

Gravity Report

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Abstract

NOTHING FOR NOW

1 Introduction

Gravity is an open source code for studying the Gravitational collapse of viriouse fields in AdS spaces. It is developed in 2012, and 2013 by Arya Farahi for gravitational collapse project under guidance of Leo Pando Zayas at University of Michigan - Ann Arbor.

2 Results

2.1 Plots

Graphs 1, 2, and 3 show results of Π , ϕ , and Φ vs. r , respectively, at finalt time, $t = 2.11978964301$.

2.2 Black hole formation

One of the aim of ... is to study the black hole fomration of different fields in AdS geometry. Once the black hole forms the field stops its evolution. It is suggested that all fields create a black hole at sometimes during their evolution, and it is the universal feature of all fields in AdS. The time of fomation of black hole depends on the ampltitude and shape of initial wave, the geometry of space, potential, and the field choice. Because it is not possible to run the code for ever an end condition implimented in the code

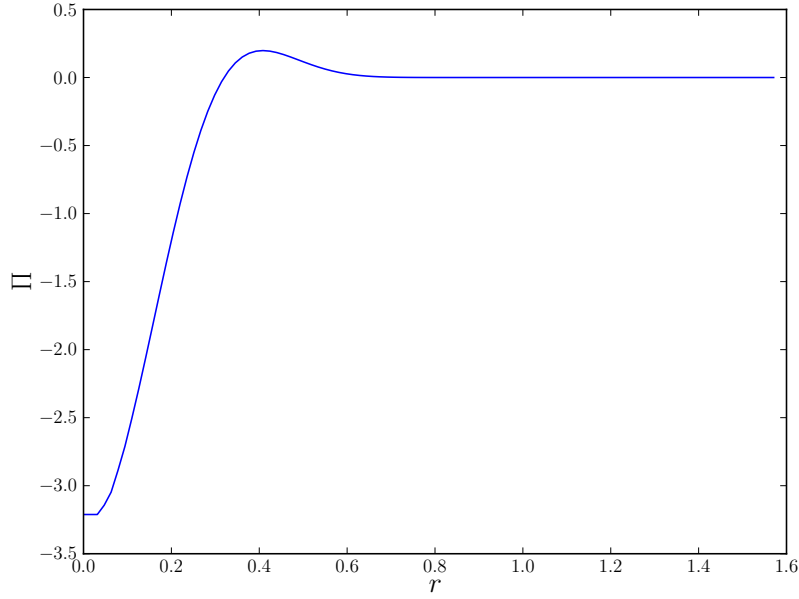


Figure 1: Plot of Π vs. r at final time.

to stop the evolution of field after some number of iteration. In this run the number of iteration is defined, $i_{\max} = 200000$.

For black hole formation the code checks the value of A at each point, at each time. Theoretically once $A = 0$ it means that the black hole formed so the condition A_{\min} is defined to check whether the black hole is formed or not. One should choose something close to zero, but independently, by changing the A_{\min} need to make sure that the condition do not affect the result. In this run $A_{\min} = 0.01$.

In this run the black hole is formed at time, $t = 2.11978964301$. And the field stops its evolution.

3 Parameters

The following parameters are used in this run,

Field properties:

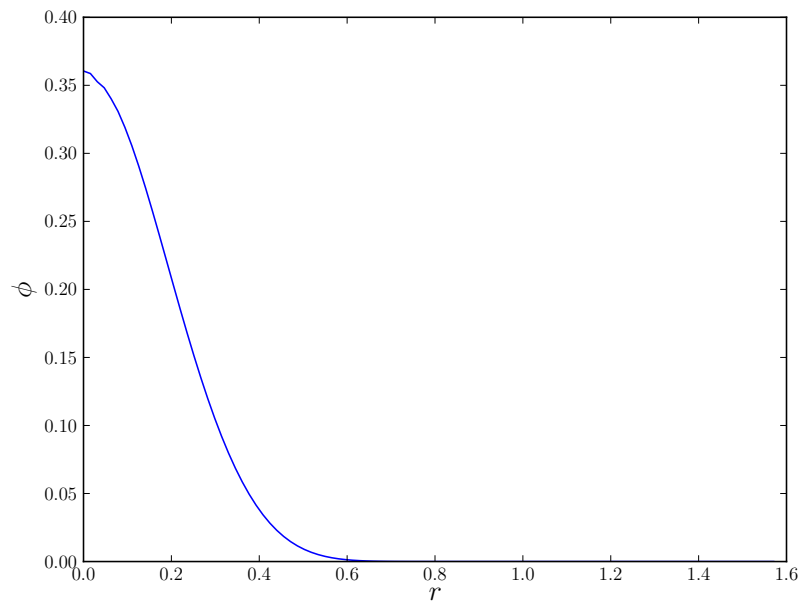


Figure 2: Plot of ϕ vs. r at final time.

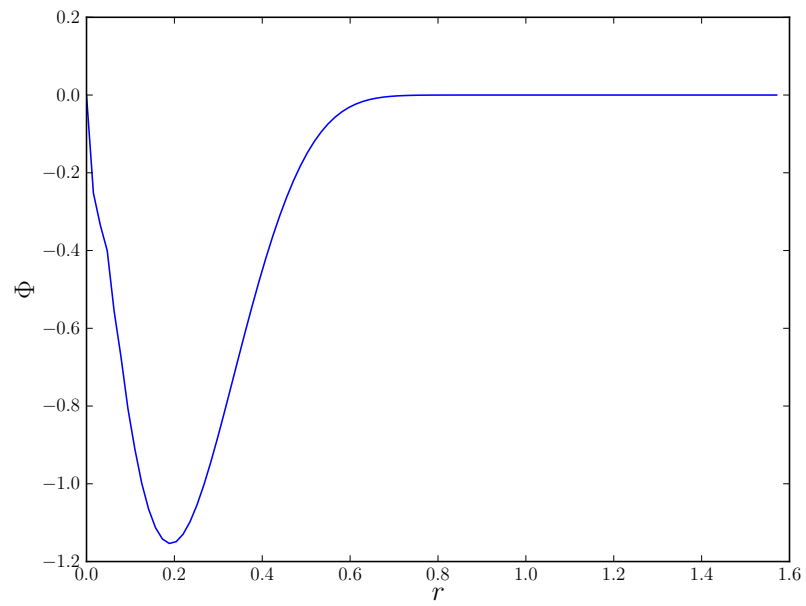


Figure 3: Plot of Φ vs. r at final time.

Geometry = AdS4
Cosmological constant = 1.0
Potential = Massive_Scalar

Initial Conditions:

Initial Condition = Gaussian

Numerical method:

Solver = RK4
Grid size = 1000

Ending conditions:

Horizon condition (A_{\min}) = 0.01
Maximum number of iteration = 200000

Acknowledgement