JOURNAL OF INTEGRAL
EQUATIONS AND APPLICATIONS
Volume 1, Number 4, Fall 1988

UNIFORM ASYMPTOTIC STABILITY OF A CLASS OF INTEGRODIFFERENTIAL SYSTEMS

T. KRISZTIN

1. Introduction. Consider the linear Volterra integrodifferential system

$$x'(t) = \mathbf{A}x(t) + \int_0^t \mathbf{B}(t-s)x(s)\,ds \tag{1.1}$$

where $x(t)$ is a vector function with n components and

$$(\mathrm{H}_1) \qquad \begin{aligned} \mathbf{A} &= [a_{ij}] \text{ is a real constant } n \times n \text{ matrix},\\ \mathbf{B}(t) &= [b_{ij}(t)] \text{ is a real } n \times n \text{ matrix}, \ \mathbf{B}(t) \in L^1[0,\infty). \end{aligned}$$

It is known [**9, 13**] that under assumption (H_1) the solution $x = 0$ of (1.1) is uniformly asymptotically stable in the sense of [**13**] if and only if

$$\det[z\mathbf{I} - \mathbf{A} - \mathbf{B}^*(z)] \neq 0 \qquad (\operatorname{Re} z \geq 0), \tag{1.2}$$

where

$$\mathbf{B}^*(z) = \int_0^\infty e^{-zt}\mathbf{B}(t)\,dt$$

is the Laplace transform of $\mathbf{B}(t)$.

If particular $\mathbf{A}$ and $\mathbf{B}(t)$ are given then, in most of the cases, the necessary and sufficient condition (1.2) can be directly verified by using a polar plot (see e.g., [**7, 12**]). In many circumstances the problem of uniform asymptotic stability arises in a different manner. For example, we may be interested in the stability properties of the equilibrium states not only for specific values of the parameters but also for certain region of the parameters, or we would like to maximize a parameter under the condition that the equilibrium state remain asymptotically stable.

Supported in part by the Hungarian National Foundation for Scientific Research with grant number 6032/6319.