

Advances in Cauchy Characteristic Extraction methods in SpECTRE

Jordan Moxon, California Institute of Technology

I present advances and early results from the Cauchy Characteristic Evolution (CCE) development in SpECTRE. We have developed a number of mathematical refinements of the CCE system that improve spectral convergence and ease the computation of detailed dynamical spacetime information at scri+. The result is an efficient code, free from logarithmic pathologies, that rapidly computes full waveform information: news, strain, and all five Weyl scalars. I summarize the performance improvements in the SpECTRE implementation, highlighting key numerical techniques, and describe the battery of physical tests used to verify the precision of our CCE results. The CCE module of the open-source SpECTRE framework can be used either as a stand-alone executable to extract waveform information provided from any code base, or in parallel with the SpECTRE Cauchy evolution system to extract the waveform data directly from the running simulation. SpECTRE CCE has already shown important gains in rapidly resolving memory features from Cauchy data generated by SpEC simulations.