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SQUARE MEAN ALMOST AUTOMORPHIC SOLUTION OF STOCHASTIC EVOLUTION EQUATIONS WITH IMPULSES ON TIME SCALES

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Abstract. In this paper, we study the existence, uniqueness and exponential stability of the square-mean almost automorphic solution for stochastic evolution equation with impulses on time scales. For this purpose, we introduce the concept of equipotentially square-mean almost automorphic sequence and square-mean almost automorphic functions with impulses on time scales. At the end, a numerical example is given to illustrate the effectiveness of the obtained theoretical results.

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REFERENCES

[1] G. M. N'GUÉRÉKATA, *Topics in almost automorphy*, Springer Science & Business Media, (2007).
[2] T. DIAGANA, *Almost automorphic type and almost periodic type functions in abstract spaces*, New York: Springer, (2013).
[3] G. M. N'GUÉRÉKATA, *Almost automorphic and almost periodic functions in abstract spaces*, Springer Science & Business Media, (2013).
[4] C. LIZAMA, J. G. MESQUITA, *Almost automorphic solutions of non-autonomous difference equations*, Journal of Mathematical Analysis and Applications 407.2 (2013), 339–349.
[5] J. A. GOLDSTEIN, G. M. N'GUÉRÉKATA, *Almost automorphic solutions of semilinear evolution equations*, Proceedings of the American Mathematical Society (2005), 2401–2408.
[6] K. EZZINBI, G. M. N'GUÉRÉKATA, *Almost automorphic solutions for some partial functional differential equations*, Journal of Mathematical Analysis and Applications 328.1 (2007), 344–358.
[7] C. WANG, S. RATHINASAMY, *Double almost periodicity for high-order Hopfield neural networks with slight vibration in time variables*, Neurocomputing 282 (2018), 1–15.
[8] ZHI-HONG GUAN, G. CHEN, *On delayed impulsive Hopfield neural networks*, Neural Networks 12.2 (1999), 273–280.
[9] D. BAINOV, P. SIMEONOV, *Impulsive differential equations: periodic solutions and applications*, Vol. 66. CRC Press, (1993).
[10] R. P. AGARWAL, T. G. BHASKAR, K. PERERA, *Some results for impulsive problems via Morse theory*, Journal of Mathematical Analysis and Applications 409.2 (2014), 752–759.
[11] G.T. STAMOV, AND J. O. ALZABUT, *Almost periodic solutions for abstract impulsive differential equations*, Nonlinear Analysis: Theory, Methods & Applications 72.5 (2010), 2457–2464.
[12] D. GROW, S. SANYAL, *Brownian motion indexed by a time scale*, Stochastic Analysis and Applications 29.3 (2011) 457–472.
[13] W. HU, *Itô's Formula, the Stochastic Exponential and Change of Measure on General Time Scales*, Abstract and Applied Analysis. Vol. 2017. Hindawi, (2017).
[14] W. T. BRETT, *On stochastic differential equations in the Ito and in the Stratonovich sense (Master's Thesis)*, University of Maryland, College Park, (2012).
[15] B.H. PAUL, T. DIAGANA, *Existence of almost periodic solutions to some stochastic differential equations*, Applicable Analysis 86.7 (2007), 819-827.

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[16] B. H. PAUL, *Existence of almost periodic solutions to some functional integro-differential stochastic evolution equations*, Statistics & Probability Letters 78.17 (2008), 2844–2849.

[17] F. KORICHI, *Existence et unicité de la solution pour une classe d'équations stochastiquesa coefficients définis par rapporta un ensemble fermé de temps*, To appear in Rend. Sem. Mat. Univ. Pol. Torino (2016).

[18] S. SANYAL, D. GROW, *Existence and uniqueness for stochastic dynamic equations*, International Journal of Statistics and Probability 2.2 (2013), 77.

[19] F. MIAOMIAO, Z. LIU, *Square-mean almost automorphic solutions for some stochastic differential equations*, Proceedings of the American Mathematical Society 138.10 (2010), 3689–3701.

[20] S. HILGER, *Ein Makettenkalkäul mit Anwendung auf Zentrumsmannigfaltigkeiten (Ph.D Thesis)*, Universität Wäurzburg, (1988).

[21] M. BOHNER, A. PETERSON, *Dynamic Equations on Time Scales*, Birkhäuser, Basel, (2001).

[22] M. BOHNER, A. PETERSON, *Advances in Dynamic Equations on Time Scales*, Birkhäuser, Boston, MA, (2003).

[23] M. BOHNER, A. PETERSON, *A survey of exponential functions on time scales*, Cubo Mat. Educ 3.2 (2001), 285–301.

[24] R.P. AGARWAL, M. BOHNER, *Basic calculus on time scales and some of its applications*, Resultate der Mathematik 35.1 (1999), 3–22.

[25] S. ABBAS, *Qualitative analysis of dynamic equations on time scales*, Electron. J. Differential Equations (2018), Paper No. 51, 13 pp.

[26] S. S. NEGI, S. ABBAS, M. MALIK, *Oscillation criteria of singular initial-value problem for second order nonlinear dynamic equation on time scales*, Nonauton. Dyn. Syst. 5 (2018), 102–112.

[27] V. KUMAR, M. MALIK, *Existence and stability of fractional integro differential equation with non-instantaneous integrable impulses and periodic boundary condition on time scale*, Journal of King Saud University- Science (2018). doi: https://doi.org/10.1016/j.jksus.2018.10.011

[28] C. WANG, R. P. AGARWAL, *Relatively dense sets, corrected uniformly almost periodic functions on time scales, and generalizations*, Advances in Difference Equations 2015.1 (2015), 312.

[29] R. P. AGARWAL, D. O'REGAN, *Some comments and notes on almost periodic functions and changing-periodic time scales*, Electron. J. Math. Anal. Appl 6 (2018), 125–136.

[30] Y. LI, Y. LI, *Existence and exponential stability of periodic solution for stochastic Hopfield neural networks on time scales*, Neurocomputing 167 (2015), 543–550.

[31] Y. LI, Y. LI, W. WU, *Square-mean almost periodic solution for stochastic Hopfield neural networks with time-varying delays on time scales*, Neural Computing and Applications 26.5 (2015), 1073–1084.

[32] Y. LI, X. MENG, *Synchronisation of generalised stochastic neural networks with delays and reaction-diffusion terms on time scales*, International Journal of Dynamical Systems and Differential Equations 5.3 (2015), 248–266.

[33] S. DHAMA, S. ABBAS, *Existence and stability of square-mean almost automorphic solution for neutral stochastic evolution equations with Stepanov-like terms on time scales*, Revista de la Real Academia de Ciencias Exactas, Físicas y Naturales. Serie A. Matemáticas (2018), 1–20.

[34] D. GROW, S. SANYAL, *The quadratic variation of Brownian motion on a time scale*, Statistics & Probability Letters 82.9 (2012), 1677–1680.

[35] N. H. DU, N. T. DIEU, *Stochastic dynamic equations on time scales*, Acta Mathematica Vietnamica 38.2 (2013), 317–338.

[36] N. H. DU, N. T. DIEU, *The first attempt on the stochastic calculus on time scale*, Stochastic Analysis and Applications 29.6 (2011), 1057–1080.

[37] N. T. DIEU, N. H. DU, *On the Stability of Stochastic Dynamic Equations on Time Scales*, Acta Mathematica Vietnamica 43.1 (2018), 111–124.

[38] C. WANG, *Existence and exponential stability of piecewise mean-square almost periodic solutions for impulsive stochastic Nicholson's blowflies model on time scales*, Applied Mathematics and Computation 248 (2014), 101–112.

[39] C. WANG, *Almost periodic solutions of impulsive BAM neural networks with variable delays on time scales*, Communications in Nonlinear Science and Numerical Simulation 19.8 (2014), 2828–2842.

[40] C. WANG, R. P. AGARWAL, S. RATHINASAMY,*Almost periodic oscillations for delay impulsive stochastic Nicholson's blowflies timescale model*, Computational and Applied Mathematics 37.3 (2018), 3005–3026.

[41] C. WANG, R. P. AGARWAL, *Almost periodic solution for a new type of neutral impulsive stochastic Lasota-Wazewska time scale model*, Applied Mathematics Letters 70 (2017), 58–65.
[42] M. BOHNER, S. SANYAL, *The stochastic dynamic exponential and geometric Brownian motion on isolated time scales*, Communications in Mathematical Analysis 8.3 (2010), 120–135.
[43] M. BOHNER, O. M. STANZHYTSKYI, A. O. BRATOCHKINA, *Stochastic dynamic equations on general time scales*, Electronic Journal of Differential Equations 2013.57 (2013), 1–15.
[44] C. WANG, RAVI P. AGARWAL, *Weighted piecewise pseudo almost automorphic functions with applications to abstract impulsive* ∇*-dynamic equations on time scales*, Advances in Difference Equation (2014) 2014: 153. https://doi.org/10.1186/1687-1847-2014-153.
[45] J. BILLY, *Partial dynamic equations on time scales*, Journal of Computational and Applied Mathematics 186.2 (2006), 391–415.

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