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Characteristic-Cauchy code patching for a binary-black hole evolution MARIA BABIUC, Marshall University — The methodology called Cauchy-Characteristic Extraction (CCE) utilizes Cauchy evolution within some prescribed timelike world-tube, but replaces the need for an outer boundary condition by matching to a characteristic evolution in the exterior of this world-tube. The Cauchy and the characteristic approaches have complementary strengths and weaknesses. Unification of the two methods seems to be a promising way of combining the strengths of both formalisms. At the boundary, since the coordinates of the Cauchy system are arbitrary while the coordinates of the characteristic system are based on the light-cone structure of space-time, a non-trivial coordinate transformation takes place when matching the characteristic and Cauchy evolution equations. The waveform extraction is carried out at some inner worldtube in order to avoid the errors introduced by the outer boundary treatment. This methodology has not yet been extended to the binary black hole problem, due to the errors introduced by the finite size and other geometrical properties of the extraction worldtube. This work investigates the steps involved in developing the algorithms and implementing it into a computational module that will perform the important task of patching a Characteristic code to a Cauchy evolution code, in the astrophysical realistic case of a binary black hole evolution, which have strong requirements for numerical accuracy and place greater demands on computational resources.

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