Spectral Collocation/p-Version Finite Element Methods
for Hamiltonian Dynamical Systems

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We make a systematic study of spectral Galerkin methods (or p-version finite element methods) and spectral collocation methods in numerically solving the Hamiltonian dynamical systems. Different strategies including Legendre-Lobatto collocation, Chebyshev-Lobatto collocation, spectral Galerkin/p-version, are discussed and compared, especially with symplectic methods. Numerical tests on some benchmark nonlinear problems are provided.