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Title: Strang splitting with processing for perturbed harmonic oscillators

Abstract: We consider the application of processed Strang splitting applied to systems of ODEs consisting of one or several harmonic oscillators with a common frequency perturbed by a polynomial potential. We are particularly interested (in view of possible applications to Hamiltonian Monte Carlo methods,) in the evolution of errors in energy for relatively large step sizes. We propose a particular processor defined as an splitting scheme with coefficients depending on the step-size (and the degree of the perturbing potential), and analyse the error in energy of the resulting processed Strang integrator. We present some numerical experiments for the Hénon-Heiles problem near the origin.

Joint work with J.M. Sanz-Serna.