

Structure-Preserving Projection Methods for Hamiltonian Systems

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In this work we consider the numerical solution of Hamiltonian systems via symmetric, symplectic integrators, which preserve simultaneously the energy of the Hamiltonian system. Starting from Hairer's pioneering idea of the symmetric projection methods we design a new structure-preserving numerical scheme.

The proposed methods can be used for solving a wide range of problems, where it is necessary for the integrator to possess structure-preserving properties, e.g in quantum chromodynamics (QCD) calculations.

Finally, we present the numerical results for a hierarchy of Hamiltonian systems ranging from the simple harmonic oscillator to non-separable Hamiltonians to illustrate and give numerical evidence for which setting our approach is already working.