Research

Analysis Seminar

Maximal bifurcation of nonlinear equations as a nonlinear generalized of Perron-Frobenius eigenvalue

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Auditorium

Abstract. In 1942 L. Collatz discovered and in 1950 H. Wielandt used it to develop the Perron-Frobenius theory the Collatz-Wielandt formula $r = \max_{x\in(\mathbb{R}^+)^n,\ x\neq 0} L(x)$ for the Perron root r of non-negative real square matrix $A_{n\times n}$, where

$$L(x) = \min_{1\leq i\leq n}\{\frac{[A_{n\times n}x]_i}{x_i} : x_i \neq 0\}, \quad x \in (\mathbb{R}^+)^n. \tag{1}$$

In this talk we present the so-called extended functional method [1, 2] which makes it possible to find the so-called maximal bifurcation point for non-linear PDE by means of a nonlinear generalized Collatz-Wielandt variational principle. We shall exhibit the method on the examples of the finding bifurcations for solutions of nonlinear elliptic and parabolic problems. Particular attention will be given for the numerical implementation to the method.

References

[1] Il'yasov, Y. S., *Bifurcation calculus by the extended functional method*, Funct. Anal. Appl. 41, No. 1, (2007) 18-30

[2] Il'yasov, Y., *A duality principle corresponding to the parabolic equations*, Physica D: Nonlinear Phenomena, Vol. 237, 5(1) (2008) p. 692-698