Abstract Submitted
for the APR08 Meeting of
The American Physical Society

Numerical Relativity from a Gauge Theory Perspective WILL FARR, EDMUND BERTSCHINGER, MIT — We present some recent results in a program to discretize the first-order Hilbert-Palatini action for gravity on a simplicial complex as a first step towards computing numerical relativity simulations in a fully gauge-covariant manner. The tetrad and spin connection, the dynamical variables of this theory, discretize naturally on the struts of the complex, and the resulting action is both locally Lorentz and diffeomorphically invariant. Because constraints are associated with these symmetry transformations, the evolutions which result from the Euler-Lagrange procedure are exactly constraint-preserving. This discretization procedure introduces extra degrees of freedom, in much the same way as lattice quantum gauge theory simulations, but we expect theoretically that these will be irrelevant at physical scales in our simulations. We are presently attempting to verify this computationally.

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Date submitted: 11 Jan 2008 Electronic form version 1.4