

Average Flow Constraints and Stabilizability in Uncertain Production-Distribution Systems

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Abstract We consider a multi-inventory system with controlled flows and uncertain demands (disturbances) bounded within assigned compact sets. The system is modelled as a first-order one integrating the discrepancy between controlled flows and demands at different sites/nodes. Thus, the buffer levels at the nodes represent the system state. Given a long-term average demand, we are interested in a control strategy that satisfies just one of two requirements: (i) meeting any possible demand at each time (worst case stability) or (ii) achieving a predefined flow in the average (average flow constraints). Necessary and sufficient conditions for the achievement of both goals have been proposed by the authors. In this paper, we face the case in which these conditions are not satisfied. We show that, if we ignore the requirement on worst case stability, we can find a control strategy driving the expected value of the state to zero. On the contrary, if we ignore the average flow constraints, we can find a control strategy that satisfies worst case stability while optimizing any linear cost on the average control. In the latter case, we provide a tight bound for the cost.

Keywords Inventory control · Robust control · Stochastic stability

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