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ROBUST RELIABLE CONTROL FOR UNCERTAIN IMPULSIVE LARGE-SCALE SYSTEMS

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Abstract. This paper addresses the problem of designing a robust reliable decentralized control for impulsive large scale systems (ILSS) with admissible uncertainties in the system states. Then, reliable observers are also considered to estimate the states of the above systems. The faulty actuator/sensor outputs are assumed to be zero. The reliability analysis is achieved by using a scalar Lyapunov function. Some numerical examples are introduced to illustrate the validity of the theoretical results.

Keywords. Large Scale systems, impulsive effects, Lyapunov functions, Luenberger observer, reliable control.

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1 Introduction

Many dynamical processes experience some abrupt changes in the state at certain moments during the continuous evolution. These changes can be reasonably approximated as impulses, and the corresponding systems are called *impulsive systems*, a special type of hybrid systems that is a combination of continuous and discrete evolutionary processes. Due to their significant applications, impulsive systems have attracted much attention in the past three decades; see for example [2, 3, 4, 5, 6, 10, 12, 13, 15, 18] and many references therein.

In practice, transforming physical phenomena into mathematical models often includes uncertain factors due to modelling mismatches, linearization, approximations or measurement errors, etc. It has been realized that considering such uncertainties results in more accurate systems; see for instance [1, 7, 8, 9, 14].

Reliable control means a control system that tolerates failures in its components. In reality, such failures are unavoidable, and in some critical situations such as in the case of aerospace vehicles or submarine systems, etc, the risk of failure may become fatal where the immediate repair is impossible. Consequently, designing a reliable controller that is robust to some failure