IMPLICIT CONTRACTIONS FOR A SEQUENCE OF MULTI-VALUED MAPPINGS

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Abstract. In the present paper, we define a new class of implicit contractions for a sequence of multi-valued mappings on a metric space endowed with a graph to obtain sufficient conditions for existence of common fixed points for this sequence. This will enable us to obtain a simultaneous generalization of various types of fixed point theorems for a sequence of multi-valued mappings. Moreover, multi-fractal operators related to these contractive mappings are considered.
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References

[1] M.R. Alfuraidan, *Remarks on monotone multivalued mappings on a metric space with a graph*, J. Inequal. Appl. 2015;202, doi:10.1186/s13660-015-0712-6.

[2] A. Amini-Harandi, *Fixed point theory for set-valued quasi-contraction maps in metric spaces*, Appl. Math. Lett., (2011), 1791-1794.

[3] S. Banach, *Sur les operations dans les ensembles abstraits et leur application aux equations integrales,* (French), Fund. Math., **3**(1922), 133-181.

[4] Lj. B. Ciric, *A genaralization of Banach's contraction principle*, Proc. Am. Math. Soc., **45**(1974), 267-273.

[5] N. Hussain, C. Vetro, F. Vetro, *Fixed point results for α-implicit contractions with application to integral equations*, Nonlinear Anal.: Modelling and Control, **21**(2016), no. 3, 362-378.

[6] J. Jachymski, *The contraction principle for mappings on a metric space with a graph*, Proc. Amer. Math. Soc., **136**(2008), 1359-1373.

[7] M. Kikkawa, T. Suzuki, *Three fixed point theorems for generalized contractions with constants in complete metric spaces*, Nonlinear Anal., **69**(2008), 2942-2949.

[8] A.K. Mirmostafaee, *Coupled fixed points for mappings on a b-metric space with a graph*, Math. Vesnik, **69**(2017), no. 3, 214-225.

[9] A.K. Mirmostafaee, *Fixed point theorems for set-valued mappings in b-metric spaces*, Fixed Point Theory, **18**(2017), no. 1, 305-314.

[10] G. Moţ, A. Petruşel, *Fixed point theory for a new type of contractive multivalued operators*, Nonlinear Anal., **70**(2009), 3371-3377.

[11] S.B. Nadler Jr., *Multi-valued contraction mappings*, Pacific J. Math., **30**(1969), 475-488.

[12] J.J. Nieto, R. Rodríguez-López, *Contractive mapping theorems in partially ordered sets and applications to ordinary differential equations*, Order, **22**(2005), 223-239.

[13] J.J. Nieto, R. Rodríguez-López, *Existence and uniqueness of fixed point in partially ordered sets and applications to ordinary differential equations,* Acta Mathematica Sinica, **23**(2007), no. 12, 2205-212.

[14] V. Popa, *Fixed point theorems for implicit contractive mappings,* Stud. Cerc. St. Ser. Mat. Univ. Bacău, **7**(1997), 127-133.

[15] V. Popa, *Some fixed point theorems for compatible mappings satisfying an implicit relation,* Demonstratio Math., **32**(1999), 157-163.

[16] O. Popescu, *A new type of contractive multivalued operators*, Bull. Sci. Math., **137**(2013), 30-44.

[17] O. Popescu, G. Stan, *A generalization of Nadler's fixed point theorem*, Results Math., **72**(2017), 1525-1534.

[18] A.C.M. Ran, M.C.B. Reurings, *A fixed point theorem in partially ordered sets and some applications to matrix equations*, Proc. Amer. Math. Soc., **132**(2003), 1435-1443.

[19] B.E. Rhoades, *A comparison of various definitions of contractive mappings,* Trans. Amer. Math. Soc., **226**(1977), 257-290.

[20] T. Suzuki, *Nadler's fixed point theorem in ν-generalized metric spaces*, Fixed Point Theory Appl., (2017), 2017:18.