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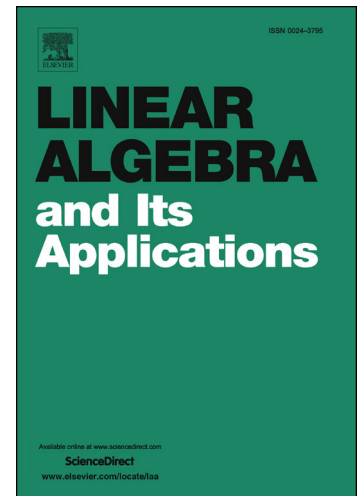
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# Exponential Stability of Time-Varying Linear Discrete Systems

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## Abstract

We are concerned with the stability of non-autonomous linear discrete-time systems. Two necessary and sufficient conditions are derived for exponential stability of time-varying linear discrete-time systems. They show that through a nonsingular state transformation an exponentially stable system can be reduced to a simple one with the coefficient matrix whose spectral norm being less than unity. Furthermore, an estimation of solution of time-varying linear discrete-time system is provided which extends the results in the literature.

**AMS classification** 65F10, 65F15

**Keywords:** varying-time discrete systems, exponential stability, spectral norm of matrix

## 1 Introduction

We are concerned with a non-autonomous linear discrete-time system given by the linear state equation

$$\begin{cases} x(k+1) = A(k)x(k), \\ x(k_0) = x_0 \end{cases} \quad (1)$$

where the  $n \times 1$  vector sequence  $x(k)$  is called the state vector and the  $n \times n$  matrix sequence  $A(k)$  the coefficient matrix. The default assumption on the coefficient matrix  $A(k)$  is that it is a real matrix sequence defined for every integer  $k \in \mathbb{Z}$ .

The continuous analog of discrete system (1) is the following equation

$$\dot{z}(t) = G(t)z(t), \quad (2)$$

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