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A multisymplectic integrator for elastodynamic frictionless impact problems

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Abstract

We present a structure preserving numerical algorithm for the collision of elastic bodies. Our integrator is derived from a discrete version of the field-theoretic (multisymplectic) variational description of nonsmooth Lagrangian continuum mechanics, combined with generalized Lagrange multipliers to handle inequality constraints. We test the resulting explicit integrator for the longitudinal impact of two elastic linear bar models, and for the collision of a nonlinear geometrically exact beam model with a rigid plane. Numerical simulations for various physical parameters are presented to illustrate the behavior and performance of our approach.

Contents

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