

DELAY-DEPENDENT STABILIZATION OF UNCERTAIN SINGULAR SYSTEMS WITH MULTIPLE STATE DELAYS

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ABSTRACT. *The problem of delay-dependent robust stabilization for singular systems with multiple state delays is investigated. Firstly, without using any model transformation and bounding technique for cross terms, a delay-dependent stability criterion is given to ensure that the singular system is regular, impulse free and stable. Based on this criterion, the state feedback controller is also given, which guarantees that the resultant closed-loop system is regular, impulse free and stable for all admissible uncertainties. Numerical examples are provided to illustrate the validity of the proposed method.*

Keywords: Delay-dependent, Robust stability, Robust stabilization, Singular systems, Multiple state delays

1. Introduction. During the past few decades, much attention has been paid to the problems of robust stability, robust stabilization and H_∞ control for linear time-delay systems. Most of the results can be classified into delay-independent approaches [1,2] and delay-dependent approaches [3-5]. Generally, delay-dependent approaches are less conservative than the delay-independent ones since the results depend explicitly on time delay.

On the other hand, Singular systems, which are also referred to as descriptor systems, generalized state-space systems or semi-state systems, have been extensively studied in the last few decades since singular systems can describe better practical dynamical systems than standard state-space systems [6]. As is well known, the problem for singular systems is much more complicated than that for standard state-space systems.

The delay-independent case for singular time-delay systems has been considered [7,8] in past years. Recently, the problems of delay-dependent robust stability, robust stabilization and H_∞ control for uncertain discrete singular time-delay systems have been studied [9-11]. For continuous singular time-delay systems, [12-14] gave some results on the problems of delay-dependent robust stability and stabilization, [15-17] discussed the delay-dependent robust H_∞ control problem for singular time-delay systems. It should be pointed out that all the above references [9-17] only deal with the problems for single time-delay singular systems. Fridman [18] discussed the problem of delay-independent/delay-dependent stability for singular systems with multiple discrete and distributed delays, but did not consider the stabilization problem. However, to the best of our knowledge, the problem of robust stabilization for continuous singular systems with multiple time delays