Null geodesics

Modelling light in the Schwartzschild metric

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Abstract: The field of black hole imaging in Physics and Computer Science has had a wave of enthusiasm and development following Christopher Nolan's 2014 Interstellar, and the imaging of the supermassive black hole at the centre of M87 by the Event Horizon Telescope in 2019. Producing high quality images and videos of black holes and wormholes can be very computationally costly, so ingenious ways of gaining efficacy must often be used. My aim is to explore these methods and tricks to present practical approaches to modelling various spacetime metrics, including the Schwarzschild metric, Kerr metric, and the Ellis wormhole.

Declaration

The work in this thesis is based on research carried out in the Department of Mathematical Sciences at Durham University. No part of this thesis has been submitted elsewhere for any degree or qualification.

Contents

Introduction

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Introduction to General Relativity