

L-OPERATOR INTEGRO-DIFFERENTIAL INEQUALITY FOR DISSIPATIVITY OF STOCHASTIC INTEGRO-DIFFERENTIAL EQUATIONS

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Abstract. In this paper, Itô stochastic integro-differential equations are considered. By establishing an L -operator integro-differential inequality and using the properties of M -cone and stochastic analysis technique, we obtain some new sufficient conditions ensuring the exponential p -dissipativity of the stochastic integro-differential equations. An example is also discussed to illustrate the efficiency of the obtained results.

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REFERENCES

- [1] K. GOPALSAMY, *Stability and Oscillations in Delay Differential Equations of Population Dynamics*, Kluwer Academic Publishers, Dordrecht, 1992.
- [2] J. K. HALE, *Theory of Functional Differential Equations*, Springer, New York, 1977.
- [3] V. B. KOLMANOVSKII, A. MYSHKIS, *Applied Theory of Functional Differential Equations*, Kluwer Academic Publishers, Dordrecht, 1992.
- [4] D. Y. XU, *Integro-differential equations and delay integral inequalities*, Tohoku Math. J., **44** (1992), 365–378.
- [5] H. Y. ZHAO, *Invariant set and attractor of nonautonomous functional differential systems*, J. Math. Anal. Appl., **282** (2003), 437–443.
- [6] D. Y. XU, H. Y. ZHAO, *Invariant set and attractivity of nonlinear differential equations with delays*, Appl. Math. Lett., **15** (2002), 321–325.
- [7] Y. M. HUANG, D. Y. XU, Z. C. YANG, *Dissipativity and periodic attractor for non-autonomous neural networks with time-varying delays*, Neurocomputing, **70** (2007), 2953–2958.
- [8] L. S. WANG, D. Y. XU, *Asymptotic behavior of a class of reaction-diffusion equations with delays*, J. Math. Anal. Appl., **281** (2003), 439–453.
- [9] Y. J. WANG, D. S. LI, P. E. KLOEDEN, *On the asymptotical behavior of nonautonomous dynamical systems*, Nonlinear Anal., **59** (2004), 35–53.
- [10] X. X. LIAO, J. WANG, *Global dissipativity of continuous-time recurrent neural networks with time delay*, Phys. Rev. E, **68** (2003), 1–7.
- [11] I.-G. E. KORDONIS, CH. G. PHILOS, *The behavior of solutions of linear integro-differential equations with unbounded delay*, Comput. Math. Appl., **38** (1999), 45–50.
- [12] X. Y. LOU, B. T. CUI, *Global robust dissipativity for integro-differential systems modeling neural networks with delays*, Chaos, Solitons & Fractals, **36** (2008), 469–478.
- [13] Q. K. SONG, Z. J. ZHAO, *Global dissipativity of neural networks with both variable and unbounded delays*, Chaos, Solitons & Fractals, **25** (2005), 393–401.
- [14] T. JANKOWSKI, *Delay integro-differential inequalities with initial time difference and applications*, J. Math. Anal. Appl., **291** (2004), 605–624.
- [15] X. R. MAO, M. RIEDLE, *Mean square stability of stochastic Volterra integro-differential equations*, Systems & Control Letters, **55** (2006), 459–465.

- [16] M. JOVANOVIĆ, S. JANKOVIĆ, *On perturbed nonlinear Itô type stochastic integrodifferential equations*, J. Math. Anal. Appl., **269** (2002), 301–316.
- [17] X. R. MAO, *Stochastic Differential Equations and Applications*, Horwood Publishing, 1997.
- [18] S.-E. A. MOHAMMED, *Stochastic Functional Differential Equations*, Longman, New York, 1986.
- [19] B. L. S. PRAKASA RAO, *Absolute stability of a stochastic integro-differential system*, J. Math. Anal. Appl., **54** (1976), 666–673.
- [20] K. BALACHANDRAN, S. KARTHIKEYAN, *Controllability of stochastic integrodifferential systems*, Int. J. Control., **80** (2007), 486–491.
- [21] A. RATHINASAMY, K. BALACHANDRAN, *Mean-square stability of Milstein method for linear hybrid stochastic delay integro-differential equations*, Nonlinear Anal.: HS (2008), doi:10.1016/j.nahs.2008.09.015.
- [22] F. Y. WEI, K. WANG, *The existence and uniqueness of the solution for stochastic functional differential equations with infinite delay*, J. Math. Anal. Appl., **331** (2007), 516–531.
- [23] R. A. HORN, C. R. JOHNSON, *Topics in Matrix Analysis*, vol. 2, Cambridge Univ. Press, England, 1991.
- [24] Z. G. YANG, D. Y. XU, L. XIANG, *Exponential p -stability of impulsive stochastic differential equations with delays*, Phys. Lett. A, **359** (2006), 129–137.
- [25] E. BECKENBACH, R. BELLMAN, *Inequalities*, Springer-Verlag, New York, 1961.
- [26] D. Y. XU, W. ZHU, S. J. LONG, *Global exponential stability of impulsive integro-differential equation*, Nonlinear Anal., **64** (2006), 2805–2816.