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STABILITY ANALYSIS OF A CLASS OF NONLINEAR DISCRETE SYSTEMS WITH IMPULSIVE EFFECTS

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Abstract. This paper investigates stability problems of nonlinear discrete systems with impulsive effects. The impulse is described by a nonlinear function of the state vector x. Employing a Lyapunov functional-based method, sufficient conditions for asymptotical stability of this class of discrete systems are derived. Finally, numerical examples are presented to illustrate the efficiency of our results.

Keywords. impulsive increments, discrete systems, stability analysis, asymptotical stability.

AMS (MOS) subject classification: 37C75,37B25,37N35.

1 Introduction

In recent decades, dynamic systems with impulsive effects (or sometimes called impulsive systems), usually described by impulsive differential equations, have attracted considerable attention since many evolution systems in the real world are characterized by the fact that they suffer abrupt changes of their state. Impulsive systems exist in a great range of disciplines, including chaos control, chaos synchronization, neural networks, circuit systems and biological systems, and so on [1-2]. As stability is an essential problem for impulsive systems, many contributions to stability properties of impulsive systems have been published in recent years, see for instance the books by V. Lak et al. [3] and by T. Yang [4] for more details.

On the other hand, stability analysis of discrete systems is of importance for both theoretical challenges and practical applications. Many results for robust stability of discrete systems have been obtained, see [5]-[8] and the references therein. In addition, for stability problems of impulsive discrete systems, see [8]-[14] and the references therein. However, most of these stability criteria are based on linear impulsive increments rather than nonlinear impulsive increments, which severely limit their results' application range.