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Introducing the LazEv Evolution Code for 3+1 Gravity YOSEF ZLOCHOWER, The University of Texas at Brownsville, JOHN BAKER, NASA Goddard Space Flight Center, MANUELA CAMPANELLI, CARLOS LOUSTO, The University of Texas at Brownsville — We have developed a generalized code to solve the Cauchy Initial Value Problem (with boundaries) for the Einstein Equations using a variety of 3+1 decompositions. The time integration is carried out using the 'Method of Lines' with ICN and Runge Kutta style integrators (up to fourth-order), and the spatial derivatives are evaluated using a variety of finite differencing operators (both centered and upwinded) with up to sixth-order accuracy. We have currently implemented the ADM formulation as well as several 'flavors' of the BSSN formulation, and used the code to evolve puncture data for single distorted black-holes, head-on collisions of binary black holes, and orbiting binary black-holes. We also tested the code by evolving the linear wave, gauge wave, and Gowdy wave testbeds. Here we describe the features of this code and show convergence plots and waveforms. We also describe some technical difficulties encountered when evolving puncture data with fourth-order techniques. We conclude by demonstrating that fourth-order BSSN evolutions give significantly improved Lazarus waveforms over second-order BSSN and fourth-order ADM evolutions.

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