

ON THE SOLVABILITY OF HYBRID FRACTIONAL DIFFERENTIAL ITERATIVE EQUATIONS

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Abstract. This work is devoted to find sufficient conditions that guarantee the existence of Lipschitzian solution of general class of fractional iterative differential equations. The study of these equations is investigated via both Schauder and Boyd-Wong fixed point theorems. Our results include several previously results as special cases.

Keywords. Banach algebras, Fixed point theory, Fractional differential equations, Iterative differential equation.

AMS (MOS) subject classification: 32A65, 47H10, 47G20, 12H20.

1 Introduction

Nonlinear integro-differential equations and fractional differential equations have become an intriguing area of exploration over recent decades, as evidenced by the works cited [1, 4, 5, 6, 23, 24]. These equations hold significant sway in the realm of practical mathematical modeling, finding application in various real-world quandaries across engineering and scientific domains like control theory, signal and image processing, biophysics, and blood flow dynamics [1, 21, 24, 29, 30, 31], due to the nonlocal nature of fractional derivative.

Iterative differential equations serve as potent tools, wielding significant influence in describing diverse phenomena across various scientific and biological domains. These equations are vital in the investigation of dynamical systems, infectious disease models, etc. Thus there are many researchers in the literature who studied and have dealt this type of problems, for example, see [7, 10, 13, 14, 15, 22, 25, 26, 27, 28, 30].

During the process of modeling real problems one can generate an integral equation and formulate related theorems. Further related existence and uniqueness theories for a solution for such problems are also growing very rapidly with the aid of various tools such as functional analysis, topology and the theory of fixed point, see [2, 3, 5, 6, 9, 10, 20]).