Lyapunov Functions for Random One-Sided Systems in Terms of Nonuniform Exponential Stability

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1 Abstract

In this study, we investigate the nonuniform exponential stability for a continuous linear random one-sided system. We derive necessary and sufficient conditions for this concept. As an extension for this study we establish Lyapunov type characterizations using Lyapunov functions. Additionally, we illustrate the essential properties that are derived in this directions for the adjoint and inverse systems associated for the original linear random one-sided system.

References

- I. P. Cornfeld, S. V. Fomin, Y. G. Sinai, Ergodic Theory. Springer-Verlag, Berlin Heidelberg New York, 1982.
- [2] T.S. Doan, Lyapunov exponents for random dynamical systems, PhD Technischen Universitat Dresden, 2009.
- [3] D. Dragičević, On the exponential stability and hyperbolicity of linear cocycles, Linear Multilinear Algebra, 69, 2021, 259–277.
- [4] D. Henry, Geometric Theory of Semilinear Parabolic Equations, Lecture Notes in Math., vol. 840, Springer, Berlin, 1981.
- [5] R. A. Johnson, K. J. Palmer, G. E. Sell, Ergodic properties of linear dynamical systems, Siam. J. Math. Anal., Vol. 18, No. 1, 1–33, 1987
- [6] I.-L. Popa, T. Ceauşu, M. Megan, On exponential stability for linear discrete-time systems in Banach spaces, Comput. Math. Appl., 63 (2012), 1497–1503
- [7] C. Pötzsche, Geometric Theory of Discrete Nonautonomous Dynamical Systems, Lecture Notes in Mathematics, Springer 2010.

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[8] R. L. Sacker, G. R. Sell, Lifting Properties in skew-product flows with applications to differential equations, Memoirs of the American Mathematical Society, Vol. 11 No. 190, DOI: DOI: 10.1090/memo/0190