Dynamics of Continuous, Discrete and Impulsive Systems
Series **A:** *Mathematical Analysis* **8 (2001)** 183-191

SCHUR STABILITY OF SOME INTERVAL MATRICES

Jian Gao[1] and Xiaoxin Liao

Departent of Mathematics
Huazhong University of Science and Technology
Wuhan 430074 P.R. China

Abstract. In this paper, we study the schur stability of some interval matrices. Sufficient and necessary conditions for stability, asymptotically stability and composite stability are given respectively for some classes of discrete interval dynamical systems.

1 Introduction

The modeling of phisical systems is a process which inherently depends on making various approximations. The main motivation for this paper and related work stem from the considerations of "stability of robustness". Stability of continuous interval dynamical systems and delay interval dynamical systems had been investigated by many reseachers, but results of discrete dynamical system are very few.

It is well known that, the spectral radius of a matrix A playes an important role in solving linear algebria equations by iteration method and in studying the stability of a linear discrete dynamical systems.

In this paper, we consider the discrete interval system

$$x(k+1) = Ax(k), \qquad A \in A_I \tag{1}$$

where $x = \text{col}(x_1, x_2, ..., x_n)$, $A = A(a_{ij})_{n\times n}$,

$$A_I = \left\{ \begin{array}{l} A : \underline{A}(\underline{a}_{ij})_{n\times n)} \leq A(a_{ij})_{n\times n} \leq \overline{A}(\overline{a}_{ij})_{n\times n}, \\ i.e, \quad \underline{a}_{ij} \leq a_{ij} \leq \overline{a}_{ij}, \quad \texttt{for} \quad i,j = 1, ..., n \end{array} \right\}$$

We shall study the stability of (1) in the case of that the matrix $A(a_{ij})$ is not known precisely, i.e., we do not know elements of A, but know the values of elements of $\underline{A}$ and $\overline{A}$.

Definition 1. For any $A \in A_I$, if the zero solution of system (1)is asymptotically stable, i.e. $\forall \epsilon > 0, \quad \exists \delta > 0, \|x_0\| < \delta$, implies $\|x(k, 0, x_0)\| < \epsilon$. and $\lim\limits_{k\to\infty} x(k, 0, x_0) = 0$ for $\forall x_0 \in R^n$. then the interval dynamical system (1) is said to be asymptotically stable, this is denoted by $A_I \in AS$; if the zero solution of (1) is unstable, then the interval system (1) is said to be

[1]The author gratefully acknowledges the support of National Natural Science Foundation of China (N0.69974018)