

Mouffak Benchohra*, Imene Medjadj

Global existence results for second order neutral functional differential equation with state-dependent delay

Comment.Math.Univ.Carolin. 57,2 (2016) 169–183.

Abstract: Our aim in this work is to provide sufficient conditions for the existence of global solutions of second order neutral functional differential equation with state-dependent delay. We use the semigroup theory and Schauder's fixed point theorem.

Keywords: neutral functional differential equation of second order; mild solution; infinite delay; state-dependent delay fixed point; semigroup theory; cosine function

AMS Subject Classification: 34G20, 34K20, 34K30

REFERENCES

- [1] Abbas S., Benchohra M., *Advanced Functional Evolution Equations and Inclusions*, Springer, Cham, 2015.
- [2] Aiello W.G., Freedman H.I., Wu J., *Analysis of a model representing stage-structured population growth with state-dependent time delay*, SIAM J. Appl. Math. **52** (1992), 855–869.
- [3] Anguraj A., Arjunan M.M. Hernández E., *Existence results for an impulsive neutral functional differential equation with state-dependent delay*, Appl. Anal. **86** (2007), 861–872.
- [4] Balachandran K., Anthoni S.M., *Existence of solutions of second order neutral functional differential equations*, Tamkang J. Math. **30** (1999), 299–309.
- [5] Bartha M., *Periodic solutions for differential equations with state-dependent delay and positive feedback*, Nonlinear Anal. TMA **53** (2003), 839–857.
- [6] Benchohra M., Henderson J., Ntouyas S.K., *Existence results for impulsive multivalued semilinear neutral functional differential inclusions in Banach spaces*, J. Math. Anal. Appl. **263** (2001), 763–780.
- [7] Benchohra M., Medjadj I., *Global existence results for neutral functional differential equations with state-dependent delay*, Differ. Equ. Dyn. Syst., **24** (2016), 189–200.
- [8] Benchohra M., Medjadj I., Nieto J.J., Prakash P., *Global existence for functional differential equations with state-dependent delay*, J. Funct. Spaces Appl. 2013, Article ID 863561, 7 pages.
- [9] Cao Y., Fan J., Gard T.C., *The effects of state-dependent time delay on a stage-structured population growth model*, Nonlinear Anal. TMA **19** (1992), 95–105.
- [10] Corduneanu C., *Integral Equations and Stability of Feedback Systems*, Academic Press, New York, 1973.
- [11] Hartung F., *Parameter estimation by quasilinearization in functional differential equations state-dependent delays: a numerical study*, Proceedings of the Third World Congress of Nonlinear Analysts, Part 7 (Catania, 2000), Nonlinear Anal. TMA **47** (2001), 4557–4566.
- [12] Domoshnitsky A., Drakhlin M., Litsyn E., *On equations with delay depending on solution*, Nonlinear Anal. TMA **49** (2002), 689–701.
- [13] Hartung F., Turi J., *Identification of parameters in delay equations with state-dependent lags*, Nonlinear Anal. TMA **29** (1997), 1303–1318.
- [14] Hartung F., Herdman T.L., Turi J., *Parameter identification in classes of neutral differential equations with state-dependent delays*, Nonlinear Anal. TMA **39** (2000), 305–325.
- [15] Fattorini H.O., *Second Order Linear Differential Equations in Banach Spaces*, North-Holland Mathematics Studies, 108, North-Holland, Amsterdam, 1985.
- [16] Granas A., Dugundji J., *Fixed Point Theory*, Springer, New York, 2003.
- [17] Hale J., Kato J., *Phase space for retarded equations with infinite delay*, Funkcial. Ekvac. **21** (1978), 11–41.
- [18] Hernández E., *Existence of solutions for a second order abstract functional differential equation with state-dependent delay*, Electron. J. Differential Equations **21** (2007), 1–10.
- [19] Hernández E., McKibben M., *On state-dependent delay partial neutral functional differential equations*, Appl. Math. Comput. **186** (2007), 294–301.
- [20] Hernández E., Pierri M., União G., *Existence results for an impulsive abstract partial differential equation with state-dependent delay*, Comput. Math. Appl. **52** (2006), 411–420.

- [21] Hernández E., Sakthivel R., Tanaka S., *Existence results for impulsive evolution differential equations with state-dependent delay*, Electron. J. Differential Equations **28** (2008), 1–11.
- [22] Hino Y., Murakami S., Naito T., *Functional Differential Equations with Unbounded Delay*, Springer, Berlin, 1991.
- [23] Kisynski J., *On cosine operator functions and one parameter group of operators*, Studia Math. **49** (1972), 93–105.
- [24] Kozak M., *A fundamental solution of a second order differential equation in Banach space*, Univ. Iagel. Acta Math. **32** (1995), 275–289.
- [25] Li W.-S., Chang Y.-K., Nieto J.J., *Solvability of impulsive neutral evolution differential inclusions with state-dependent delay*, Math. Comput. Modelling **49** (2009), 1920–1927.
- [26] Ntouyas S.K., *Global existence results for certain second order delay integrodifferential equations with nonlocal conditions*, Dynam. Systems Appl. **7** (1998), 415–425.
- [27] Ntouyas S.K., Tsamatos P.Ch., *Global existence for second order semilinear ordinary and delay integrodifferential equations with nonlocal conditions*, Appl. Anal. **67** (1997), 245–257.
- [28] Rezounenko A., *Partial differential equations with discrete and distributed state-dependent delays*, J. Math. Anal. Appl. **326** (2007), 1031–1045.
- [29] Rezounenko A., Wu J., *A non-local PDE model for population dynamics with state-selective delay: local theory and global attractors*, J. Comput. Appl. Math. **190** (2006), 99–113.
- [30] Si J.-G., Wang X.P., *Analytic solutions of a second-order functional differential equation with a state dependent delay*, Results Math. **39** (2001), 345–352.
- [31] Travis C.C., Webb G.F., *Compactness, regularity, and uniform continuity properties of strongly continuous cosine families*, Houston J. Math. **3** (1977), 555–567.
- [32] Travis C.C., Webb G.F., *Cosine families and abstract nonlinear second order differential equations*, Acta Math. Acad. Sci. Hungar. **32** (1978), 76–96.