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BIBO STABILIZATION OF NEUTRAL SYSTEMS BY LMI APPROACH

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Abstract. This paper considered the problem of bounded-input bounded-output (BIBO) stabilization of a class of neutral systems. Based on Lyapunov-Krasovskii functional, Moon inequality, and linear matrix inequality (LMI) approach, sufficient conditions guaranteeing BIBO stabilization of the given systems are derived in terms of LMIs. Solving the LMIs by means of the Matlab LMI toolbox, a desired controller can be constructed. An illustrative simulation example is provided to demonstrate the effectiveness of the proposed approach.

Keywords: Neutral systems; Lyapunov-Krasovskii functional; Linear matrix inequalities (LMIs); BIBO stabilization.

1 Introduction

Many practical processes can be modeled as general neutral systems, which contain delays in both its states and the derivatives of its states, such as circuit analysis, computer aided design, real-time simulation of mechanical systems, power systems, chemical process simulation, optimal control etc, see, e.g., [1]. Moreover, delay is frequently a source of instability and a source of generation of oscillation in many systems [1]. So, recently, the stability and stabilization analysis of neutral systems have been widely investigated, see, e.g., [1-7] and the references therein.

On the other hand, in practice, it is expected that the control systems can track input signals, so it's of significance to investigate bounded-input bounded-output (BIBO) stability and stabilization of systems[8]. The issues of BIBO stability and stabilization of dynamic systems have been well investigated recently, see, e.g., [8-13] and the references therein. In [9], robust BIBO stabilization of large-scale systems with nonlinearly perturbations in the subsystems was investigated by means of scalar Lyapunov function, matrix Riccati equation and Bihari-type inequality. In [10], Robust BIBO stabilization of linear large-scale systems with nonlinear delay perturbations was concerned. In [11], by employing the Razumikhin technique, several criteria of BIBO stabilization in mean square for nonlinear and quasi-linear stochastic control systems with time-varying delay and time-varying uncertainties were presented. In [12], BIBO Stability of linear switching systems