

## ABSTRACT MEASURES OF NONCOMPACTNESS AND FIXED POINTS FOR NONLINEAR MAPPINGS

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**Abstract.** In this paper, we study the existence of fixed points for a mapping by using abstract measures of noncompactness. Thus, we can obtain some generalizations of Darbo and Sadovskii's theorems and we also give a characterization for the existence of fixed points of a mapping which is not necessarily continuous. Finally, we solve an open problem proposed by I.A. Rus in 2001.

**Key Words and Phrases:** Measure of noncompactness, fixed points, continuous mappings.

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### REFERENCES

- [1] A. Aghajani, R. Allahyari, M. Mursaleen, *A generalization of Darbo's theorem with application to the solvability of systems of integral equations*, J. Comput. Appl. Math., **260**(2014), 68-77.
- [2] J. Appell, *Measure of noncompactness, condensing operators and fixed points: An application-oriented survey*, Fixed Point Theory, **6**(2005), 157-229.
- [3] R. Arab, *The existence of fixed points via the measure of noncompactness and its application to functional-integral equations*, Mediterr. J. Math., **13**(2016), no. 2, 759-773.
- [4] J.M. Ayerbe-Toledano, T. Domínguez-Benavides, G. López-Acedo, *Measures of Noncompactness in Metric Fixed Point Theory*, Birkhäuser Verlag, 1997.
- [5] J. Banas, K. Goebel, *Measure of Noncompactness in Banach Spaces*, Lecture Notes in Pure and Applied Math., Vol. 60, Marcel Dekker, 1980.
- [6] J. Banas, M. Jleli, M. Mursaleen, B. Samet, C. Vetro (Editors), *Advances in Nonlinear Analysis via the Concept of Measures of Noncompactness*, Springer Nature Singapore, 2017.

- [7] M. Baronti, E. Casini, P.L. Papini, *Diametrically contractive maps and fixed points*, Fixed Point Theory Appl., **2006**(2006), Art. ID 79075, 8 pp.
- [8] L.E.J. Brouwer, *Über Abbildungen von Mannigfaltigkeiten*, Mathematische Annalen, **71**(1912), 97-115.
- [9] J. Chen, X. Tang, *Generalizations of Darbo's fixed point theorem via simulation functions with application to functional integral equations*, J. Comput. Appl. Math., **296**(2016), 564-575.
- [10] G. Darbo, *Punti uniti in trasformazioni a codominio non compatto*, Rend. Semin. Mat. Uni. Padova, **24**(1955), 84-92.
- [11] B.C. Dhage, S.B. Dhage, H.K. Pathak, *A generalization of Darbo's fixed point theorem and local attractivity of generalized nonlinear functional integral equations*, Differential Eq. Appl., **7**(2015), no. 1, 57-77.
- [12] J. Diestel, *Geometry of Banach Spaces – Select Topics*, Lecture Notes in Mathematics, vol. 485, Springer, New York, 1975.
- [13] J. Garcia-Falset, K. Latrach, *On Darbo-Sadovskii's fixed point theorems type for abstract measures of (weak) noncompactness*, Bull. Belg. Math. Soc. Simon Stevin, **22**(2015), no. 5, 797-812.
- [14] M.A. Geraghty, *On contractive mappings*, Proc. Amer. Math. Soc., **40**(1973), 604-608.
- [15] K. Goebel, B. Sims, *More on minimal invariant sets for nonexpansive mappings*, Proceedings of the Third World Congress of Nonlinear Analysts, Part 4 (Catania, 2000), Nonlinear Anal., **47**(2001), no. 4, 2667-2681.
- [16] L.S. Goldenstein, I.T. Gohber, A.S. Markus, *Investigations of some properties of bounded linear operators with their  $q$ -norms*, Ucen. Zap. Kishinovsk., **29**(1957), 29-36.
- [17] N. Hussain, Z. Kadelburg, S. Radenović, F. Al-Solami, *Comparison functions and fixed point results in partial metric spaces*, Abstr. Appl. Anal. 2012, Art. ID 605781 (2012).
- [18] K. Kuratowski, *Sur les espaces complets*, Fund. Math., **15**(1930), 301-209.
- [19] R.D. Nussbaum, *Some fixed point theorems*, Bull. Amer. Math. Soc., **77**(1971), 360-365.
- [20] I.A. Rus, *Generalized Contractions and Applications*, Cluj-Napoca Press, 2001.
- [21] B.N. Sadovskii, *On a fixed point principle*, Funkt. Anal., **4**(1967), no. 2, 74-76.
- [22] J. Schauder, *Der Fixpunktsatz in Funktionalräumen*, Studia Math., **2**(1930), 171-180.

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