

# Ulam-Hyers-Rassias stability of pseudoparabolic partial differential equations

NICOLAIE LUNGU and SORINA ANAMARIA CIPLEA

## ABSTRACT.

The aim of this paper is to give some types of Ulam stability for a pseudoparabolic partial differential equation. In this case we consider Ulam-Hyers stability and generalized Ulam-Hyers-Rassias stability. We investigate some new applications of the Gronwall lemmas to the Ulam stability of a nonlinear pseudoparabolic partial differential equations.

## REFERENCES

- [1] Brillouët-Belluot, N., Brzdęk, J. and Cieplinski, K., *On some recent developments in Ulam's type stability*, Abstr. Appl. Anal., 2012 (2012), Article ID 716936, 41 pages
- [2] Colton, D. L., *Pseudoparabolic equations in one space variable*, J. Diff. Equations, **12** (1972), 559–565
- [3] Crăciun, C. and Lungu, N., *Abstract and concrete Gronwall lemmas*, Fixed Point Theory, **10** (2009), No. 2, 221–228
- [4] Crăciun, C. and Lungu, N., *Pseudo-Parabolic Inequalities*, Carpathian J. Math., **27** (2011), No. 2, 201–207
- [5] Lungu, N. and Popa, D., *Hyers-Ulam stability of a first order partial differential equation*, J. Math. Anal. Appl., **385** (2012), 86–91
- [6] Lungu, N. and Popa, D., *On the Ulam-Hyers stability of first order partial differential equations*, Carpathian J. of Math., **28** (2012), No. 1, 77–82
- [7] Lungu, N. and Rus, I. A., *Hyperbolic differential inequalities*, Libertas Math., (2001), 35–40
- [8] Lungu, N. and Rus, I. A., *Gronwall inequality via Picard operators*, Scientific Annals of Al. I. Cuza Iași, Tomul LVIII, 2012, f. 2, 269–278
- [9] Lungu, N. and Popa, D., *Hyers-Ulam stability of some partial differential equations*, Carpathian J. Math., **30** (2014), No. 3, 327–334
- [10] Popa, D., *A generalization of Jensen equation for set-valued maps*, Seminar on Fixed Point Theory, **3** (2002), 317–322
- [11] Popa, D., *Hyers-Ulam-Rassias stability of a linear recurrence*, J. Math. Anal. Appl., **309** (2005), 591–597
- [12] Popa, D. and Raşa, I., *On Hyers-Ulam stability of the linear differential equation*, J. Math. Anal. Appl., **381** (2011), 530–537
- [13] Rus, I. A. and Lungu, N., *Ulam stability of a nonlinear hyperbolic partial differential equation*, Carpathian J. Math., **24** (2008), No. 3, 403–408
- [14] Rus, I. A., *Gronwall lemma approach to the Hyers-Ulam-Rassias stability of an integral equation*, in: Nonlinear Analysis and Variational Problems, Springer, 2009, 147–152
- [15] Rus, I. A., *Remarks on Ulam stability of the operatorial equations*, Fixed Point Theory, **10** (2009), No. 2, 305–320
- [16] Rus, I. A., *Ulam stability of ordinary differential equations*, Studia Univ. Babeş-Bolyai, Mathematica, **54** (2009), No. 4, 125–133
- [17] Rundell, W. and Stecher, M., *Remarks concerning the supports of solutions of pseudoparabolic equations*, Proc. Amer. Math. Soc., **63** (1977), No. 1, 77–81
- [18] Showalter, R. E. and Ting, T. W., *Pseudoparabolic partial differential equations*, Siam J. Math. Anal., **1** (1970), 1–26

Received: 20.09.2013; In revised form: 19.11.2014; Accepted: 01.12.2014

2010 Mathematics Subject Classification. 45G10, 45M10, 45N05, 47N10.

Key words and phrases. Pseudoparabolic partial differential equations, Ulam-Hyers stability, Gronwall lemma, inequalities.

Corresponding author: Nicolaie Lungu; nlungu@math.utcluj.ro

- [19] Vodahova, V. A., *Limit problems for a pseudoparabolic differential equations*, *Dif. Urav.*, **18** (1982), No. 2, 280–285

DEPARTMENT OF MATHEMATICS

TECHNICAL UNIVERSITY OF CLUJ-NAPOCA

MEMORANDUMULUI 28, 400114 CLUJ-NAPOCA, ROMANIA

AND

TECHNICAL UNIVERSITY OF CLUJ-NAPOCA, DEPARTMENT OF MANAGEMENT

MEMORANDUMULUI 28, 400114 CLUJ-NAPOCA, ROMANIA

*E-mail address:* nlungu@math.utcluj.ro

*E-mail address:* sorina.ciplea@ccm.utcluj.ro