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H_∞ TRACKING CONTROL FOR NCS WITH PACKET LOSSES IN MULTIPLE CHANNELS CASE

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Abstract. *This paper studies the model reference H_∞ tracking control problem of networked control systems (NCSs) with random packet dropout in both sensor-to-controller channels and controller-to-actuator channels. A general packet dropout model in multiple channels case is adopted to formulate the information missing in the communication networks. The multiple channels packet dropout model results in new complexities and difficulties in the H_∞ tracking controller design. A latest received data dependent Lyapunov function is proposed and exploited to develop a sufficient condition for the H_∞ tracking controller design in terms of a linear matrix inequality (LMI). The proposed controller design method can guarantee the asymptotic tracking of the prescribed reference outputs while rejecting disturbances in mean square sense. A numerical example is given to illustrate the effectiveness of the proposed H_∞ tracking controller design method.*
Keywords: Networked control systems, H_∞ tracking, Multiple channels dropouts, Random packet dropout, LMI

1. **Introduction.** It is well known that networked control systems (NCSs) are control systems in which the actuators, sensors and the controllers are spatially distributed and communicated through a shared band-limited communication network. Due to the benefits of a communication network, such as the scalability, flexibility and cost effectiveness, as apposed to dedicated point-to-point wiring, more and more attention has been paid to NCSs in recent years [1-12]. However, the insertion of the communication channels results in discrepancies between the data information to be transmitted and their associated remotely transmitted images, and thus the analysis and design are more complex and challenging than before.

Particularly, random transmission delays and packet dropouts are unavoidable in the data transmission through unreliable communication channels. And due to the random nature, the classical control and estimation methods cannot be adopted directly in NCSs. In the past few years, many works have come forth on the stochastic parameter systems [1-7] and references therein. Specifically, the problem of NCSs with random delays has been studied in [1-3]. And the problem of the networked control and estimation systems with random packet dropout has been considered in [4, 5] and so on. However, in all the above work, a single channel with one random variable system has been considered. It means that all of the sensor information or controller command information passes through a single channel and entirely loses or not at the same time. The latest work [6] presents a