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QUANTIZED STATIC OUTPUT FEEDBACK STABILIZATION OF DISCRETE-TIME NETWORKED CONTROL SYSTEMS

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Abstract. *This paper is concerned with the static output feedback (SOF) stabilization for discrete-time networked control systems (NCSs) with input and output signals quantization. A novel model of the systems is proposed by a sector bounded approach where the internal effects of network induced delay and signals quantization are considered. By using Lyapunov functional approach, together with introducing relaxation variables technique, sufficient conditions for quantized SOF stabilizing controller design are given. Since the obtained conditions are not expressed strictly in term of linear matrix inequalities (LMIs), the quantized SOF controller is solved by using modified cone complementary linearization (CCL) algorithm. In addition, the obtained conditions of stability analysis and SOF stabilization for discrete-time NCSs in absence of quantization are proved to be less conservative than some existing results. Numerical examples are also presented to illustrate the applicability of the developed method.*

Keywords: Networked control systems, Static output feedback, Quantization, Stabilization

1. **Introduction.** The network-induced delay in NCSs occurs when sensors, actuators and controllers exchange data across the network. The network-induced delay in NCSs can degrade the performance of network and can even destabilize the system. For discrete-time systems with time-delay, which have strong background in engineering applications, but only limited effort has been made towards investigating them. The delay-dependent stability problem for discrete-time systems has been studied in [1,9,16,17,24]. It should be pointed out that these approaches may lead to more or less conservativeness, and there is still room for improvement. For example, the Lyapunov functionals considered in these references are more restrictive due to the ignorance of some terms. [17,18] ignored $\sum\limits_{i=k-dm}^{k-1} x(i)^T Q_3 x(i)$ and [2] ignored $\sum\limits_{i=-d_m}^{-1} \sum\limits_{m=k+i}^{k-1} \eta^T(m) U_3 \eta(m)$. The ignorance of these terms may lead to considerable conservativeness. [27] also brought some conservativeness by using Jessen inequality approach.

There is another important issue in NCSs, that is the quantization effect, which has significant impact on the performance of NCSs. In fact, when measurements to be used for feedback are transmitted by a digital communication channel, data is quantized before transmission. Therefore, to achieve better performance of the considered systems, the effect of data quantization on the network should be taken into consideration. For