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IMPULSIVE SYNCHRONIZATION OF DISCRETE CHAOTIC SYSTEMS BASED ON PARTIAL VARIABLES FEEDBACK

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Abstract. This paper studies the problem of impulsive synchronization of discrete chaotic systems. Several criteria on stability and asymptotic stability of discrete impulsive systems based on partial variables feedback are established. Some impulsive synchronization algorithms are developed for a class of discrete chaotic systems.
Keywords. Impulse, synchronization,Lyapunov function, stability.

1 Introduction

Chaos has many interesting properties, such as deterministic but random-like and complex temporal behavior, high sensitivity to initial conditions, fractal structure, long-term unpredictability and so on. In the past decade, these properties are found to be essential and useful for various engineering applications such as encryption [1], digital communication system [2], human brain study [3], heart beat regulation [4], and network behavior modeling [5], to name just a few.

The problem of synchronization of chaotic systems was analyzed by Yamada and Fujisaka [6] in early times, with subsequent work by Afraimovich, et al.[7] and by Pecora and Carroll [8]. It has been a great deal of interest in this topic since the seminal work of Pecora and Carroll, due to a variety of applications where it is relevant. To date, various techniques have been suggested over a variety of schemes such as Pecora-Carroll method [8],[9],[10],state observer synchronization method [11].

Impulsive control, which is based on the theory of impulsive differential equations, has gained renewed interests recently for controlling chaotic systems. It allows the stabilization of a chaotic system using only small control impulses, even though the chaotic behavior may follow unpredictable patterns (in general, chaotic signals are broadband, noise like, and difficult to