Simplecticity properties of Euler–Maclaurin methods

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Abstract

We consider the use of Euler–Maclaurin methods for the solution of canonical Hamiltonian problems. As a subclass of multi-derivative Runge–Kutta methods, these integrators cannot be symplectic, however they turn out to be conjugate symplectic. The numerical solutions provided by a conjugate symplectic integrator essentially share the same qualitative long time behavior as those yielded by a symplectic integrator. This aspect, along with an efficient evaluation of the derivatives, suggests that Euler–Maclaurin methods could play an interesting role in the context of geometric integration.