

FIXED POINTS FOR MULTIVALUED OPERATORS ON A SET ENDOWED WITH VECTOR-VALUED METRICS AND APPLICATIONS

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Abstract. In this paper we present the fixed point theory for multivalued operators on a set endowed with vector valued metrics. Our results extend, to the multivalued case, the result given by A.I. Perov, A.I. Perov and A.V. Kibenko, J. Matkowski, T. Shibata, as well as, some recent work of C. Bacoțiu, D. O'Regan, N. Shahzad and R.P. Agarwal, D. O'Regan and R. Precup, R. Precup, etc.

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REFERENCES

- [1] C. Bacoțiu, *Data dependence of the fixed points set of weakly Picard operators in generalized metric spaces*, Studia Univ. Babes-Bolyai, Math., **49**(2004), no.1, 15-17.
- [2] S. Czerwinski, A fixed point theorem for a system of multivalued transformations, Proc. Amer. Math. Soc., **55**(1976), 136-139.
- [3] M. Fréchet, *Les espaces abstraits*, Gauthier-Villars, Paris, 1928.
- [4] J. Matkowski, *Some inequalities and a generalization of Banach's principle*, Bull. Acad. Pol. Sci., Sér. Sci. Math. Astron. Phys., **21**(1973), 323-324.
- [5] J. Matkowski, *Integrable solutions of functional equations*, Dissertationes Math., Warszawa, **127** (1975), 63 pp.

- [6] S.B. Nadler, Jr., *Multi-valued contraction mappings*, Pacific J. Math., **30**(1969), 475-487.
- [7] D. O'Regan, R. Precup, *Continuation theory for contractions on spaces with two vector-valued metrics*, Applicable Analysis, **82**(2003), 131-144.
- [8] D. O'Regan, N. Shahzad, R.P. Agarwal, *Fixed point theory for generalized contractive maps on spaces with vector-valued metrics*, Fixed Point Theory and Applications, (Eds. Y.J. Cho, J.K. Kim, S. M. Kang), Vol. 6, Nova Sci. Publ., New York, 2007, 143-149.
- [9] A.I. Perov, *On Cauchy problem for a system of ordinary differential equations*, (in Russian), Priblizhen. Metody Reshen. Differ. Uravn., **2**(1964), 115-134.
- [10] A.I. Perov, A.V. Kibenko, *On a certain general method for investigation of boundary value problems* (in Russian), Izv. Akad. Nauk SSSR Ser. Mat., **30**(1966), 249-264.
- [11] A. Petruşel, *Multivalued weakly Picard operators and applications*, Scientiae Mathematicae Japonicae, **59**(2004), 167-202.
- [12] A. Petruşel, I.A. Rus, *Fixed point theory for multivalued operators on a set with two metrics*, Fixed Point Theory, **8**(2007), no.1, 97-104.
- [13] R. Precup, *The role of the matrices that are convergent to zero in the study of semilinear operator systems*, Mathematical and Computer Modelling, **49**(2009), 703-708.
- [14] I.A. Rus, *Principles and Applications of Fixed Point Theory*, (in Romanian), Editura Dacia, Cluj-Napoca, 1979.
- [15] I.A. Rus, *Picard operators and applications*, Scientiae Mathematicae Japonicae, **58**(2003), 191-219.
- [16] I.A. Rus, *The theory of a metrical fixed point theorem: theoretical and applicative relevances*, Fixed Point Theory, **9**(2008), no.2, 541-559.
- [17] I.A. Rus, A. Petruşel, A. Săntămărian, *Data dependence of the fixed point set of multi-valued weakly Picard operators*, Nonlinear Anal., **52**(2003), 1947-1959.
- [18] I.A. Rus, A. Petruşel, M.A. Şerban, *Weakly Picard operators: equivalent definitions, applications and open problems*, Fixed Point Theory, **7**(2006), no.1, 3-22.
- [19] I.A. Rus, A. Petruşel, G. Petruşel, *Fixed Point Theory*, Cluj University Press, 2008.
- [20] T. Shibata, *On Matkowski's fixed point theorem*, TRU Math., **18**(1982), 57-60.
- [21] M. Turinici, *Finite dimensional vector contractions and their fixed points*, Studia Univ. Babes-Bolyai, Math., **35**(1990), no.1, 30-42.
- [22] P.P. Zabrejko, *K-metric and K-normed linear spaces: Survey*, Collect. Math., **48**(1997), 825-859.

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