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A New Approach to Decentralized Adaptive Output Feedback Controller Design for Mismatched Uncertain Large-scale Systems Using Linear Matrix Inequalities

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ABSTRACT

In this study, an adaptive sliding-mode controller was designed for use in a class of large-scale systems that exhibit mismatched uncertainties and exogenous disturbances. First, a new sliding mode controller was proposed using only output variables. Adaptation laws were developed for calculating the unknown upper bounds of mismatched uncertainties; these updated values were used to establish a class of decentralized adaptive output feedback controllers. Both sliding surfaces and adaptive sliding-mode controllers can be easily attained using a linear matrix inequality technique. Moreover, a stability analysis was conducted to assess the overall system. Finally, a numerical example was used to demonstrate the efficacy of the proposed method.

Key Words: large-scale systems, decentralized adaptive controller, linear matrix inequalities (LMI), sliding mode control (SMC).

以線性矩陣不等式理論設計非匹配不確定大型系統之分散式自適應輸出回授控制器

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摘　要

本文對於具有非匹配不確定成分和外部擾動的大型系統，設計其自適應滑動模式控制器，新的自適應動態滑動模式控制器僅僅使用輸出變數。本文提供一個自適應法則來計算非匹配不確定成分的未知上界，並使用更新值來完成此種分散式自適應輸出回授控制器的設計。另外，通過使用線性矩陣不等式（LMI）以及凸集最佳化技術，滑動平面和自適應滑動模式控制器得以容易實現。此外，本文也完成整個系統的穩定性分析。最後，一個數值例子用來證明本方法的正確有效。

關鍵詞：大型系統，分散自適應控制，線性矩陣不等式，滑動模式控制。