



Generalized Monotone Method for Nonlinear Caputo Fractional Impulsive Differential Equations

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Abstract: Generalized monotone method is a useful technique to prove the existence of coupled minimal and maximal solutions when the nonlinear function is the sum of an increasing and decreasing functions. In this work, we develop generalized monotone method for Caputo fractional impulsive differential equations with initial conditions, using coupled lower and upper solutions of Type 1. For that purpose we develop comparison results for Caputo fractional impulsive differential equation. Further, under uniqueness assumption, we prove the existence of the unique solution of the nonlinear Caputo fractional impulsive differential equation with initial conditions.

Keywords: *nonlinear Caputo fractional differential equations; impulsive differential equations; generalized monotone method.*

Mathematics Subject Classification (2010): 34A08, 34A37.

1 Introduction

In the past few decades, the impulsive equations have exhibited more advantages in the mathematical models of physical and biological models. See [2, 3, 6–8, 14, 23] for details. These equations can describe more naturally and more closed to the real world problems. See [9, 12, 15]. In the past four decades, the study of fractional differential equations has gained lots of importance due to its applications. See [1, 4, 5, 10, 11, 13, 25, 26]. In fact, the dynamic equations with fractional derivative have represented as better and economical models in various branches of science and engineering. See [12, 13, 15–17].

In this work, we develop generalized monotone method combined with coupled lower and upper solutions for nonlinear Caputo fractional impulsive differential equations with initial conditions. In general, explicit solution for nonlinear problems is rarely possible.

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