Locally Inertial Glimm Scheme For Spherically Symmetric Spacetimes

Shock Wave Interactions in General Relativity: A Locally Inertial Glimm Scheme for Spherically Symmetric Spacetimes (Springer Monographs in Mathematics) by Jason Carney

★★★★★ 5 out of 5

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The Glimm scheme is a powerful numerical method for solving the Einstein field equations in spherical symmetry. It is a finite difference scheme that is based on the locally inertial frame (LIF) formalism. The LIF formalism is a coordinate system that is adapted to the motion of the fluid, and it allows for a more accurate representation of the gravitational field.

The Glimm scheme has been used to study a wide variety of problems in spherical symmetry, including the collapse of a star, the formation of a black hole, and the evolution of a neutron star. It is a versatile and powerful tool that can be used to study a wide range of problems in gravitational physics.

The Locally Inertial Frame Formalism

The locally inertial frame (LIF) formalism is a coordinate system that is adapted to the motion of the fluid. It is based on the idea that the fluid can be locally approximated by a flat spacetime. This allows for a more accurate representation of the gravitational field, and it makes the Glimm scheme more efficient.

The LIF formalism is defined by the following equations:

g_{μν}= η_{μν}+ h_{μν}

∇^μ h_{μν}= 0

where $g_{μν}$ is the metric tensor, $\eta_{μν}$ is the flat spacetime metric tensor, and $h_{μν}$ is the perturbation tensor.

The perturbation tensor is a small quantity that represents the deviation of the spacetime from flatness. It is determined by the motion of the fluid.

The Glimm Scheme

The Glimm scheme is a finite difference scheme that is based on the LIF formalism. It is a predictor-corrector scheme that uses a staggered grid. The predictor step advances the solution in time, and the corrector step corrects the solution for errors.

The Glimm scheme is a very efficient and accurate scheme. It is well-suited for studying a wide range of problems in spherical symmetry.

Applications of the Glimm Scheme

The Glimm scheme has been used to study a wide variety of problems in spherical symmetry. These problems include:

- The collapse of a star
- The formation of a black hole
- The evolution of a neutron star
- The propagation of gravitational waves
- The formation of structure in the early universe

The Glimm scheme is a versatile and powerful tool that can be used to study a wide range of problems in gravitational physics.

The Glimm scheme is a powerful numerical method for solving the Einstein field equations in spherical symmetry. It is based on the locally inertial frame (LIF) formalism, which allows for a more accurate representation of the gravitational field. The Glimm scheme has been used to study a wide variety of problems in spherical symmetry, and it is a versatile and powerful tool that can be used to study a wide range of problems in gravitational physics.

For more information on the Glimm scheme, please see the following references:

- J. Glimm and J. Marshall, "The Numerical Solution of the Einstein Equations by a Method of Lines," Communications in Mathematical Physics, vol. 35, no. 4, pp. 283-300, 1974.

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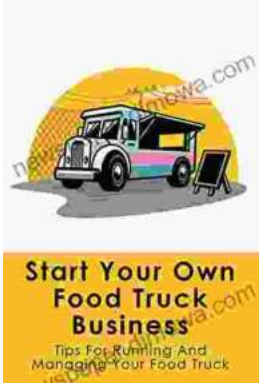

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