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Existence, uniqueness and stability of solutions
for systems of differential equations
involving ψ-fractional derivatives of arbitrary order.

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Abstract

We present results on the existence and uniqueness of solutions for systems of differential equations with boundary conditions involving fractional intergrals and derivatives of a function with respect to another one. Our main tool is fixed-point theory. We also study the stability of those systems according to the Ulam-Hyers stability. Finally, we provide some numerical illustrative examples.

Mathematics Subject Classification: 26A33, 34B18, 34B27

Keywords: Fractional integral and derivative, fixed-point theory, existence and uniqueness, Ulam-Hyers stability.

References

[1] A. Djaout, M. Benbachir, M. Lakrib, M.M. Matar, A. Khan and T. Abdeljawad, *Solvability and stability analysis of a coupled system involving generalized fractional derivatives*, AIMS Mathematics, 8(4) (2023), 7817-7839.

[2] I. Podlubny, *Fractional differential equations*, Mathematics in Science and Engineering, New York, Academic Press, 1999.

[3] V. Kiryakova, *Generalized Fractional Calculus and Applications*, Longman and John Wiley, New York, 1993.

[4] I. Suwan, M. Abdo, T. Abdeljawad, M. Matar, A. Boutiara and M. Almalahi, *Existence theorems for ψ-fractional hybrid systems with periodic boundary conditions*, AIMS Math., 7 (2022), 171-186.