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STABILITY IN TERMS OF TWO MEASURES FOR NONLINEAR IMPULSIVE SYSTEMS ON TIME SCALES BY COMPARISON METHOD

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Abstract. This paper studies stability problem in terms of two measures for a class of nonlinear impulsive systems on time scales. By establishing a new comparison result, we derive several stability criteria in terms of two measures for nonlinear impulsive systems on time scales. As applications, nonlinear impulsive control problems of continuous and discrete chaotic systems are discussed. Some less conservative nonlinear impulsive stabilization criteria are obtained where both nonuniform and uniform impulsive intervals are considered. Four examples are discussed to illustrate the effectiveness of our results and the proposed impulsive control schemes.

Keywords: Stability in terms of two measures, impulsive systems, time scales, impulsive control, chaotic systems.

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1 Introduction

The theory of impulsive differential equations has been studied extensively over the past three decades, since it provides a general framework for mathematical modeling of many important dynamic processes. For example, it serves as an adequate mathematical tool to study evolution processes that are subjected to abrupt changes in their states. For more details about the theory of impulsive differential equations, refer to [13,33].

A theory known as time scales calculus has been developing rapidly and gained a lot of attention in recent years [1,7,8]. It was initialed by Stefan Hilger in his PhD thesis [9] in 1988 and has provided a unified framework to study continuous and discrete dynamic systems simultaneously. Due to its two main features of unification and extension, this theory has tremendous potential for application in control theory [16,20,21], economics [3], geometric analysis [32], neural networks [10,24] and so on. For example, it can model the insect populations that are continuous in season and die out in winter, while their eggs are dormant, and then hatch in a new season [7].