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A New Hyperbolic Solver for Initial Data in Numerical Relativity[1] MARIA BABIUC, Marshall University, JEFFREY WINICOUR, University of Pittsburgh, NUMERICAL RELATIVITY COLLABORATION — Numerical relativity is essential to the efforts of detecting gravitational waves from mergers of binary compact object. The first requirement for the success of numerical relativity simulations is a reliable and accurate method of constructing initial data (ID) by solving the Hamiltonian and momentum constraints. The common approach, of decomposing the constraints into elliptic equations, is plagued by junk radiation and ambiguities about which component is constrained. Recently, I. Racz introduced a new way of solving the constraints, obtaining one algebraic equation for the hamiltonian, and a system of three strongly hyperbolic equations for the momentum. Racz and Winicour applied this method to nonlinear perturbations of a Schwarzchild black hole, and established its well-posedness. Here we present our first steps towards the numerical implementation of this scheme. The code takes as input the 3D metric, the lapse and the shift, calculates the new variables and performs the radial inward integration. The angular derivatives are expressed in terms of spherical harmonics. Our long term goal is to generate a novel numerical initial data solver and explore whether it can produce astrophysical-relevant initial data.

[1]A New Hyperbolic Solver for Initial Data in Numerical Relativity

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