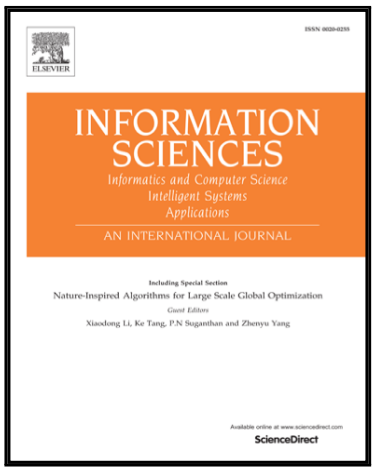

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Stability analysis for discrete time-delay systems based on new finite-sum inequalities

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Abstract

A new finite-sum inequality is derived that includes the discrete Jensen's inequality and the Abel lemma-based finite-sum inequality as special cases. Another new inequality, which needs fewer decision variables than the first one and provides a tighter lower bound than the Abel lemma-based finite-sum inequality, is also given. Applying these new inequalities yields new results on stability analysis for discrete time-delay systems. Two numerical examples demonstrate the effectiveness and superiority of the proposed methods.

Keywords: Discrete-time system; Time-delay system; Stablity; Finite-sum inequality

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1. Introduction

The stability of discrete-time systems has attracted considerable attention from the system and control communities, and many significant results have recently been reported [4,16,22,25,32,33]. A time delay in a system is often a major cause of instability and poor system performance. It frequently occurs in many practical systems, such as networked control systems [5,17,28], genetic regulatory networks [18,19], and power systems [29]. So, the stability analysis of time-delay systems has aroused a great deal of interest, and various approaches

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