

SVD-based Line Integral Methods for preserving multiple invariants of Hamiltonian problems

In this talk, we generalize the class of energy-conserving Runge-Kutta methods, named Hamiltonian Boundary Value Methods, to handle the numerical solution of Hamiltonian problems with additional independent invariants besides the Hamiltonian. The proposed strategy relies on the solution of a perturbed problem, where a minimum norm perturbation is computed by resorting to the singular value decomposition. The analysis of the approach is given and numerical tests are reported, to make evidence of the theoretical findings and assess their effectiveness.

1. L. Brugnano, F. Iavernaro. *Line Integral Methods for Conservative Problems*. Chapman et Hall/CRC, Boca-Raton, FL, USA, (2016).
2. L. Brugnano, F. Iavernaro. *Modified line integral methods for conservative problems with multiple invariants*. AIP Conference Proceedings **1648** 150010 (2015).
3. L. Brugnano, F. Iavernaro. *Line Integral Methods which preserve all invariants of conservative problems*. J. Comput. Appl. Math. **236** 3905–3919 (2012).
4. L. Brugnano, Y. Sun. *Multiple invariants conserving Runge-Kutta type methods for Hamiltonian problems*. Numer. Algorithms **65** 611–632 (2014).

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