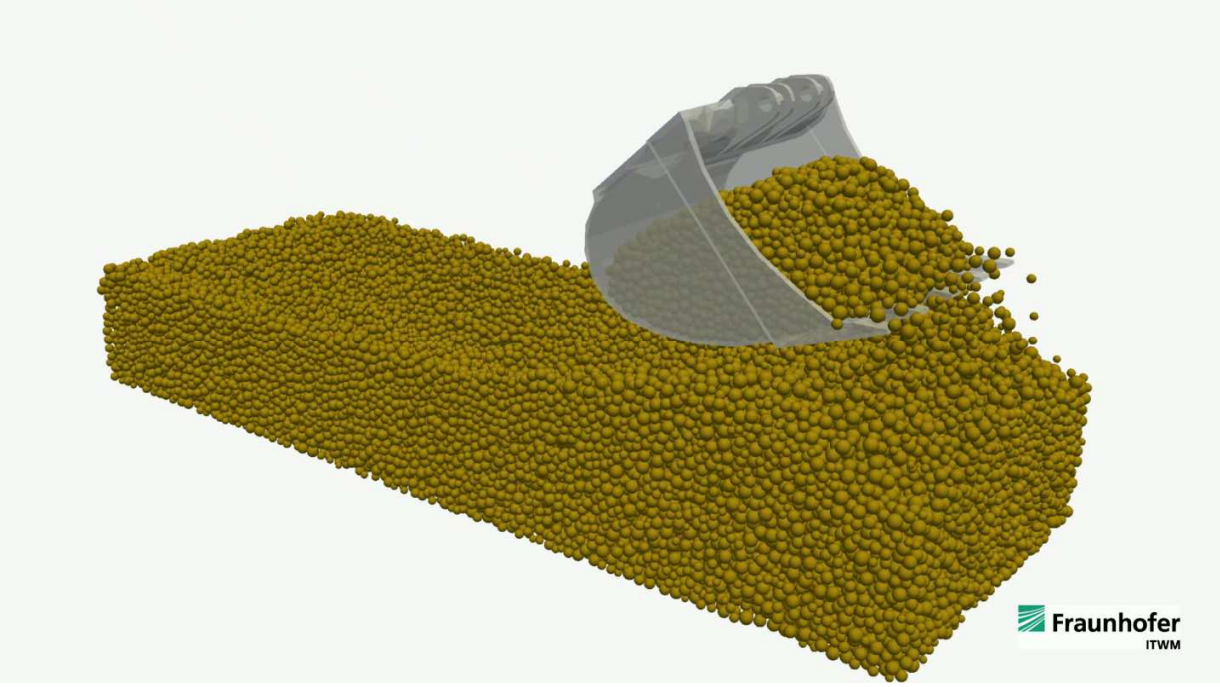

The field of Nonsmooth Contact Dynamics (NSCD) provides an increasingly popular simulation framework for granular material. In contrast to penalty-based Discrete Element Methods (DEM), this approach is stable for arbitrary time steps and produces visually acceptable results in very short computing time. Yet when it comes to the prediction of draft forces, NSCD relies on powerful numerical solvers.

This talk sets out to discuss NSCD as an alternative to DEM. The physical model behind NSCD is laid out, starting from Hamilton's principle of least action to the discretized equations of motion. To integrate these equations in time, it is necessary to solve a large Cone Complementarity Problem (CCP) per time step. Two numerical methods to solve the CCP are introduced. The first is the Projected Gauß-Jacobi solver, which is widely used for the simulation of granular material. But it suffers from slow convergence when applied to large systems. The second technique, an Interior Point Method based on Jordan algebras, exhibits better convergence properties whenever the accuracy requirements are high.