Abstract Submitted
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Hyperbolic Initial Data for Nontrivial Spacetimes[1] MARIA BABIUC HAMILTON, Marshall University — The first requirement for the success of numerical relativity simulations is a reliable and accurate method of constructing initial data. The standard techniques use elliptic equations that require boundary conditions, and are plagued by junk radiation. We present a novel numerical technique to generate initial data for the simulation of black holes, using a recent analytical approach in which the spacetime is described by a metric of Kerr-Schild form, with the constraints written as three strongly hyperbolic and one algebraic equation. We have completed the code that implements the algebraic algorithm for constructing hyperbolically-constrained initial data for single black holes. Tests prove the code converges, even inside the event horizon, and it has long-term, robust stability. We present our work in progress to develop key tests, such as a near-light-speed boosted black hole and a spinning Kerr hole, which are essential to prove that the code is correctly able to evolve nontrivial spacetimes. Next, the code will be tested with the geometry of a binary black hole system, a superposition of Kerr-Schild solutions. To assess its usefulness in reducing spurious radiation, this code will be tested against codes using elliptical methods, for the same binary black hole ansatz.

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Maria Babiuc Hamilton
Marshall University

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