

On exact discretizations of the Kepler problem

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The Kepler problem is a classical superintegrable dynamical system, possessing five functionally independent integrals of motion. We present a new explicit integrator which preserves exactly (up to round-off errors) all these integrals (and, as a consequence, all phase space trajectories). What is more, our numerical scheme also provides the exact explicit time discretization. We shortly mention other possibilities to approach the exact discretization of the Kepler problem: the Kustaanheimo–Stiefel regularization (standard in celestial dynamics) and a method inspired by the discretization of the generalized Nambu mechanics.

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