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STABILITY ANALYSIS AND CONTROLLER DESIGN FOR A CLASS OF UNCERTAIN DELAY SYSTEMS BASED ON NETWORK

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Abstract. This paper focuses on the problem of stability analysis and controller design for a class of uncertain delay systems based on networked control system. By introducing some free matrix variables, some criteria for stability analysis and state feedback control law design can be obtained by solving of linear matrix inequality. A numerical example is also offered to prove the effectiveness of the proposed method.

Keywords. Time-delay system, networked control system , robust stabilization , linear matrix inequality, state feedback, uncertain system.

1 Introduction

As is well know, the inherent time delays contained in the dynamical behaviour of many physical process are unavoided.The existence of delays may degrade the performance of the system and induce instability. Hence, stability issues for time delays have been studied recently decades. They can be classified into two categories :delay-dependent and delay-independent.Since delay-dependent criteria make use of information on the length of delay ,they are less conservative than delay-independent ones ,especially when the delay is small. Thus much attention is paid on delay-dependent stability conditions[5],[6],[14],[15].

On the other hand, in modern complicated control system, devices are spatially distributed over a certain area. Hence a traditional centralized point-to-point control system is no longer suitable to meet new requirements such as decentralization of control , remote intelligent diagnostics and so on. In order to solve the problems, a new kind of control architectures with common serial communication networks or a field bus are employed to exchange information and control signals between spatially distributed system components ,like sensors, controllers, actuators ,supervisory computers, and so on. When a system is closed via the serial communication channel,we called it a networked control system(NCS). Compared with the traditional control system,