Structure-preserving numerical integrators for flexible multibody dynamics

Peter Betsch (University of Siegen)

Starting with the nineties, structure-preserving schemes have been developed in the context of nonlinear elastodynamics and structural dynamics. In this field of application a lot of effort has been put into the design of energy-momentum schemes. Energy-momentum consistent integrators satisfy discrete versions of important balance laws for mechanical systems, namely balance of energy and angular momentum. Energy-momentum integrators are known to possess enhanced numerical stability and robustness properties. These advantageous features are of special importance when large deformation analysis are pursued that require time integrations over relatively long time intervals.
Originally the development of energy-momentum schemes has been confined to mechanical systems that belong to the class of Hamiltonian systems with symmetry. Recent developments aim at the extension of their range of applicability to more elaborate problems including large deformation contact, thermo-mechanically coupled systems and flexible multibody dynamics. These developments will be addressed in the talk.