

Generalized history-dependent operators and their applications

Zhenhai Liu, Anna Ochal and Jing Zhao

We establish a unified fixed point theorem for a class of almost generalized history-dependent operators, extending the classical history-dependent operators by allowing the kernel to be integrable rather than constant. These operators provide a flexible framework for modeling memory effects in differential and integro-differential equations, encompassing Volterra and fractional integral operators as special cases.

The framework developed here has broad applications in viscoelasticity, population dynamics with hereditary effects, and contact mechanics. Its main advantage is that it offers a more flexible tool for analyzing evolution equations with memory.

References

- [1] Z. H. Liu, S. Tatar, and J. Zhao, *Existence and uniqueness of solutions for generalized history-dependent variational-hemivariational inequalities*, Applied Mathematics & Optimization, 94 no. 21, 18 p. (2026)
- [2] S. Migórski, A. Ochal, and M. Sofonea, *History-dependent variational-hemivariational inequalities in contact mechanics*, Nonlinear Analysis: Real World Applications 22, 604–618 (2015)
- [3] M. Sofonea and S. Migórski, *Variational-Hemivariational Inequalities with Applications*, Chapman & Hall/CRC, Boca Raton, 311 p. (2018)

First Author: Zhenhai Liu
Affiliation: Guangxi Minzu University
Nanning, P.R. China
e-mail: zhhliu@hotmail.com

Second Author: Anna Ochal
Affiliation: Jagiellonian University in Krakow
Poland
e-mail: anna.ochal@uj.edu.pl

Third Author: Jing Zhao
Affiliation: Guangxi University of Finance and Economics
Nanning, P.R. China
e-mail: jingzhao100@126.com