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MODELING AND STABILIZATION OF MIMO NETWORKED CONTROL SYSTEMS WITH NETWORK CONSTRAINTS

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Abstract. *This paper is concerned with the stability analysis and controller design for a class of MIMO networked control systems (NCSs) with network constraints. In view of MIMO NCSs where network is of limited access channels, a discrete-time switched delay model is formulated. By constructing a novel piecewise Lyapunov-Krasovskii functional, a new stability criterion is developed in terms of linear matrix inequalities. On the basis of the obtained stability condition, a static output feedback controller is designed by applying an iterative algorithm. A numerical example is given to show the effectiveness of the proposed method.*

Keywords: Networked control systems, Switched delay system, Piecewise Lyapunov functional, Static output feedback control

1. **Introduction.** In recent years, networked control systems (NCSs) have received much attention due to many practical advantages such as reduced wiring and power requirements, ease of system diagnosis and maintenance, and flexibility of operations [1, 2, 3]. However it is well known that the inserted network also makes analysis and design of NCSs more complex.

Networked-induced delay and data dropout are two main issues in NCSs. Various kinds of control methodologies for dealing with these two issues have been proposed. For example, based on remote control and local control strategy, a class of hybrid multi-rate control models with uncertainties and multiple time-varying delays was formulated in [4, 5], and their robust stability properties were also investigated. Closed-loop NCSs have been modeled as systems with time-varying delay [6, 7] and the design problems of state feedback controller [7] were obtained by solving a set of linear matrix inequalities. The problem of stabilization of NCSs with packet dropout was studied in [8], and time-varying optimal control with packet dropout was studied in [9]. Special cases where systems occasionally have extreme large delays or intermittent controller failures were discussed in [10, 11]. A networked predictive control method [12, 13] was proposed to compensate the network-induced delay. Other methodologies can also be found in [14, 15, 16, 17, 18] and references therein.