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Variational integrator for a mixed-type delay equation of electrodynamics

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Abstract

The Lagrangian structure of the action-at-a-distance electrodynamics is used to build a variational integrator for the two-body problem. The variational equations are obtained from a discrete approximation to the action integral. The variational equations are easily rearranged to overcome some singular denominators, unlike the direct numerical integration of the Euler-Lagrange equations of motion. Depending on orbit type the action integral can be used directly with an optimization method to solve the mixed-type neutral-delay equations of two-body motion.