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Recent Advances in Electrical Engineering

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- *Proceedings of the 2nd International Conference on Power Engineering, Energy and Electrical Drives (PEED '14)*
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Plenary Lecture 1

On Ulam's Type Stability



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Abstract:

Quite often (e.g., in applications) we have to do with functions that satisfy some equations only approximately. There arises a natural question what errors we commit when we replace such functions by the exact solutions to those equations. Some tools to evaluate them are provided within the theory of the Ulam (also Hyers-Ulam) type stability.

The issue of Ulam's type stability of (first, functional, but next also difference, differential and integral) equations has been a very popular subject of investigations for the last nearly fifty years (see, e.g., [3, 8, 9, 10]). The main motivation for it was given by S.M. Ulam in 1940. The following definition somehow describes the main ideas of such stability notion for equations in n variables (\mathbb{R}_+ stands for the set of nonnegative reals).

Definition 1. Let A be a nonempty set, (X, d) be a metric space, $\mathcal{C} \subset \mathbb{R}_+^{A^n}$ be nonempty, \mathcal{T} map \mathcal{C} into \mathbb{R}_+^A , and $\mathcal{F}_1, \mathcal{F}_2$ map a nonempty $\mathcal{D} \subset X^A$ into X^{A^n} . We say that the equation

$$\mathcal{F}_1\varphi(x_1, \dots, x_n) = \mathcal{F}_2\varphi(x_1, \dots, x_n) \quad (1)$$

is \mathcal{T} -stable provided for every $\varepsilon \in \mathcal{C}$ and $\varphi_0 \in \mathcal{D}$ with

$$d(\mathcal{F}_1\varphi_0(x_1, \dots, x_n), \mathcal{F}_2\varphi_0(x_1, \dots, x_n)) \leq \varepsilon(x_1, \dots, x_n), \quad x_1, \dots, x_n \in A,$$

there is a solution $\varphi \in \mathcal{D}$ of equation (1) such that $d(\varphi(x), \varphi_0(x)) \leq \mathcal{T}\varepsilon(x)$ for $x \in A$.

The next two theorems contain examples of some results on stability of the additive Cauchy equation (see [3]) and of a linear difference equation of higher order (see [7]).

Theorem 1. Let E_1 and E_2 be two normed spaces, $c \geq 0$ and $p \neq 1$ be fixed real numbers. Let $f : E_1 \rightarrow E_2$ be such that

$$\|f(x+y) - f(x) - f(y)\| \leq c(\|x\|^p + \|y\|^p), \quad x, y \in E_1 \setminus \{0\}.$$

If $p < 0$, then f is additive (i.e., $f(x+y) = f(x) + f(y)$ for $x, y \in E_1$). If $p \geq 0$ and E_2 is complete, then there is a unique additive $T : E_1 \rightarrow E_2$ with

$$\|f(x) - T(x)\| \leq \frac{c\|x\|^p}{|2^{p-1} - 1|}, \quad x \in E_1 \setminus \{0\}.$$

Theorem 2. Let T be either \mathbb{N} or \mathbb{Z} , X be a Banach space over $F \in \{\mathbb{R}, \mathbb{C}\}$, $(b_n)_{n \in T}$ be a sequence in X , $a_1, \dots, a_m \in F$, $\delta > 0$ and $r_1, \dots, r_m \in \mathbb{C}$ be the roots of the characteristic equation of the difference equation

$$x_{n+m} = a_1x_{n+m-1} + \dots + a_mx_n + b_n, \quad n \in T. \quad (2)$$

Suppose that $|r_i| \neq 1$ for $i = 1, \dots, m$ and $(y_n)_{n \in T}$ is a sequence in X with

$$\|y_{n+m} - a_1 y_{n+m-1} - \dots - a_m y_n - b_n\| \leq \delta, \quad n \in T.$$

Then there exists a sequence $(x_n)_{n \in T}$ in X such that (2) holds and

$$\|y_n - x_n\| \leq \frac{\delta}{|1 - |r_1|| \cdot \dots \cdot |1 - |r_m||}, \quad n \in T.$$

The lecture contains some basic motivations, definitions and results connected with the notion of the Ulam (but also the Hyers-Ulam) type stability. A general method will also be presented for investigations of that stability, e.g., of the following linear (difference, differential, functional) equations of higher orders:

$$b_m \varphi(n+m) + b_{m-1} \varphi(n+m-1) + \dots + b_1 \varphi(n+1) + b_0 \varphi(n) = G(n),$$

$$b_m \varphi^{(m)}(z) + b_{m-1} \varphi^{(m-1)}(z) + \dots + b_1 \varphi'(z) + b_0 \varphi(z) = G(z),$$

$$b_m \varphi(f^m(z)) + b_{m-1} \varphi(f^{m-1}(z)) + \dots + b_1 \varphi(f(z)) + b_0 \varphi(z) = G(z).$$

It works for analogous integral equations, as well. In many cases, functions satisfying such equations approximately generate the exact solutions to them (see, e.g., [2]). That method can be described in the terms of fixed points in suitable function spaces (for related results see, e.g., [1, 5, 6]). Some examples of simple applications of it are provided.

References

- [1] R. Badora, J. Brzdek, Fixed points of a mapping and Hyers-Ulam stability. *Journal of Mathematical Analysis and Applications* 413 (2014), 450-457.
- [2] A. Bahyrycz, J. Brzdek, Z. Lesniak, On approximate solutions of the Volterra integral equation. *Nonlinear Analysis: Real World Applications* 20 (2014), 59-66.
- [3] N. Brillouët-Belluot, J. Brzdek, K. Cieplinski, On some recent developments in Ulam's type stability. *Abstract and Applied Analysis* 2012 (2012), Article ID 716936, 41 pages.
- [4] Bing Xu, J. Brzdek, Weinian Zhang, Fixed point results and the Hyers-Ulam stability of linear equations of higher orders. *Pacific Journal of Mathematics*, to appear.
- [5] J. Brzdek, J. Chudziak, Zs. Páles, A fixed point approach to stability of functional equations. *Nonlinear Analysis: Theory, Methods & Applications* 74 (2011), 6728-6732.
- [6] J. Brzdek, K. Cieplinski, A fixed point approach to the stability of functional equations in non-Archimedean metric spaces. *Nonlinear Analysis: Theory, Methods & Applications* 74 (2011), 6861-6867.
- [7] J. Brzdek, D. Popa, B. Xu, Remarks on stability of the linear recurrence of higher order. *Applied Mathematics Letters* 23 (2010), 1459-1463.
- [8] V.A. Faiziev, Th. M. Rassias, P. K. Sahoo, The space of (ψ, γ) -additive mappings on semigroups. *Transactions of the American Mathematical Society* 354 (2002), 4455-4472.
- [9] D.H. Hyers, G. Isac, Th.M. Rassias, *Stability of Functional Equations in Several Variables*. Birkhäuser, Boston, 1998.
- [10] S-M. Jung, *Hyers-Ulam-Rassias Stability of Functional Equations in Nonlinear Analysis*. Springer Optimization and Its Applications vol. 48, Springer, New York, 2011.

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1991 – PhD in Mathematics

2000 – Habilitation in Mathematics

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Chairman of the Scientific Committee of the series of conferences: International Conference on Functional Equations and Inequalities (ICFEI) (<http://uatacz.up.krakow.pl/icfei/15ICFEI/>)

Chairman of the Organizing Committees of 10th (2005), 11th (2006), 12th (2008), 13th (2009), 14th (2011), 15th (2013), and 16th (2015) ICFEIs (<http://uatacz.up.krakow.pl/icfei/15ICFEI/prev.php>)

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