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NONLINEAR CONTRACTION AND FUZZY COMPACT OPERATOR IN FUZZY BANACH ALGEBRAS

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Abstract. In this paper, at first, we consider the concept of fuzzy Banach algebras and fuzzy compact operators. Then we apply a fixed point theorem to solve the operator equation $AxBx = x$ in the fuzzy Banach algebras under a nonlinear contraction.
Key Words and Phrases: Banach algebra, fuzzy Banach space, nonlinear contraction, compact operator, completely continuous operator, Schauder fixed point theorem.
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References

[1] R.P. Agarwal, Y.J. Cho, R. Saadati, *On random topological structures*, Abstr. Appl. Anal. 2011, Art. ID 762361, 41 pp.
[2] C. Alsina, B. Schweizer, A. Sklar, *Continuity properties of probabilistic norms*, J. Math. Anal. Appl., **208**(1997), 446–452.
[3] T. Bag, S.K. Samanta, *Finite dimensional fuzzy normed linear spaces*, J. Fuzzy Math., **11**(2003), 687–705.
[4] T. Bag, S.K. Samanta, *Fuzzy bounded linear operators*, Fuzzy Sets and Systems, **151**(2005), 513–547.
[5] A. Ben Amar, S. Chouayekh, A. Jeribi, *New fixed point theorems in Banach algebras under weak topology features and applications to nonlinear integral equations*, J. Funct. Anal., **259**(2010), no. 9, 2215–2237.
[6] T. Bîzar, F. Pater, S. Nădăban, *On fuzzy normed algebras*, J. Nonlinear Sci. Appl., **9**(9)(2016), 5488–5496.
[7] S.C. Cheng, J.M. Mordeson, *Fuzzy linear operators and fuzzy normed linear spaces*, Bull. Calcutta Math. Soc., **86**(1994), 429–436.
[8] B.C. Dhage, *Remarks on two fixed point theorems involving the sum and the product of two operators*, Comput. Math. Appl., **46**(2003), 1779-1785.
[9] C. Felbin, *Finite dimensional fuzzy normed linear spaces*, Fuzzy Sets and Systems, **48**(1992), 239–248.
[10] V. Gregori, S. Romaguera, *Some properties of fuzzy metric spaces*, Fuzzy Sets and Systems, **115**(2000), 485-489.
[11] O. Hadžić, E. Pap, *Fixed Point Theory in PM Spaces*, Kluwer Academic Publishers, Dordrecht, 2001.

[12] O. Hadžić, E. Pap, *New classes of probabilistic contractions and applications to random operators*, in: Y.J. Cho, J.K. Kim, S.M. Kong (Eds.), Fixed Point Theory and Application, vol. 4, Nova Science Publishers, Hauppauge, New York, 2003, pp. 97-119.
[13] B. Lafuerza-Guillén, A. Rodríguez-Lallena, C. Sempi, *Normability of probabilistic normed spaces*, Note Mat., **29**(2009), no. 1, 99–111.
[14] A.K. Katsaras, *Fuzzy topological vector spaces II*, Fuzzy Sets and Systems, **12**(1984), 143–154.
[15] I. Kramosil, J. Michalek, *Fuzzy metric and statistical metric spaces*, Kybernetica, **11**(1975), 326–334.
[16] K. Mirmostafaee, *Perturbation of generalized derivations in fuzzy Menger normed algebras*, Fuzzy Sets and Systems, **195**(2012), 109–117.
[17] S. Nădăban, *Fuzzy continuous mappings in fuzzy normed linear spaces*, Int. J. Comput. Commun. Control, **10**(6)(2015), 834–842.
[18] S. Nădăban, I. Dzitac, *Atomic decompositions of fuzzy normed linear spaces for wavelet applications*, Informatica (Vilnius), **25**(2014), no. 4, 643–662.
[19] D. O'Regan, R. Saadati, *Nonlinear contraction theorems in probabilistic spaces*, Appl. Math. Comput., **195**(2008), 86–93.
[20] R. Saadati, J.H. Park, *Intuitionistic fuzzy Euclidean normed spaces*, Commun. Math. Anal., **1**(2006), no. 2, 85–90.
[21] R. Saadati, S.M. Vaezpour, *Some results on fuzzy Banach spaces*, J. Appl. Math. Comput, **17**(2005), 475–484.
[22] B. Schweizer, A. Sklar, *Probabilistic Metric Spaces*, Elsevier, North Holand, New York, 1983.
[23] G. Zhang, M. Zhang, *On the normability of generalized Šerstnev PN spaces*, J. Math. Anal. Appl., **340**(2008), no. 2, 1000–1011.

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