FORMULATION, ANALYSIS AND APPLICATIONS OF ADVANCED TIME INTEGRATORS IN SCIENCE AND ENGINEERING

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ABSTRACT

A modern approach to the formulation of numerical methods to approximate solutions of differential equations on general manifolds is to design the methods so as to preserve as many features of the dynamics as possible. This perspective has motivated the formulation of a wide variety of structure-preserving integrators specialized on both the conservation of the geometrical properties of the flow of dynamical systems as well as on the fulfilment of some of the basic laws in physics, such as the second law of thermodynamics.

The purpose of this mini-symposium is to bring together researchers working on both the theoretical basis and the applications of new time integration methods for simulating the dynamics of mechanical systems arising in science and engineering problems. The scope of this MS includes papers devoted to, but not limited to, the following topics:

- The design and numerical analysis of new time integrators in solid mechanics, fluid mechanics and coupled problems.
- Structure-preserving methods on manifolds and Lie-group methods.
- Energy-momentum methods.
- Symplectic and momentum-conserving methods.
- Symplectic and multi-symplectic discretizations of PDE's.
- Generalized variational integrators.
- New algorithms and parallel implementations of time integrators.
- Thermodynamically consistent methods for irreversible problems.
- New time integrators for rods, shells and incompressible fluids.
- New methods and algorithms in multi-body dynamics, molecular dynamics and computer animation.
- Discontinuous methods in space and time integration.