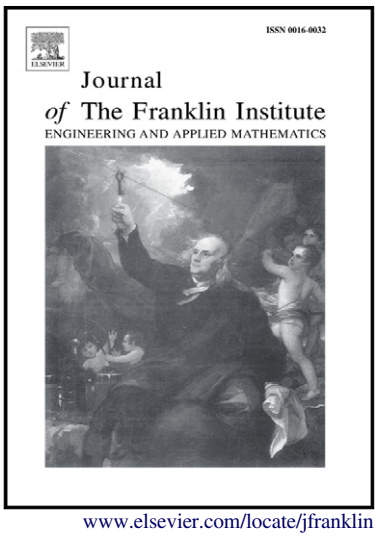

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LQG control for networked control systems over packet drop links without packet acknowledgment☆

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Abstract

In this paper, we are concerned with the linear quadratic Gaussian (LQG) problem for systems with packet losses but without acknowledgment (ACK) signals to inform the estimator the status of control packet losses. Such system is usually called the user datagram protocol (UDP)-like system. The LQG problem for the UDP-like systems is usually studied under an assumption that the system state is estimated by a suboptimal linear estimator. It is well-known that the resulting optimal control law is not only nonlinear in the system state but also difficult to compute. To deal with such issue, we propose an efficient suboptimal estimator, and then based on it we study the LQG problem for the UDP-like systems. We show that (i) for the finite horizon case, the resulting optimal control law can be recursively computed and is linear in the estimates; (ii) for the infinite horizon case, under some conditions the optimal control law exists and the close-loop system is mean square stable.

Keywords: LQG control, networked control systems, packet loss, UDP

1. Introduction

Recently a increasing attention has been focused on the networked control systems (NCSs) in which the information among sensors, controllers, and actuators is exchanged

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