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The ψ -Caputo fractional sweeping process and its applications

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Abstract

Much of the existing literature has focused on integer-order sweeping processes, but real-world systems often exhibit memory effects, which introduce additional complexity. The concept of sweeping process [1] was initially formulated by J.J. Moreau in 1971 for modeling elasto-plastic mechanical systems.

In this article, we will study a specific type of sweeping process, governed by a fractional ψ -Caputo derivative [2] in Hilbert spaces. We prove the uniqueness of the solution of sweeping processes through Rothe's method [3], as well as the surjectivity of the operator [4].

Furthermore, established abstract results are applied to investigate a complex viscoelastic contact problem involving fractional constitutive laws [5].

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