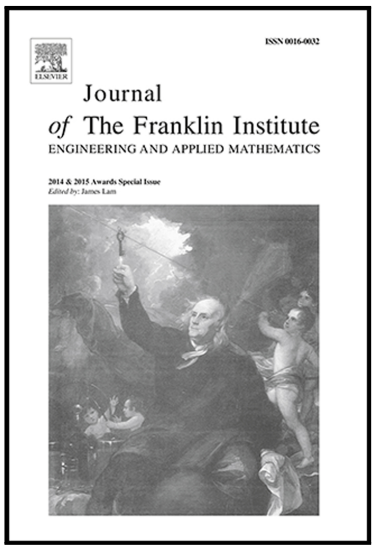

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Asymptotic Properties of the Solutions of Nonlinear Non-instantaneous Impulsive Differential Equations

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Abstract

In this article, we investigate asymptotic properties of solutions, continuous dependence and stability, of integer order and fractional order nonlinear non-instantaneous impulsive differential equations (IDEs). We introduce the concept of continuous dependence and stability of solutions to integer order and fractional order non-instantaneous impulsive Cauchy problems (ICPs) and establish sufficient conditions to guarantee that the solutions of both the original and the perturbed non-instantaneous ICPs are close to each other in a certain sense. Finally, examples are given to illustrate our results.

Keywords: Non-instantaneous IDEs, Fractional order, Continuous dependence, Stability.

1. Introduction

Classical instantaneous IDEs are suitable to show some evolution processes in engineering, physics, biology, medical science; see the monographs [1, 2, 3, 4, 5, 6, 7] and the papers [8, 9, 10, 11, 12, 13, 14, 15]. The concept of non-instantaneous IDEs introduced in [16] was motivated from dynamic phenomena for evolution processes of injecting drugs in a person. For recent results in this new area we refer the reader to [17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32].

The paper discuss asymptotic properties of the solutions of the following integer non-instantaneous ICPs:

$$\begin{cases} x'(t) = f(t, x(t)), \quad t \in (s_i, t_{i+1}], \ i \in \{0\} \cup N, \\ x(t_i^+) = g_i(t_i, x(t_i^-)), \quad i \in N, \\ x(t) = g_i(t, x(t_i^-)), \quad t \in (t_i, s_i], \ i \in N, \\ x(0) = x_0, \end{cases} \tag{1}$$

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