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AN OPTIMIZATION APPROACH FOR STABILIZING LINEAR IMPULSIVE SYSTEMS

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Abstract. This paper researches the stabilization and robust stabilization issues for a class of linear impulsive systems. An optimization approach is proposed for the first time to solve the stabilization problem for this class of linear impulsive systems. The design of the state feedback is reduced to an optimization problem on a feasible set described by linear matrix inequalities (LMIs).

Keywords. Linear impulsive systems; Stabilization; Optimization
AMS (MOS) subject classification: 34A37, 93D15

1 Introduction

Impulsive behaviors can be found in many fields such as medicine, biology, and economics [9]. In order to describe the phenomena, impulsive differential equations (impulsive systems) were introduced in [9]. The theory of impulsive differential equations is very rich including finite and infinite dimensional systems[6][13]. But the results on control theory of impulsive systems are not much. For ordinary differential equations, impulsive control was used for control purpose [11][12]. Controllability and observability of linear impulsive systems were researched [1][3][4][10]. Guan *et. al.* researched H_∞ control problem for linear impulsive systems and reduced the problem to algebraic Riccati equations [5]. In [5], the stabilization problem was also considered. But the results on stabilization problem of impulsive systems are still not much and the stabilization for impulsive systems with structure uncertainty is not yet researched. Linear matrix inequalities and optimization approach have been used to design controller for many years and have been payed great attention in control field in due to convenience for computation [8][2].

In this paper, we proposes an optimization approach for stabilizing impulsive systems and robustly stabilizing uncertain impulsive systems. The feasible sets of the optimization problems are described by LMIs. This paper is organized as follows. Section 2 are preliminaries and statements of the problems. In section 3, we research the (robust) stabilization of (uncertain) linear impulsive systems. Section 4 is conclusion.

Notations: Denote by R^n the n-dimensional real space. R_+ denotes the interval $[0, +\infty)$. The superscript T denotes transpose. $P > 0 (\geq 0)$ means