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RESILIENT OBSERVER-BASED CONTROL OF UNCERTAIN TIME-DELAY SYSTEMS

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Abstract. *The problem of designing a resilient observer-based dynamic feedback controller for a class of uncertain systems with time-varying delays against controller perturbations is investigated. The uncertainties are parametric and norm-bounded. The objective is to derive tractable synthesis conditions for the resilient dynamic feedback design. All the developed results are cast in the format of linear matrix inequalities (LMIs). Previous related results are recovered. A simulation example is presented.*
Key Words: Resilient control, Time-delay systems, Norm-bounded uncertainties, Observer-based control, LMIs

1. **Introduction.** It becomes increasingly apparent that delays occur in physical and man-made systems due to various reasons including finite capabilities of information processing among different parts of the system, inherent phenomena like mass transport flow and recycling and/or by product of computational delays [2, 3, 15, 21, 22, 23, 24]. Considerable discussions on delays and their stabilization/destabilization effects in control systems have commanded the interests of numerous investigators in recent years, see [11] and the references therein. Existing stabilization methods include, but not limited to, $\mathcal{H}_\infty$ and guaranteed cost control using feedback control techniques. On another research front, an integral part of robust control system design methods has been based on using a fixed quadratic Lyapunov function in order to guarantee robust stability [6]. An implicit assumption inherent in these design methods is that the controller will be implemented exactly. In the presence of uncertain parameters, it is often desirable to perform the control system design not only to ensure stability but also to guarantee an adequate level