ORIGINAL PAPERS

Page 1177–1190  Alexandre Almeida, Lars Diening, and Peter Hästö
Homogeneous variable exponent Besov and Triebel–Lizorkin spaces
We introduce homogeneous Besov and Triebel–Lizorkin spaces with variable indexes. We show that their study reduces to the study of inhomogeneous variable exponent spaces and homogeneous constant exponent spaces. Corollaries include trace space characterizations and Sobolev embeddings.

Page 1191–1207  Nguyen Buong
Steepest-descent proximal point algorithms for a class of variational inequalities in Banach spaces
In this paper, we present a new approach to the problem of finding a common zero for a system of $m$-accretive mappings in a uniformly convex Banach space with a uniformly Gâteaux differentiable norm. We propose an implicit iteration method and two explicit ones, based on compositions of resolvents with the steepest-descent method. We show that our results contain some iterative methods in literature as special cases. An extension of the Xu's regularization method for the proximal point algorithm from Hilbert spaces onto Banach ones under simple conditions of convergence and a new variant for the method of alternating resolvents are obtained. Numerical experiments are given to affirm efficiency of the methods.

Page 1208–1215  María J. Carro and Eduard Roure
Weighted boundedness of the 2-fold product of Hardy–Littlewood maximal operators
We study new weighted estimates for the 2-fold product of Hardy–Littlewood maximal operators defined by $M^\otimes(f, g) := Mf Mg$. This operator appears very naturally in the theory of bilinear operators such as the bilinear Calderón–Zygmund operators, the bilinear Hardy–Littlewood maximal operator introduced by Calderón or in the study of pseudodifferential operators. To this end, we need to study Hölder's inequality for Lorentz spaces with change of measures

$$
\|fg\|_{L^{p_1, \infty}(\nu_1^{p_1/p_2})} \leq C\|f\|_{L^{p_1, \infty}(\nu_1)}\|g\|_{L^{p_2, \infty}(\nu_2)}.
$$

Unfortunately, we shall prove that this inequality does not hold, in general, and we shall have to consider a weaker version of it.

Page 1216–1239  A. D. D. Cavalcanti, M. M. Cavalcanti, L. H. Fatori, and M. A. Jorge Silva
Unilateral problems for the wave equation with degenerate and localized nonlinear damping: well-posedness and non-stability results
Unilateral problems related to the wave model subject to degenerate and localized nonlinear damping on a compact Riemannian manifold are considered. Our results are new and concern two main issues: (a) to prove the global well-posedness of the variational problem; (b) to establish that the corresponding energy functional is not (uniformly) stable to equilibrium in general, namely, the energy does not converge to zero on the trajectory of every solution, even if a full linear damping is taken in place.
Solvability near the characteristic set for a class of first-order linear partial differential operators

In this work we deal with solvability of first-order differential equations in the form
\[ Lu = pu + f, \]
where \( L \) is a planar complex vector field, elliptic everywhere except along a simple closed curve \( \Sigma \) on which it is tangent and \( L \wedge L \) vanishes of order \( m \geq 2 \). In contrast with the local solvability, it is shown that the zero order term \( p \) has influence in the solvability in a full neighborhood of \( \Sigma \).

A fairly strong stability result for parabolic quasiminimizers

In this paper we consider parabolic \( Q \)-quasiminimizers related to the \( p \)-Laplace equation in \( \Omega_T := \Omega \times (0,T) \). In particular, we focus on the stability problem with respect to the parameters \( p \) and \( Q \). It is known that, if \( Q \to 1 \), then parabolic quasiminimizers with fixed initial-boundary data on \( \Omega_T \) converge to the parabolic minimizer strongly in \( L^p(0,T; W^{1,p}(\Omega)) \) under suitable further structural assumptions. Our concern is whether or not we can obtain even stronger convergence. We will show a fairly strong stability result.

Discrete Morrey spaces and their inclusion properties

We discuss discrete Morrey spaces and their generalizations, and we prove necessary and sufficient conditions for the inclusion property among these spaces through an estimate for the characteristic sequences.

On closed Lie ideals of certain tensor products of \( C^\ast \)-algebras

For a simple \( C^\ast \)-algebra \( A \) and any other \( C^\ast \)-algebra \( B \), it is proved that every closed ideal of \( A \otimes^\mathrm{min} B \) is a product ideal if either \( A \) is exact or \( B \) is nuclear. Closed commutator of a closed ideal in a Banach algebra whose every closed ideal possesses a quasi-central approximate identity is described in terms of the commutator of the Banach algebra. If \( a \) is either the Haagerup norm, the operator space projective norm or the \( C^\ast \)-minimal norm, then this allows us to identify all closed Lie ideals of \( A \otimes^a B \), where \( A \) and \( B \) are simple, unital \( C^\ast \)-algebras with one of them admitting no tracial functionals, and to deduce that every non-central closed Lie ideal of \( B(H) \otimes^a B(H) \) contains the product ideal \( K(H) \otimes^a K(H) \). Closed Lie ideals of \( A \otimes^\mathrm{min} C(X) \) are also determined, \( A \) being any simple unital \( C^\ast \)-algebra with at most one tracial state and \( X \) any compact Hausdorff space. And, it is shown that closed Lie ideals of \( A \otimes^a K(H) \) are precisely the product ideals, where \( A \) is any unital \( C^\ast \)-algebra and \( a \) any completely positive uniform tensor norm.

Two-parameter anisotropic homogenization for a Dirichlet problem for the Poisson equation in an unbounded periodically perforated domain.

A functional analytic approach

We consider a Dirichlet problem for the Poisson equation in an unbounded periodically perforated domain. The domain has a periodic structure, and the size of each cell is determined by a positive parameter \( \delta \), and the level of anisotropy of the cell is determined by a diagonal matrix \( \gamma \) with positive diagonal entries. The relative size of each periodic perforation is instead determined by a positive parameter \( \epsilon \). For a given value \( \gamma \) of \( \gamma \), we analyze the behavior of the unique solution of the problem as \((\epsilon, \delta, \gamma)\) tends to \((0, 0, \gamma)\) by an approach which is alternative to that of asymptotic expansions and of classical homogenization theory.
Masaaki Mizukami

The fast signal diffusion limit in a chemotaxis system with strong signal sensitivity

This paper gives an insight into making a mathematical bridge between the parabolic-parabolic signal-dependent chemotaxis system and its parabolic-elliptic version. To be more precise, this paper deals with convergence of a solution for the parabolic-parabolic chemotaxis system with strong signal sensitivity

\[(u_\lambda)_t = \Delta u_\lambda - \nabla \cdot (u_\lambda \chi(v_\lambda) \nabla v_\lambda), \quad \lambda(v_\lambda)_t = \Delta v_\lambda - v_\lambda + u_\lambda \quad \text{in } \Omega \times (0, \infty)\]

to that for the parabolic-elliptic chemotaxis system

\[u_t = \Delta u - \nabla \cdot (u \chi(v) \nabla v), \quad 0 = \Delta v - v + u \quad \text{in } \Omega \times (0, \infty),\]

where \(\Omega\) is a bounded domain in \(\mathbb{R}^n\) (\(n \in \mathbb{N}\)) with smooth boundary, \(\lambda > 0\) is a constant and \(\chi\) is a function generalizing \(\chi(v) = \chi_0 (1 + v)^k\) \((\chi_0 > 0, \ k > 1)\).

In chemotaxis systems parabolic-elliptic systems often gave some guide to methods and results for parabolic-parabolic systems. However, the relation between parabolic-elliptic systems and parabolic-parabolic systems has not been studied except for the case that \(\Omega = \mathbb{R}^n\). Namely, in the case that \(\Omega\) is a bounded domain, it still remains to analyze on the following question: Does a solution of the parabolic-parabolic system converge to that of the parabolic-elliptic system as \(\lambda \searrow 0\)? This paper gives some positive answer in the chemotaxis system with strong signal sensitivity.

Jun O'Hara and Gil Solanes

Regularized Riesz energies of submanifolds

Given a closed submanifold, or a compact regular domain, in Euclidean space, we consider the Riesz energy defined as the double integral of some power of the distance between pairs of points. When this integral diverges, we compare two different regularization techniques (Hadamard's finite part and analytic continuation), and show that they give essentially the same result. We prove that some of these energies are invariant under Möbius transformations, thus giving a generalization to higher dimensions of the Möbius energy of knots.

Yuri Prokhorov and Constantin Shramov

\(p\)-subgroups in the space Cremona group

We prove that if \(X\) is a rationally connected threefold and \(G\) is a \(p\)-subgroup in the group of birational selfmaps of \(X\), then \(G\) is an abelian group generated by at most 3 elements provided that \(p \geq 17\). We also prove a similar result for \(p \geq 11\) under an assumption that \(G\) acts on a \((\text{Gorenstein})\) \(G\)-Fano threefold, and show that the same holds for \(p \geq 5\) under an assumption that \(G\) acts on a \(G\)-Mori fiber space.

Raul Quiroga-Barranco

Pseudo-Riemannian \(G_{2(2)}\)-manifolds with dimension at most 21

Let \(G_{2(2)}\) be the non-compact connected simple Lie group of type \(G_2\) over \(\mathbb{R}\), and let \(M\) be a connected analytic complete pseudo-Riemannian manifold that admits an isometric \(G_{2(2)}\)-action with a dense orbit. For the case \(\dim(M) \leq 21\), we provide a full description of the manifold \(M\), its geometry and its \(G_{2(2)}\)-action. The latter are always given in terms of a Lie group geometry related to \(G_{2(2)}\), and in one case \(M\) is essentially the quotient of \(SO_0(3, 4)\) by a lattice.
Idha Sihwaningrum, Hendra Gunawan, and Eiichi Nakai

Maximal and fractional integral operators on generalized Morrey spaces over metric measure spaces

We establish the boundedness and weak boundedness of the maximal operator and generalized fractional integral operators on generalized Morrey spaces over metric measure spaces \((X, d, \mu)\) without the assumption of the growth condition on \(\mu\). The results are generalization and improvement of some known results. We also give the vector-valued boundedness. Moreover we prove the independence of the choice of the parameter in the definition of generalized Morrey spaces by using the geometrically doubling condition in the sense of Hytönen.

Lin Tang

The estimates of Bessel integrals with oscillatory factors

In this paper, we establish some sharp estimates of Bessel integrals with oscillatory factors \(e^{iatr}\). As an application, we obtain the \(L^2(\mathbb{R}^n)\) boundedness of the oscillatory singular integral operators with variable kernels.

Liwei Wang and Lisheng Shu

Higher order commutators of fractional integrals on Morrey type spaces with variable exponents

Based on the theory of variable exponent and BMO norms, we prove some boundedness results for the \(m\)-th order commutators of the fractional integrals on variable exponent Morrey and Morrey–Herz spaces. Even in the special case of \(m = 1\), the main results obtained are also new.

Lian Wu, Dejian Zhou, and Yong Jiao

Modular inequalities in martingale Orlicz–Karamata spaces

In this paper, some new martingale inequalities in the framework of Orlicz–Karamata spaces are provided. More precisely, we establish modular martingale inequalities associated with concave functions and slowly varying functions.