Investigating Variational Integrators for Numerical Relativity
WILL FARR, MIT — We report on numerical simulations of simple general relativistic systems using variational integrators. Our variational integrators apply the stationary action principle to discretized versions of the Plebanski action for gravity to derive discrete evolution equations. The discrete action has (discrete) diffeomorphism and local Lorentz transformation symmetries; these symmetries generate discrete constraints which are analogous to the constraints of the continuous system. Because they are derived from the discrete action, our discrete evolution equations are discrete-constraint-preserving. We demonstrate this remarkable property in our simple simulations and discuss the issues involved in using this technique in larger, astrophysically-interesting simulations.

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