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Blow-up for Higher-Order Parabolic, Hyperbolic, Dispersion and Schrödinger Equations shows how four types of higher-order nonlinear evolution partial differential equations (PDEs) have many commonalities through their special quasilinear degenerate representations. The authors present a unified approach to deal with these quasilinear PDEs.

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Blow-up for Higher-Order Parabolic, Hyperbolic, Dispersion ...

Keywords: Blow-up rate; Higher-order; Parabolic equation; Parabolic system; Fujita-type theorem 1. Introduction In this paper, we study the blow-up rates of the higher-order semilinear parabolic equation ut +(-) mu=|u|p,x∈RN, 0 <t<T, u(x,0)=u0(x)∈L∞ RN, (1.1) as well as the system ut +(-) mu=|v|p,vt +(-) mv=|u|q,x∈RN, 0 <t<T, u(x,0)=u0(x)∈L∞ RN

Blow-up rates for higher-order semilinear parabolic ...

Structure of boundary blow-up for higher-order quasilinear parabolic equations. Proceedings of the Royal Society of London. Series A: Mathematical, Physical and Engineering Sciences, Vol. 460, Issue. 2051, p. 3299.

Saint-Venant's principle in blow-up for higher-order ...

We show that, in contrast to the solutions of the classical second-order parabolic equations ut = uxx + up and ut = uxx + eu from combustion theory, the blow-up in their higher-order counterparts is asymptotically self-similar. In particular, there exist exact nontrivial self-similar blow-up solutions, u* (x, t) = (T - t) -1/ (p-1)f (y) in the case of the polynomial nonlinearity and u (x, t) = -ln (T - t) + f (y) for the exponential nonlinearity, where y = x / (T - t) 1/2m is the ...

Self-Similar Blow-Up in Higher-Order Semilinear Parabolic ...

A blow-up result for a higher-order nonlinear Kirchhoff-type hyperbolic equation Salim A. Messaoudia,*, Belkacem Said Houarib aMathematical Sciences Department, KFUPM, Dhahran, 31261, Saudi Arabia bUniversit´e Badji Mokhtar, D ´epartement de Math ´ematiques, B. P. 12 Annaba 23000, Alg ´erie Received 26 July 2006; accepted 23 August 2006 Abstract

A blow-up result for a higher-order nonlinear Kirchhoff ...

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Blow-up for Higher-Order Parabolic, Hyperbolic, Dispersion ...

Abstract We consider the higher-order semilinear parabolic equation ∂tu=−(−Δ)mu+u|u|p−1, $$\\begin{array}{} \\displaystyle \\partial_t u = -(-{\\it\\Delta})^{m} u + u|u|^{p-1}, \\end{array}$$ in the whole space ℝN, where p > 1 and m ≥ 1 is an odd integer. We exhibit type I non self-similar blowup solutions for this equation and obtain a sharp description of its asymptotic behavior ...

Construction of type I blowup solutions for a higher order ...

The aim of this thesis is to locate the blow-up points and study the local behavior of blow-up solutions to the following higher order Liouville equations: :� XjM^t in �- =u Au = ... = = 0 on dCt, where is a bounded smooth domain in k{x) is a positive function on Q. with certain smooth conditions, 0 < A < C for some constant C.

Locating the Blow-up Points and Local Behavior of Blow-up ...

blow-up set for problem (1.1). Inparticular, we show the relationship betweenthe blow-up set and higher order derivatives of the initial data. Before stating our main results, we introduce some notation. For any $x\in R^{N}$ and $r>0$, we denote the open ball radiusof r and center x by $B(x, r)$. Let $BC_{+}(\overline{\Omega})$ be the set ofnonnegative bounded continuos functions on

Effect of higher order derivatives of initial data on the ...

blow up for higher order parabolic hyperbolic dispersion and schrodinger equations shows how four types of higher order nonlinear evolution partial differential equations pdes have many commonalities through their special quasilinear degenerate representations the authors present a unified approach to deal with these quasilinear pdesthe book

10+ Blow Up For Higher Order Parabolic Hyperbolic ...

title = "Existence and blow-up for higher-order semilinear parabolic equations: Majorizing order-preserving operators",

Existence and blow-up for higher-order semilinear ...

As for the solid fuel model (1.1), the structure of such a blow-up singularity formation is of importance in the present higher-order model. From the Cambridge English Corpus Total wave collapse will take place provided the blow - up singularity does not occur at times earlier than the collapse predicted by the virial theorem.

Blow-up for Higher-Order Parabolic, Hyperbolic, Dispersion and Schrödinger Equations shows how four types of higher-order nonlinear evolution partial differential equations (PDEs) have many commonalities through their special quasilinear degenerate representations. The authors present a unified approach to deal with these quasilinear PDEs. The book first studies the particular self-similar singularity solutions (patterns) of the equations. This approach allows four different classes of nonlinear PDEs to be treated simultaneously to establish their striking common features. The book describes many properties of the equations and examines traditional questions of existence/nonexistence, uniqueness/nonuniqueness, global asymptotics, regularizations, shock-wave theory, and various blow-up singularities. Preparing readers for more advanced mathematical PDE analysis, the book demonstrates that quasilinear degenerate higher-order PDEs, even exotic and awkward ones, are not as daunting as they first appear. It also illustrates the deep features shared by several types of nonlinear PDEs and encourages readers to develop further this unifying PDE approach from other viewpoints.

The monograph is devoted to the study of initial-boundary-value problems for multi-dimensional Sobolev-type equations over bounded domains. The authors consider both specific initial-boundary-value problems and abstract Cauchy problems for first-order (in the time variable) differential equations with nonlinear operator coefficients with respect to spatial variables. The main aim of the monograph is to obtain sufficient conditions for global (in time) solvability, to obtain sufficient conditions for blow-up of solutions at finite time, and to derive upper and lower estimates for the blow-up time. The monograph contains a vast list of references (440 items) and gives an overall view of the contemporary state-of-the-art of the mathematical modeling of various important problems arising in physics. Since the list of references contains many papers which have been published previously only in Russian research journals, it may also serve as a guide to the Russian literature.

Our analysis adapts the robust energy method developed for the study of energy critical bubbles by Merle-Rapha¨el-Rodnianski, Rapha¨el-Rodnianski and Rapha¨el- Schweyer, the study of this issue for the supercritical semilinear heat equation done by Herrero-Vel´azquez, Matano-Merle and Mizoguchi, and the analogous result for the energy supercritical Schr¨odinger equation by Merle-Rapha¨el-Rodnianski.

* Introduces a state-of-the-art method for the study of the asymptotic behavior of solutions to evolution partial differential equations. * Written by established mathematicians at the forefront of their field, this blend of delicate analysis and broad application is ideal for a course or seminar in asymptotic analysis and nonlinear PDEs. * Well-organized text with detailed index and bibliography, suitable as a course text or reference volume.

This book addresses the global study of finite and infinite singularities of planar polynomial differential systems, with special emphasis on quadratic systems. While results covering the degenerate cases of singularities of quadratic systems have been published elsewhere, the proofs for the remaining harder cases were lengthier. This book covers all cases, with half of the content focusing on the last non-degenerate ones. The book contains the complete bifurcation diagram, in the 12-parameter space, of global geometrical configurations of singularities of quadratic systems. The authors' results provide – for the first time – global information on all singularities of quadratic systems in invariant form and their bifurcations. In addition, a link to a very helpful software package is included. With the help of this software, the study of the algebraic bifurcations becomes much more efficient and less time-consuming. Given its scope, the book will appeal to specialists on polynomial differential systems, pure and applied mathematicians who need to study bifurcation diagrams of families of such systems, Ph.D. students, and postdoctoral fellows.

This monograph looks at several trends in the investigation of singular solutions of nonlinear elliptic and parabolic equations. It discusses results on the existence and properties of weak and entropy solutions for elliptic second-order equations and some classes of fourth-order equations with L1-data and questions on the removability of singularities of solutions to elliptic and parabolic second-order equations in divergence form. It looks at localized and nonlocalized singularly peaking boundary regimes for different classes of quasilinear parabolic second- and high-order equations in divergence form. The book will be useful for researchers and post-graduate students that specialize in the field of the theory of partial differential equations and nonlinear analysis. Contents: Foreword Part I: Nonlinear elliptic equations with L^1-data Nonlinear elliptic equations of the second order with L^1-data Nonlinear equations of the fourth order with strengthened coercivity and L^1-data Part II: Removability of singularities of the solutions of quasilinear elliptic and parabolic equations of the second order Removability of singularities of the solutions of quasilinear elliptic equations Removability of singularities of the solutions of quasilinear parabolic equations Quasilinear elliptic equations with coefficients from the Kato class Part III: Boundary regimes with peaking for quasilinear parabolic equations Energy methods for the investigation of localized regimes with peaking for parabolic second-order equations Method of functional inequalities in peaking regimes for parabolic equations of higher orders Nonlocalized regimes with singular peaking Appendix: Formulations and proofs of the auxiliary results Bibliography

This Special Edition contains new results on Differential and Integral Equations and Systems, covering higher-order Initial and Boundary Value Problems, fractional differential and integral equations and applications, non-local optimal control, inverse, and higher-order nonlinear boundary value problems, distributional solutions in the form of a finite series of the Dirac delta function and its derivatives, asymptotic properties' oscillatory theory for neutral nonlinear differential equations, the existence of extremal solutions via monotone iterative techniques, predator-prey interaction via fractional-order models, among others. Our main goal is not only to show new trends in this field but also to showcase and provide new methods and techniques that can lead to future research.

Sobolev spaces become the established and universal language of partial differential equations and mathematical analysis. Among a huge variety of problems where Sobolev spaces are used, the following important topics are the focus of this volume: boundary value problems in domains with singularities, higher order partial differential equations, local polynomial approximations, inequalities in Sobolev-Lorentz spaces, function spaces in cellular domains, the spectrum of a Schrodinger operator with negative potential and other spectral problems, criteria for the complete integration of systems of differential equations with applications to differential geometry, some aspects of differential forms on Riemannian manifolds related to Sobolev inequalities, Brownian motion on a Cartan-Hadamard manifold, etc. Two short biographical articles on the works of Sobolev in the 1930s and the foundation of Akademgorodok in Siberia, supplied with unique archive photos of S. Sobolev are included.

This book provides an overview of different topics related to the theory of partial differential equations. Selected exercises are included at the end of each chapter to prepare readers for the “research project for beginners” proposed at the end of the book. It is a valuable resource for advanced graduates and undergraduate students who are interested in specializing in this area. The book is organized in five parts: In Part 1 the authors review the basics and the mathematical prerequisites, presenting two of the most fundamental results in the theory of partial differential equations: the Cauchy-Kovalevskaja theorem and Holmgren's uniqueness theorem in its classical and abstract form. It also introduces the method of characteristics in detail and applies this method to the study of Burger's equation. Part 2 focuses on qualitative properties of solutions to basic partial differential equations, explaining the usual properties of solutions to elliptic, parabolic and hyperbolic equations for the archetypes Laplace equation, heat equation and wave equation as well as the different features of each theory. It also discusses the notion of energy of solutions, a highly effective tool for the treatment of non-stationary or evolution models and shows how to define energies for different models. Part 3 demonstrates how phase space analysis and interpolation techniques are used to prove decay estimates for solutions on and away from the conjugate line. It also examines how terms of lower order (mass or dissipation) or additional regularity of the data may influence expected results. Part 4 addresses semilinear models with power type non-linearity of source and absorbing type in order to determine critical exponents: two well-known critical exponents, the Fujita exponent and the Strauss exponent come into play. Depending on concrete models these critical exponents divide the range of admissible powers in classes which make it possible to prove quite different qualitative properties of solutions, for example, the stability of the zero solution or blow-up behavior of local (in time) solutions. The last part features selected research projects and general background material.

Overview of current developments in nonlinear photorefractive optics. The book dicusses exciting discoveries, with special emphasis on transverse effects such as spatial soliton formation and interaction, spontaneous pattern formation and pattern competition in active feedback systems. Different aspects of potential applications, such as wave guiding in adaptive photorefractive solitons and techniques for pattern control for information processing, are also described.