

ON PERIODIC OSCILLATIONS FOR A CLASS OF FEEDBACK CONTROL SYSTEMS IN HILBERT SPACES

NGUYEN VAN LOI

Faculty of Fundamental Science
PetroVietNam University, Viet Nam

e-mail: loinv@pvu.edu.vn

Abstract

In this paper, by using the topological degree theory for multivalued maps and the method of guiding functions in Hilbert spaces we deal with the existence of periodic oscillations for a class of feedback control systems in Hilbert spaces.

Keywords: semilinear differential inclusion, periodic solution, guiding function.

2010 Mathematics Subject Classification: 34A60, 34H05, 34C25.

REFERENCES

- [1] R. Bader and W. Kryszewski, *Fixed-point index for compositions of set-valued maps with proximally ∞ -connected values on arbitrary ANR's*, Set-Valued Anal. **2** (3) (1994), 459–480. doi:10.1007/BF01026835
- [2] V. Barbu, *Nonlinear Semigroups and Differential Equations in Banach Spaces*, Noordhoff International Publishing, Leyden, 1976.
- [3] Yu.G. Borisovich, B.D. Gel'man, A.D. Myshkis and V.V. Obukhovskii, *Introduction to the Theory of Multivalued Maps and Differential inclusions*, Second edition, Librokom, Moscow, 2011 (in Russian).
- [4] Yu.G. Borisovich, B.D. Gelman, A.D. Myshkis and V.V. Obukhovskii, *Topological methods in the theory of fixed points of multivalued mappings*, (Russian) Uspekhi Mat. Nauk **35** (1980), 59–126. English translation: Russian Math. Surveys **35** (1980), 65–143. doi:10.1070/RM1980v035n01ABEH001548
- [5] K. Borsuk, *Theory of Retracts*. Monografie Matematyczne, 44, Państwowe Wydawnictwo Naukowe, Warsaw, 1967.
- [6] I. Ekeland and R. Temam, *Convex Analysis and Variation Problems*, North Holland, Amsterdam, 1979.

- [7] R.E. Gaines and J.L. Mawhin, *Coincidence degree and nonlinear differential equations*, Lecture Notes in Mathematics, no. 568, Springer-Verlag, Berlin-New York, 1977.
- [8] L. Górniewicz, *Topological Fixed Point Theory of Multivalued Mappings*, 2nd edition. *Topological Fixed Point Theory and Its Applications*, 4. Springer, Dordrecht, 2006.
- [9] L. Górniewicz, A. Granas and W. Kryszewski, *On the homotopy method in the fixed point index theory of multi-valued mappings of compact absolute neighborhood retracts*, *J. Math. Anal. Appl.* **161** (2) (1991), 457–473.
doi:10.1016/0022-247X(91)90345-Z
- [10] Ph. Hartman, *Ordinary Differential Equations*, Corrected reprint of the second (1982) edition [Birkhäuser, Boston, MA], *Classics in Applied Mathematics*, 38, Society for Industrial and Applied Mathematics (SIAM), Philadelphia, PA, 2002.
- [11] D.M. Hyman, *On decreasing sequences of compact absolute retracts*, *Fund Math.* **64** (1969), 91–97.
- [12] M. Kamenskii, V. Obukhovskii and P. Zecca, *Condensing Multivalued Maps and Semilinear Differential Inclusions in Banach Spaces*, de Gruyter Series in Nonlinear Analysis and Applications 7, Walter de Gruyter, Berlin-New York, 2001.
doi:10.1515/9783110870893
- [13] N.V. Loi, *Method of guiding functions for differential inclusions in a Hilbert space*, *Differ. Uravn.* **46** (10) (2010), 1433–1443 (in Russian); English tranl.: *Differ. Equat.* **46** (10) (2010), 1438–1447. doi:10.1134/S0012266110100071
- [14] N.V. Loi, V. Obukhovskii and P. Zecca, *Non-smooth guiding functions and periodic solutions of functional differential inclusions with infinite delay in Hilbert spaces*, *Fixed Point Theory* **13** (2) (2012), 565–582.
- [15] A.D. Myshkis, *Generalizations of the theorem on a stationary point of a dynamical system inside a closed trajectory*, (Russian) *Math. Sb.* **34** (1954), 525–540.
- [16] V. Obukhovskii, P. Zecca, N.V. Loi and S. Kornev, *Method of Guiding Functions in Problems of Nonlinear Analysis*, *Lecture Notes in Math.* 2076, Springer, Berlin, 2013. doi:10.1007/978-3-642-37070-0
- [17] L. Schwartz, *Cours d'Analyse 1*, Second edition, Hermann, Paris, 1981.