

Raport Stiintific. Raport de Activitate

Proiect: Contract PCE 23/2017, Cod Depunere: PN-III-P4-ID-PCE-2016-0130 ,

Etapa: 2 (2018)

Contractor:

Universitatea din Craiova

Director Proiect:

Prof. Univ. Dr. Vicentiu Radulescu

Rezumatul etapei

In cadrul acestei etape au fost realizate toate punctele asumate prin contract si au fost realizate si studii suplimentare, astfel au fost realizate studii ale problemelor critice si supercritice cu exponent variabil, ecuatii Schrodinger peste campuri fractionare precum si studiul problemelor critice si supercritice pentru ecuatii neliniare cu derivate partiale descrise de operatori cu unul sau mai multi exponenti variabili si al ecuatiilor Schrodinger peste campuri scalare fractionare:

1. Stabilirea formulei Pohozaev Puccini Serrin in cazul studiat
2. Studiul existentei solutiilor multiple in cazul supercritic
3. Studiul operatorilor poliharmonici in cazul descris

Conform rezultatelor obtinute au fost realizate toate obiectivele propuse, evidentindu-se crearea unor premize pentru depasirea rezultatelor initial propuse si optimizari ale sistemelor de implementare datorate DataRoom-ului existent in Laboratorul de cercetare MANA (<http://stiinte.ucv.ro/mana/>) si atragerea in cadrul echipei a noi colaboratori din tara si strainatate.

Descrierea stiintifica si tehnica

Aceste studii au avut ca rezultat publicarea de articole stiintifice in Jurnale de prestigiu International, participari la Conferinte Internationale si pozitii de Profesor Invitat la Institutii de recunoastere mondiala in domeniul studiat, dupa cum urmeaza in descrierea de mai jos:

Lista cu articolele publicate cu descrierea rezultatelor obtinute

1. **Vicentiu Radulescu**, S. Saiedinezhad, A nonlinear eigenvalue problem with $p(x)$ -growth and generalized Robin boundary value condition, *Communications on Pure and Applied Analysis* 17 (2018), 39-52.
2. N. Papageorgiou, **Vicentiu Radulescu**, D. Repovs, Nodal solutions for the Robin p -Laplacian plus an indefinite potential and a general reaction term, *Communications on Pure and Applied Analysis* 17 (2018), 231-241.
3. N. Papageorgiou, **Vicentiu Radulescu**, D. Repovs, Positive solutions for superdiffusive mixed problems, *Applied Mathematics Letters* 77 (2018), 87-93.
4. N. Papageorgiou, **Vicentiu Radulescu**, Multiplicity of solutions for nonlinear nonhomogeneous Robin problems, *Proceedings of the American Mathematical Society* 146 (2018), 601-611.
5. N. Papageorgiou, **Vicentiu Radulescu**, Semilinear Robin problems resonant at both zero and infinity, *Forum Mathematicum* 30 (2018), 237-251.
6. N. Papageorgiou, **Vicentiu Radulescu**, D. Repovs, Existence and multiplicity of solutions for resonant $(p,2)$ -equations, *Advanced Nonlinear Studies* 18 (2018), 105-129.
7. N. Papageorgiou, **Vicentiu Radulescu**, D. Repovs, Resonant Robin problems driven by the p -Laplacian plus an indefinite potential, *Ann. Acad. Sci. Fennicae* 43 (2018), 483-508.
8. A. Bahrouni, **Vicentiu Radulescu**, D. Repovs, A weighted anisotropic variant of the Caffarelli-Kohn-Nirenberg inequality and applications, *Nonlinearity* 31 (2018), 1516-1534.
9. G. Li, **Vicentiu Radulescu**, D. Repovs, Q. Zhang, Nonhomogeneous Dirichlet problems without the Ambrosetti-Rabinowitz condition, *Topological Methods in Nonlinear Analysis* 51 (2018), 55-77.
10. N. Papageorgiou, **Vicentiu Radulescu**, D. Repovs, Periodic solutions for a class of evolution inclusions, *Computers and Mathematics with Applications* 75 (2018), 3047-3065.
11. N. Papageorgiou, **Vicentiu Radulescu**, Multiplicity of solutions for Robin problems with double resonance, *Annali della Scuola Normale Superiore di Pisa, Classe di Scienze, Serie V XVIII* (2018), 145-201.
12. N. Papageorgiou, **Vicentiu Radulescu**, D. Repovs, Positive solutions for nonlinear nonhomogeneous parametric Robin problems, *Forum Mathematicum* 30 (2018), 553-580.
13. A. Bahrouni, H. Ounaies, **Vicentiu Radulescu**, Compactly supported solutions of Schrödinger equations with small perturbation, *Applied Mathematics Letters* 84 (2018), 148-154.
14. **Vicentiu Radulescu**, X. Mingqi, B. Zhang, Nonlocal Kirchhoff diffusion problems: local existence and blow-up of solutions, *Nonlinearity* 31 (2018), 3228-3250.
15. K. Kefi, **Vicentiu Radulescu**, Small perturbations of nonlocal biharmonic problems with variable exponent and competing nonlinearities, *Rend. Lincei Mat. Appl.* 29 (2018), 439-463.
16. P. Pucci, **Vicentiu Radulescu**, The maximum principle with lack of monotonicity, *Electronic Journal of Qualitative Theory of Differential Equations* 2018, No. 58, 1-11.
17. N. Papageorgiou, **Vicentiu Radulescu**, D. Repovs, $(p,2)$ -equations symmetric at both zero and infinity, *Advances in Nonlinear Analysis* 7 (2018), 327-351.

18. N. Papageorgiou, **Vicentiu Radulescu**, D. Repovs, Positive solutions for nonvariational Robin problems, *Asymptotic Analysis* 108 (2018), 243-255.
19. N. Papageorgiou, **Vicentiu Radulescu**, D. Repovs, Double-phase problems with reaction of arbitrary growth, *Zeitschrift fuer angewandte Mathematik und Physik (ZAMP)* 69 (2018), 69:108.
20. R. Alsaedi, **Vicentiu Radulescu**, Generalized biharmonic problems with variable exponent and Navier boundary condition, Two nonlinear days in Urbino 2017, *Electronic Journal of Differential Equations*, Conf. 25 (2018), pp. 27-37.
21. M. Cencelj, **Vicentiu Radulescu**, D. Repovs, Double phase problems with variable growth, *Nonlinear Analysis* 177 (2018), 270-287.
22. X. Mingqi, **Vicentiu Radulescu**, B. Zhang, Combined effects for fractional Schrödinger-Kirchhoff systems with critical nonlinearities, *ESAIM: COCV* 24 (2018), 1249-1273.

Descrierea a cinci lucrari

Lucrarea 10: N. Papageorgiou, **Vicentiu Radulescu**, D. Repovs, Periodic solutions for a class of evolution inclusions, *Computers and Mathematics with Applications* 75 (2018), 3047-3065.

We consider a periodic evolution inclusion defined on an evolution triple of spaces. The inclusion involves also a subdifferential term. We prove existence theorems for both the convex and the nonconvex problem, and we also produce extremal trajectories. Moreover, we show that every solution of the convex problem can be approximated uniformly by certain extremal trajectories (strong relaxation). We illustrate our results by examining a nonlinear parabolic control system.

Lucrarea 11: N. Papageorgiou, **Vicentiu Radulescu**, Multiplicity of solutions for Robin problems with double resonance, *Annali della Scuola Normale Superiore di Pisa, Classe di Scienze, Serie V XVIII* (2018), 145-201.

We consider Robin boundary value problems with a reaction exhibiting double resonance at ± 1 with respect to any nonprincipal spectral interval. We prove several multiplicity theorems, producing nontrivial smooth solutions with sign information. We also prove an exact multiplicity theorem. We employ variational tools from critical point theory, together with truncation-

perturbation techniques, flow invariance arguments and Morse theory (critical groups). We produce up to seven nontrivial smooth solutions all with sign information.

Lucrarea 17: N. Papageorgiou, **Vicentiu Radulescu**, D. Repovs, $(p, 2)$ -equations symmetric at both zero and infinity, *Advances in Nonlinear Analysis* 7 (2018), 327-351.

In this paper, we consider a class of nonlinear problems with unbalanced growth. More precisely, we develop the mathematical analysis of a $(p, 2)$ -equation, that is, a nonlinear nonhomogeneous elliptic equation driven by the sum of a p -Laplacian and a Laplacian with $p > 2$. The reaction term is $(p - 1)$ -linear, but exhibits asymmetric behavior at infinity and at the origin. Using variational tools, together with truncation and comparison techniques and Morse theory, we prove two multiplicity theorems, one of them providing sign information for all the solutions (positive, negative, nodal) of the problem. The methods developed in this paper can be applied to wide classes of isotropic double-phase problems.

Lucrarea 19: N. Papageorgiou, **Vicentiu Radulescu**, D. Repovs, Double-phase problems with reaction of arbitrary growth, *Zeitschrift fuer angewandte Mathematik und Physik (ZAMP)* 69 (2018), 69:108.

We consider a parametric nonlinear nonhomogeneous elliptic equation, driven by the sum of two differential operators having different structure. The associated energy functional has unbalanced growth and we do not impose any global growth conditions to the reaction term, whose behavior is prescribed only near the origin. Using truncation and comparison techniques and Morse theory, we show that the problem has multiple solutions in the case of high perturbations. We also show that if a symmetry condition is imposed to the reaction term, then we can generate a sequence of distinct nodal solutions with smaller and smaller energies.

Lucrarea 21: M. Cencelj, **Vicentiu Radulescu**, D. Repovs, Double phase problems with variable growth, *Nonlinear Analysis* 177 (2018), 270-287.

We consider a class of double phase variational integrals driven by nonhomogeneous potentials. We study the associated Euler equation and we highlight the existence of two different Rayleigh quotients. One of them is in relationship with the existence of an infinite interval of eigenvalues

while the second one is associated with the nonexistence of eigenvalues. The notion of eigenvalue is understood in the sense of pairs of nonlinear operators, as introduced by Fučík, Nečas, Souček, and Souček. The analysis developed in this paper extends the abstract framework corresponding to some standard cases associated to the $p(x)$ -Laplace operator, the generalized mean curvature operator, or the capillarity differential operator with variable exponent. The results contained in this paper complement the pioneering contributions of Marcellini, Mingione et al. in the field of variational integrals with unbalanced growth.

Conferinte

1. "Alcuni modelli matematici nelle scienze applicate: singolarità, frattali e fluidi non-newtoniani", Accademia delle Scienze dell'Umbria, 10 January 2018
2. "Small and high perturbations of nonhomogeneous elliptic problems", Two Nonlinear Days in Perugia on the occasion of Patrizia Pucci's 65th birthday, University of Perugia, 11-12 January 2018
3. "Equilibrium problems and applications", Fourth Conference on Mathematical Sciences and Applications, King Saud University, Riyadh, 11-12 April 2018

Director Project

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