ON THE EXISTENCE AND STABILITY OF SOLUTIONS OF HYBRID CAPUTO FRACTIONAL DIFFERENTIAL EQUATIONS

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Abstract. In this paper existence and stability results for hybrid Caputo fractional differential equations with fixed moments of impulses are established under the weak hypothesis of C^q continuity.

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1 Introduction

Recently, research in the area of fractional differential equations has gained impetus due to its potential in both theory [1-13] and applications [14]. The theory of impulsive differential equations is another important area of investigation, as it presents a natural framework for the mathematical modeling of certain real-world phenomena [15]. Recent investigations have combined both frameworks. See, for example, [16-26].

In this paper, we consider the initial-value problem (IVP) of the Caputo fractional differential equation, given by

$$^cD^q x(t) = F(t,x), \quad x(t_0) = x_0 \tag{1.1}$$

and its corresponding Volterra integral equation

$$x(t) = x_0 + \frac{1}{\Gamma(q)} \int_{t_0}^{t} (t-s)^{q-1} F(s,\, x(s))ds. \tag{1.2}$$

First, we transform equations 1.1 and 1.2 into their corresponding Riemann-Liouville fractional differential equation and Volterra integral equation, given by

$$D^q x = f(t,x), \qquad x^0 = x(t)(t-t_0)^q|_{t=t_0}, \tag{1.3}$$