Abstract Submitted
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Variational Integrators for Numerical Relativity WILL FARR, Northwestern University — I present a new method for numerical simulations of general relativistic systems that eliminates constraint violating modes without the need for constraint damping. The method is a type of variational integrator. It is based on a discretization of an action for gravity (the Plebański action) on an unstructured mesh that preserves the local Lorentz transformation and diffeomorphism symmetries of the continuous action. Applying Hamilton's principle of stationary action gives discrete field equations on the mesh. For each gauge degree of freedom there is a corresponding discrete constraint; the remaining discrete evolution equations exactly preserve these constraints under time-evolution. I validate the method using simulations of several analytically solvable spacetimes: a weak gravitational wave spacetime, the Schwarzschild spacetime, and the Kerr spacetime.

Will Farr
Northwestern University

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