

An application of the Lyapunov-Schmidt method to semilinear elliptic problems

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Abstract: In this paper we consider the existence of nonzero solutions for the undecoupling elliptic system - $\Delta u = \lambda u + \delta v + f(u,v)$, $-\Delta v = \theta u + \gamma v + g(u,v)$, on a bounded domain of \mathbb{R}^n , with zero Dirichlet boundary conditions. We use the Lyapunov-Schmidt method and the fixed-point principle. © 2005 Texas State University - San Marcos.

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References:

- Ahmad, S., Lazer, A., Paul, J., Elementary critical point theory and perturbation of elliptic boundary value problems at resonance (1976) Indiana Univ. Math. J., 25, pp. 933-944
- Ambrosetti, A., Mancini, G., Existence and multiplicity results for nonlinear elliptic problems with linear part at resonance. The case of the simple eigenvalue (1978) J. Diff. Equations, 28, pp. 220-245
- Anane, A., (1988) Etude des Valeurs Propres et la Resonance Pour le Operateur P-laplacian, , Ph. D. Thesis, Univ. Bruxelles
- Brown, K.J., Spatially inhomogeneous steady-state solutions for systems of equations describing interacting populations (1983) J. Math. Anal. Appl., 95, pp. 251-264
- Berestycki, H., De Figueiredo, D., Double resonance in semilinear elliptic problems (1981) Comm. Partial Diff. Equations, 6, pp. 91-120
- Bartolo, P., Benci, V., Fortunato, D., Abstract critical point theorems and applications to some nonlinear problems with strong resonance (1983) Nonlinear Analysis T.M.A., 7 (9), pp. 981-1012

- Capozzi, A., Lupo, D., Solimini, S., On the existence of a nontrivial solution to nonlinear problem at resonance (1989) *Nonlinear Analysis T.M.A.*, 13 (2), pp. 151-163
- Cesari, L., Kannan, R., Qualitative study of a class of nonlinear boundary value problems at resonance (1985) *J. Diff. Equations*, 56, pp. 63-81
- Chiappinelli, R., Mawhin, J., Nugari, R., Bifurcation from infinity and multiple solutions for some Dirichlet problems with unbounded nonlinearities *Nonlinear Analysis T.M.A.*, , in press
- Chow, S., Hale, J., (1982) *Methods of Bifurcation Theory*, , Springer-Verlag
- Costa, D., Magalhães, A variational approach to subquadratic perturbations of elliptic systems (1994) *J. Diff. Equations*, 111 (1), pp. 103-122
- De Figueiredo, D., Chiappinelli, R., Bifurcation from infinity and multiple solutions for an elliptic system (1993) *Differential and Integral Equations*, 6 (4), pp. 757-771
- De Figueiredo, D., Gossez, J., Resonance below the first eigenvalue for a semilinear elliptic problem (1988) *Math. Ann.*, 281, pp. 589-610
- De Figueiredo, D., Mitidieri, E., A maximum principle for an elliptic system and applications to semilinear problems (1986) *Siam. J. Math. Anal.*, 17, pp. 836-849
- Gossez, J., Some nonlinear differential equations at resonance at first eigenvalue (1979) *Conf. Sem. Mat. Univ Bari*, 167, pp. 355-389
- Hernández, J., Maximum principles and decoupling for positive solutions of reaction-diffusion systems (1990) Oxford University Press, pp. 199-224. , K. J. Brown and A. Lacey eds
- Hoang, Q.T., On a system of semilinear elliptic equations on an unbounded domain *Vietnam Journal of Mathematics*, , to appear
- Hoang, Q.T., Ngô, Q.A., Existence of Positive Solution for a System of Semilinear Elliptic Differential Equations on an Unbounded Domain, , submitted to NoDEA
- Iannacci, R., Nkashama, M., Nonlinear boundary value problems at resonance (1987) *Nonlinear Analysis T.M.A.*, 11, pp. 455-473
- Iannacci, R., Nkashama, M., (1987) *Nonlinear Second Order Elliptic Partial Differential Equations at Resonance*, , Report 87-12, Memphis State University
- Krasnosels'kii, M., Zabreico, F., (1984) *Geometrical Methods of Nonlinear Analysis*, , Springer-Verlag
- Landesman, E., Lazer, A., Nonlinear perturbation of elliptic boundary value problems at resonance (1970) *J. Math. Mech.*, 19, pp. 609-623
- Lazer, A., Mckenna, P.J., On steady-state solutions of a system of reaction-diffusion equations from biology (1982) *Nonlinear Analysis T.M.A.*, 6, pp. 523-530
- Lupo, D., Solimini, S., A note on a resonance problem (1986) *Proc. Royal Soc. Edinburgh*, 102 A, pp. 1-7
- Mawhin, J., (1989) *Bifurcation from Infinity and Nonlinear Boundary Value Problems*, in *Ordinary and Partial Differential Equations*, 2, pp. 119-129. , Sleeman and Jarvis eds, Longman, Ifarlow
- Mawhin, J., Schmitt, K., Landesman-Lazer type problems at an eigenvalue of odd multiplicity (1988) *Results in Math.*, 14, pp. 138-146
- Mawhin, J., Schmitt, K., Nonlinear eigenvalue problems with the parameter near resonance (1990) *Ann. Polon. Math.*, 51, pp. 241-248
- Ngô, Q.A., (2005), College graduation thesis, Hà Noi - Viet Nam Ngô, Q.A., Existence of Positive Solution of Semilinear Elliptic Equations on a Bounded Domain, , in preparation
- Nirenberg, L., (1974) *Topics in Nonlinear Functional Analysis*, , New York

- Omari, P., Zanolin, F., A note on nonlinear oscillations at resonance (1987) *Acta Math. Sinica*, 3, pp. 351-361
- Rabinowitz, P., (1986) *Minimax Methods in Critical Point Theory with Applications to Differential Equations*, , CBMS 65 Regional Conference Series in Math, A.M.S
- Rothe, F., Global existence of branches of stationary solutions for a s system of reaction-diffusion equations from biology (1981) *Nonlinear Analysis T.M.A.*, 5, pp. 487-498
- Schechtbr, M., Nonlinear elliptic boundary value problems at resonance (1990) *Nonlinear Analysis T.M.A.*, 14 (10), pp. 889-903
- Smoller, J., (1983) *Shock Waves and Reaction-diffusion Equations*, , Springer-Verlag
- Solimini, S., On the solvability of some elliptic partial differential equations with the linear part at resonance (1986) *J. Math. Anal Appl.*, 117, pp. 138-152
- Vargas, C., Zuluaga, M., On a nonlinear Dirichlet problem type at resonance and bifurcation (1992) *PDEs, Pitmat Research, Notes in Mathematics*, 273, pp. 248-252
- Vargas, C., Zuluaga, M., A nonlinear elliptic problem at resonance with a nonsimple eigenvalue (1996) *Nonlinear Analysis T.M.A.*, pp. 711-721
- Zuluaga, M., A nonlinear elliptic system at resonance (1994) *Dynamic Systems and Applications*, 3 (4), pp. 501-510
- Zuluaga, M., Nonzero solutions of a nonlinear elliptic system at resonance (1996) *Nonlinear Analysis T.M.A.*, 31 (3-4), pp. 445-454
- Zuluaga, M., On a nonlinear elliptic system: Resonance and bifurcation cases (1999) *Comment. Math. Univ. Carolinae*, 40 (4), pp. 701-711