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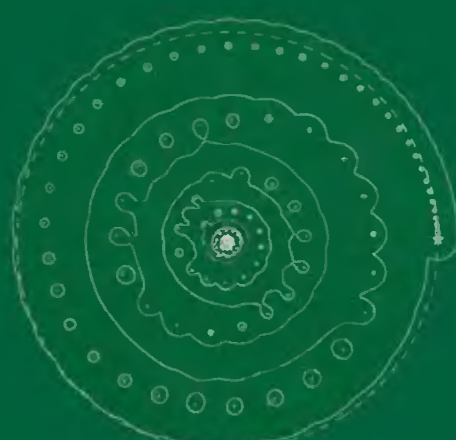

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Contents

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Numerical relativity: challenges for computational science

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We describe the burgeoning field of numerical relativity, which aims to solve Einstein's equations of general relativity numerically. The field presents many questions that may interest numerical analysts, especially problems related to nonlinear partial differential equations: elliptic systems, hyperbolic systems, and mixed systems. There are many novel features, such as dealing with boundaries when black holes are excised from the computational domain, or how even to pose the problem computationally when the coordinates must be determined during the evolution from initial data. The most important unsolved problem is that there is no known general 3-dimensional algorithm that can evolve Einstein's equations with black holes that is stable. This review is meant to be an introduction that will enable numerical analysts and other computational scientists to enter the field. No previous knowledge of special or general relativity is assumed.

CONTENTS

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