

Non-smooth contact dynamics for the large-scale simulation of granular material

Bernd Simeon (TU Kaiserslautern), Jan Kleinert

Non-smooth contact dynamics provides a powerful simulation framework for granular material that, in contrast to classical discrete element methods, is stable for arbitrary time steps and produces visually acceptable results in very short computing time. Yet when it comes to the prediction of the forces that interact with a solid modeled as continuum, non-smooth contact dynamics is typically not accurate enough. We therefore propose to combine the method class with an interior point algorithm for higher accuracy. Our specific algorithm is based on so-called Jordan algebras and exploits the relation to symmetric cones in order to tackle the conical constraints that are intrinsic to frictional contact problems. In every interior point iteration a linear system has to be solved. We analyze how the interior point method behaves when it is combined with Krylov subspace solvers and incomplete factorizations. Numerical experiments demonstrate that preconditioners and efficient linear solvers are essential for the method to be applicable to large-scale problems.