

Revisiting black-hole perturbation theory: the hyperboloidal slice approach

After reviewing the well-established notion of black-hole perturbation theory and the concept of quasinormal modes, we present a spectral representation of solutions to relativistic wave equations based on a geometrical approach in which the constant-time surfaces extend until future null infinity. Here, we restrict ourselves to an asymptotically flat, spherical symmetric spacetime (with focus on the Reissner-Nordstrom solution). With the help of a Laplace transformation on the wave equation in question, we provide a geometrical interpretation to known algorithms (i.e. Leaver's approach) apart from deriving an algorithm for obtaining all ingredients of the desired spectral decomposition, including quasi-normal modes, quasi-normal mode amplitudes as well as the jump of the Laplace-transform along the branch cut.