

Raport Stiintific. Raport de Activitate

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

Etapa: 3 (2019)

Contractor:

Universitatea din Craiova

Director Proiect:

Prof. Univ. Dr. Vicentiu Radulescu

1. Rezumatul etapei

Etapa a treia a proiectului a avut in vedere realizarea tuturor punctelor asumate cat si concluzionarea studiului prin integrarea rezultatelor suplimentare obtinute in fiecare etapa. Suplimentar fata de clauzele asumate, in cadrul acestei etape, au fost obtinute rezultate in domeniul existentei solutiilor pentru probleme superliniare de tipul Kirchhof in cazul fractiilor Laplace. In capitolul 8 al Raportului sunt descrise rezultatele obtinute precum si recunoasterea lor de catre comunitatea stiintifica internationala, prin prestigiul jurnalelor in care au fost publicate.

Rezultatele obtinute si sustinute de publicarea lor in jurnale de prestigiu international, indexate ISI, cu factor de impact, a avut un ecou in crearea de noi colaborari si deschiderea unei noi arii de cercetare interdisciplinara prin cooptarea de noi membrii in cadrului Laboratorului de Cercetare Modele de Analiza Neliniara si Aplicatii – MANA (<http://stiinte.ucv.ro/mana/>).

Conform rezultatelor obtinute au fost realizate toate obiectivele propuse, evidentiindu-se crearea unor premize si concretizarea lor 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.

2. Descrierea stiintifica si tehnica

Studiile efectuate au fost publicate si au fost efectuate prezentari la conferintele invitate in cadrul scolilor de cercetare de renume mondial, in matematica aplicata, precum si prin obtinerea de invitatii ca si editor de volume ale studiilor efectuate in colaborare cu cercetatori de prestigiu in domeniu, rezultate prezentate in cele ce urmeaza.

3. Lista cu articolele publicate (selectie)

[1] N.S. Papageorgiou, **V.D. Radulescu**, D.D. Repovs, Asymmetric Robin problems with indefinite potential and concave terms, *Adv. Nonlinear Stud.* **19** (2019), 69-87.

<https://doi.org/10.1515/ans-2018-2022>

2018 ISI Impact Factor: 1.65

[2] A. Bahrouni, H. Ounaies, **V.D. Radulescu**, Bound state solutions of sublinear Schrodinger equations with lack of compactness, *RACSAM* **113** (2019), 1191-1210.

<https://doi.org/10.1007/s13398-018-0541-9>

2018 ISI Impact Factor: 1.028

[3] N.S. Papageorgiou, **V.D. Radulescu**, D.D. Repovs, Periodic solutions for implicit evolution inclusions, *Evolution Equations and Control Theory* **8** (2019), 621-631.

doi:10.3934/eect.2019029

2018 ISI Impact Factor: 1.049

[4] N.S. Papageorgiou, **V.D. Radulescu**, D.D. Repovs, Positive solutions for nonlinear parametric singular Dirichlet problems, *Bulletin of Mathematical Sciences* **9** (2019), 1950011 (21 pages).

DOI: 10.1142/S1664360719500115

2018 ISI Impact Factor: 1.714

[5] Z. Binlin, **V.D. Radulescu**, L. Wang, Existence results for Kirchhoff-type superlinear problems involving the fractional Laplacian, *Proceedings of the Royal Society of Edinburgh* **149** (2019), 1061-1081.

DOI:10.1017/prm.2018.105

2018 ISI Impact Factor: 1.045

4. Lista Conferinte Invitate

[1] V. Radulescu, Anisotropic problems: qualitative results, Potentiel et Probabilités, Institute of Mathematics of the Romanian Academy, Bucharest, 24-25 January 2019

- [2] V. Radulescu, Anisotropic double phase problems and perspectives, King Saud University, Riyadh, 3 April 2019
- [3] V. Radulescu, Nonlinear problems with unbalanced growth: isotropic and anisotropic models, Stochastic Analysis and Related Topics, University of Bucharest, 6-9 May 2019
- [4] V. Radulescu, Problèmes à double phase et croissance variable, LAMFA, Université de Picardie Jules Verne, Amiens, 20 May 2019
- [5] V. Radulescu, *Double phase problems with variable growth*, BiUrb Recent advances in variational methods, Università di Urbino Carlo Bo, 29 May 2019
- [6] V. Radulescu, *Singular phenomena in nonlinear elliptic equations*, BiUrb Recent advances in variational methods, Università di Urbino Carlo Bo, 30 May 2019
- [7] V. Radulescu, Problems with variable exponent, Elsevier-JMAA Conference on Nonlinear Analysis at AGH-UST, Krakow, 11-12 October 2019

5. Pozitii de Profesor Invitat

- V. Radulescu, visiting professor at King Saud University, Riyadh, Saudi Arabia (1-6 April 2019)
- V. Radulescu, visiting professor at Université de Picardie Jules Verne, Amiens, France (19-25 May 2019)
- V. Radulescu, visiting professor at Università di Urbino Carlo Bo, Urbino, Italy (27 May – 1 June 2019)
- V. Radulescu, visiting professor at AGH University of Science and Technology, Krakow, Poland (30 September – 23 October 2019)
- V. Radulescu, visiting professor at Central South University, Changsha, China (19 November – 20 December 2019)

6. Carti si Capitole de Carti Publicate

N.Papageorgiou, **V.D. Radulescu**, D. Repovs, *Nonlinear Analysis – Theory and Methods*, Springer Monographs in Mathematics, Springer, Cham, 2019, 577 pp.

eBook ISBN: 978-3-030-03430-6

DOI: 10.1007/978-3-030-03430-6

Hardcover ISBN: 978-3-030-03429-0

Series ISSN: 1439-7382

7. Editor de Volum

P. Pucci, V.D. Radulescu, of the Special Issue *Progress in Nonlinear Kirchhoff Problems, Nonlinear Analysis*, vol. 186, pp. 1-258, September 2019

8. Raport Stiintific asupra cercetarii cu precizarea a trei rezultate importante obtinute

The research activity developed in the papers published in 2019 in the framework of the Research Project 23/2017 (code PN-III-P4-ID-PCE-2016-0130) focused on the qualitative, quantitative and numerical analysis of some classes of anisotropic differential systems and applications. In this framework, we have been constantly interested in some of the open problems raised by G. Mingione in 2016 concerning the analysis of *double-phase anisotropic problems*. We have considered both differential and nonlocal systems. The first class of nonlinear problems is raised by (isotropic or anisotropic) differential systems, while the second class is raised by fractional Laplace-type operators or Kirchhoff integro-differential operators. The best three results obtained in the papers reported for 2019 are the following.

Result No. 1. In paper [1] we have been concerned with a class of asymmetric differential systems with Robin boundary condition. The source term is affected by a linear perturbation and in the reaction we distinguish the competition effects of a concave term and of an asymptotically linear term which is resonant in the negative direction. The main results of this paper establish the existence of at least four (respectively, five) solutions. These solutions are nontrivial and smooth and they appear in the case of *low perturbations*. The proofs combine refined analytic, variational and topological methods, including Morse theory (critical groups), truncation methods and perturbation techniques. The results are new and the methods are quite general; we expect that they will be extended to wide classes of isotropic or anisotropic nonlinear problems.

Result No. 2. Paper [4] is devoted to the study of a class of quasilinear systems with Dirichlet boundary condition. The feature of this paper is the presence of a nonlinear singular parametric term in the reaction. We also point out the perturbation effects created by a nonlinearity with almost linear growth at infinity. At the same time, the problem is uniformly nonresonant with respect to the principal eigenvalue of the differential operator which controls the problem. A basic result established in this paper describes exhaustively a bifurcation-type property with respect to all the values of a positive parameter. Namely, the problem has at least two positive solutions for values of the parameter less than the critical value, at least one solution in the critical case, and no solutions for supercritical values of the parameter. The main result is a connected with pioneering contributions of Crandall, Rabinowitz, Tartar, Coclite, Hirano in the study of nonlinear *singular* problems. Some of the main abstract tools found in this paper have been introduced in our recent monograph N.Papageorgiou, **V.D. Radulescu**, D. Repovš, *Nonlinear Analysis – Theory and Methods*, Springer Monographs in Mathematics, Springer, Cham, 2019, 577 pp.

Result No. 3. Paper [5] deals with the qualitative analysis of a superlinear Kirchhoff system driven by a nonlocal integral-differential operator and by the fractional Laplace operator. By computing the critical groups at zero and at infinity, we obtain the existence of nontrivial solutions via Morse theory. A feature of this paper is that the reaction is very general and it does not satisfy the standard Ambrosetti-Rabinowitz condition. That is why, many classes of nonlinear terms are allowed to satisfy the general assumptions of this paper. The main result is the first existence property obtained in the case of Kirchhoff-type Laplacian problems. At the same time, the paper extends to the case of Kirchhoff problems several results developed in our monograph

G. Molica Bisci, **V.D. Radulescu**, R. Servadei, *Variational Methods for Nonlocal Fractional Problems*, Encyclopedia of Mathematics and its Applications, vol. 162, Cambridge University Press, Cambridge, 2016.

Director Project

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