

ULAM-HYERS STABILITY OF OPERATORIAL INCLUSIONS IN COMPLETE GAUGE SPACES

T.P. PETRU* AND M.-F. BOTA**

*Faculty of Economics and Business Administration, Babes-Bolyai University,
Teodor-Mihali Str., No. 58-60, 400591, Cluj-Napoca, Romania
E-mail: petra.petru@econ.ubbcluj.ro

**Faculty of Mathematics and Computer Science, Babeş-Bolyai University,
Kogălniceanu Street No.1, 400084, Cluj-Napoca, Romania
E-mail: bmonica@math.ubbcluj.ro

Abstract. Using the weakly Picard operator technique, we will present some Ulam-Hyers stability results for operatorial inclusions using the weakly Picard operator technique. We study the Ulam-Hyers stability of some inclusions, where the multivalued operator satisfies some contraction conditions. We also give an application to integral inclusion.

Key Words and Phrases: Ulam-Hyers stability, multivalued operator, weakly Picard operator, c -weakly Picard operator, fixed point, integral inclusion.

2010 Mathematics Subject Classification: 47H10, 54H25, 54C60.

Acknowledgement. The second author is partially supported by a grant of the Romanian National Authority for Scientific Research, CNCS UEFISCDI, project number PN-II-ID-PCE-2011-3-0094.

REFERENCES

- [1] V.G. Angelov, *Fixed point theorems in uniform spaces and applications*, Czechoslovak Math. J., **37(112)**(1987), 19-33.
- [2] V.G. Angelov, *Fixed points of multi-valued mappings in uniform spaces*, Math. Balkanica, **12**(1998), no. 1-2, 29-35.
- [3] J.P. Aubin, H. Frankowska, *Set-valued analysis*, Birkhäuser, Basel, 1990.
- [4] G.L. Cain, Jr., M.Z. Nashed, *Fixed points and stability for a sum of two operators in locally convex spaces*, Pacific J. Math., **39**(1971), 581-592.
- [5] M.F. Bota-Boriceanu, A. Petruşel, *Ulam-Hyers stability for operatorial equations and inclusions*, Analele Univ. I. Cuza Iasi, **57**(2011), DOI: 10.2478/v10157-011-0003-6.
- [6] L.P. Castro, A. Ramos, *Hyers-Ulam-Rassias stability for a class of Volterra integral equations*, Banach J. Math. Anal., **3**(2009), no. 1, 36-43.
- [7] I. Colojoară, *On a fixed point theorem in complete uniform spaces*, Com. Acad. RPR., **11**(1961), 281-283.
- [8] J. Dugundji, *Topology*, Allyn & Bacon, Boston, 1966.
- [9] R. Espinola, A. Petruşel, *Existence and data dependence of fixed points for multivalued operators on gauge spaces*, J. Math. Anal. Appl., **309**(2005), 420-432.
- [10] M. Frigon, *Fixed point results for generalized contractions in gauge spaces and applications*, Proc. Amer. Math. Soc., **128**(2000), 2957-2965.

- [11] M. Frigon, *Fixed point and continuation results for contractions in metric and gauge spaces*, Banach Center Publications, **77**(2007), 89-114.
- [12] N. Gheorghiu, *Contraction theorem in uniform spaces*, Stud. Cerc. Mat., **19**(1967), 119-122 (Romanian).
- [13] A. Granas, J. Dugundji, *Fixed Point Theory*, Springer-Verlag, Berlin, 2003.
- [14] R.J. Knill, *Fixed points of uniform spaces*, J. Math. Anal. Appl., **12**(1965), 449-455.
- [15] G. Marinescu, *Spații vectoriale topologice și pseudotopologice (Topological and pseudo-topological vector spaces)*, Biblioteca Matematică, vol. IV, Ed. Academiei RPR, Bucharest, 1959.
- [16] D. O'Regan, A. Petrușel, T.P. Petru, *Fixed point results for Ćirić type contractions on a set with two separating gauge structures*, Sci. Math. Jap., **21**(2008), 503-512.
- [17] T.P. Petru, *Fixed point results for φ -contractions on a set with two separating gauge structures*, Anal. Ştiinț. Univ. "Ovidius" Constanța Ser. Math., **18**(2010), 263-286.
- [18] T.P. Petru, A. Petrușel, J.-C. Yao, *Ulam-Hyers stability for operatorial equations and inclusions via nonself operators*, Taiwanese J. Math., **15**(2011), No. 5, 2169-2193.
- [19] A. Petrușel, *Multivalued weakly Picard operators and applications*, Sci. Math. Jpn., **59**(2004), 169-202.
- [20] I.A. Rus, *Remarks on Ulam stability of the operatorial equations*, Fixed Point Theory, **10**(2009), No. 2, 305-320.
- [21] I.A. Rus, *Picard operators and applications*, Sci. Math. Jpn., **58**(2003), 191-219.
- [22] I.A. Rus, *The theory of a metrical fixed point theorem: theoretical and applicative relevances*, Fixed Point Theory, **9**(2008), 541-559.
- [23] I.A. Rus, *Ulam stability of ordinary differential equations*, Stud. Univ. Babeș-Bolyai Math., **54**(2009), 125-133.
- [24] I.A. Rus, A. Petrușel, G. Petrușel, *Fixed Point Theory*, Cluj University Press, 2008.
- [25] I.A. Rus, A. Petrușel, A. Sîntămărian, *Data dependence of the fixed points set of some multi-valued weakly Picard operators*, Nonlinear Anal., **52**(2003), 1947-1959.

Received: October 13, 2011; Accepted: February 2, 2012.

