

OBSERVER BASED MODEL REFERENCE OUTPUT FEEDBACK TRACKING CONTROL FOR SWITCHED LINEAR SYSTEMS WITH TIME DELAY: CONSTANT DELAY CASE

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ABSTRACT. Observer-based model reference output feedback tracking control design for switched linear systems with time delay is investigated in this paper. The possibility of designing switching control law based on measured output is considered when the states are not available. Multiple Lyapunov function method is utilized to the stability analysis and controller design and the Variation-of-constants formula is used to conquer the difficulties caused by the estimation error and exotic disturbance. By using linear matrix inequalities techniques, the controller design problem can be solved efficiently. The numerical example shows the effectiveness of the switching control laws.

Keywords: Switched delay systems, Variation-of-constants formula, Observer-based tracking control

1. **Introduction.** During the last decade, due to the significance both in theory development and practical applications, switched systems have been attracting considerable attention in control and computer community [5, 12, 17, 25]. Meanwhile, switching control offers a new technique to the stability analysis and control synthesis for complex control systems. Examples of the applications using switched systems theory include modeling of networked control systems (NCS) [24], wind turbine regulation [8], and PWM-Driven Boost converter [19], etc. Among a wide variety of problems encountered in theory and practice of switched systems, how to find less-conservative conditions to guarantee the stability of switched systems under certain switching law is one of the most hot topics. Construction of multiple Lyapunov function can be seen a breakthrough regarding this issue, where an individual decrescent Lyapunov function is designed for each subsystem [1, 5, 23]. Generally speaking, as far as the essential discontinuousness of the switched systems is concerned, construction of individual Lyapunov function for each subsystem is less conservative than that of construction of a common Lyapunov function for the switched system.

On another research front, as an important class of systems, time-delay systems are ubiquitous in chemical process, aerodynamics, and communication network (see, e.g.,