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Xiao Yan Chew - (University of Oldenburg)

A Matrix Method for Quasinormal Modes: Schwarzschild Black Holes in Asymptotically Flat and (Anti-) de Sitter Spacetimes

Abstract

In this work, we study the quasinormal modes of Schwarzschild and Schwarzschild (Anti-) de Sitter black holes by a matrix method. The proposed method involves discretizing the master field equation and expressing it in form of a homogeneous system of linear algebraic equations. The resulting homogeneous matrix equation furnishes a non-standard eigenvalue problem, which can then be solved numerically to obtain the quasinormal frequencies. A key feature of the present approach is that the discretization of the wave function and its derivatives are made to be independent of any specific metric through coordinate transformation. In many cases, it can be carried out beforehand which in turn improves the efficiency and facilitates the numerical implementation. We also analyze the precision and efficiency of the present method as well as compare the results to those obtained by different approaches.

<https://arxiv.org/abs/1610.08135>