Computational analysis of a nonlinear wave equation with black hole embedded in an expanding universe

Andras Balogh

University of Texas Rio Grande Valley, School of Mathematical and Statistical Sciences, 78539 Edinburg, TX, USA

andras.balogh@utrgv.edu

Numerical simulations are presented for a nonlinear wave equation with singularity that models black hole and with time dependent coefficient that models an expanding universe. The high performance Pycuda computations use an explicit fourth order Runge-Kutta scheme on the temporal discretization and fourth order finite difference discretization in the 3-dimensional space. Bubble formation and the properties of solutions with compact support are examined both inside and outside of the blackhole.