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FAKULTÄT FÜR MATHEMATIK
Dekan Univ.-Prof. Dr. Radu Ioan Boț

Einladung zur öffentlichen Defensio

Matthias OSTERMANN

Thema der Dissertation

**On Stable Self-Similar Blowup Beyond Light Cones in
Nonlinear Wave Equations**

Abstract:

This thesis is concerned with the stability of self-similar blowup solutions of nonlinear wave equations. It comprises three works about the corotational wave maps equation, the equivariant Yang-Mills equation, semilinear wave equations with focusing power nonlinearities, and an elementary characterization of Sobolev norms for radially symmetric functions. Additionally, the first chapter contains a historical overview of the mathematical development of wave equations. The wave maps equation and the Yang-Mills equation are prototypical geometric wave equations, which admit self-similar blowup solutions in closed form in all energy-supercritical dimensions. Remarkably, these solutions continue to exist away from their singularities in the whole spacetime. In the work presented in the second chapter, the nonlinear stability of these solutions is proved in spacetime regions that approach the future light cone of the respective singularity. The focusing semilinear wave equations admit spatially homogeneous self-similar blowup solutions in all dimensions, referred to as ODE blowup. The work in the third chapter demonstrates the nonlinear stability of the ODE blowup without symmetry restrictions in extended past light cones. An essential foundation for these works is the implementation of novel coordinate systems in the considered spacetime regions that are adapted to self-similarity and compatible with the wave flow. In these coordinates, energies and commuting differential operators are derived for the wave operator, based on which a general functional analytic framework for the wave flow near self-similar solutions is established.

Prüfungssenat

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Zeit und Ort

Mittwoch, 26. März 2025, 16:30 Uhr

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