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IMPULSIVE DISSIPATIVE CONTROL OF LINEAR DISCRETE-TIME SYSTEMS

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Abstract. This paper focuses on the problem of impulsive quadratic dissipative control for linear discrete-time systems. We consider the design of impulsive controller to achieve quadratic dissipativeness. Sufficient conditions for dissipativeness of linear discrete-time systems with impulsive control are obtained. Criteria for the impulsive controller are established by LMIs. Some numerical examples are given to illustrate the main results.

keyword: Impulsive control, Discrete-time systems, Quadratic dissipativeness

1 Introduction

The notion of dissipativeness for continuous-time systems was first introduced by Willems in [1]. Dissipativeness can be seen in electrical networks, viscoelastic systems, thermodynamic systems and etc. The theory of dissipativeness itself generalizes some basic control tools including the passivity theorem, bounded real lemma, Kalman-Yakubovich lemma and the circle criterion, see [2] and references therein. Thus, in the past forty years, there are considerable interest in dissipativeness and dissipative control for continuous-time systems, see [3, 4, 5, 6, 7, 8] and references therein.

Byrnes extended the definition of dissipativeness to discrete-time systems in [9]. Tan extended the results in [10] for the discrete-time systems and focused on a quadratic form of dissipativeness, i.e. (Q, S, R)-dissipativeness in [2] and designed the feedback controller derived from some LMIs. Shao studied robust quadratic dissipativeness and dissipative control for discrete-time systems in [11].

Haddad extended the definition of dissipativeness to impulsive systems and studied dissipativeness of nonlinear impulsive systems in [6]. Impulsive systems form an important class of hybrid systems, and impulsive control has proved to be an efficient control tool in many control problems, see [12, 13,