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INNOVATIVE INTEGRATION SCHEMES IN SOLID, FLUID, AND MULTIBODY MECHANICS

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ABSTRACT

Continued efforts in designing more robust, accurate, and physically faithful integration schemes have resulted in the development of structure preserving integrators that have been increasingly accepted by the solid, fluid, and multibody mechanics communities. This class of methods include symplectic, energy-momentum, variational integrators, discontinuous Galerkin discretizations in space & time, mimetic finite differences, and others. Their key common feature is that the geometric/physical laws characterizing the continuum problem are taken into account for the design of the discrete evolution equations and, as a result, some of the essential properties of the continuous flow are unconditionally preserved.

The remarkable properties of this sort of methods, as well as the large evidence of their excellent numerical stability, have motivated their application to a wide class of problems. Originally developed mostly in the context of Hamiltonian problems, they have now been extended to encompass dissipative phenomena, coupled problems, constrained systems, control problems, etc., in the fields of solid, fluid, and multibody mechanics. Still, it remains an active area of research with many important open questions.

The goal of this minisymposium is to bring together researchers developing and using innovative integration schemes for solid, fluid, and multibody dynamics, and to showcase novel applications, approaches, methods, and analyses. Contributions related to these topics and general issues at the intersection of numerical analysis and nonlinear dynamics are welcome.