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Coprime factors reduction of distributed nonstationary LPV systems. (English)

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Summary: This paper is on the coprime factors reduction of distributed systems formed by discrete-time, heterogeneous, nonstationary linear parameter-varying subsystems. The subsystems are represented in a linear fractional transformation framework and interconnected over arbitrary directed graphs, and the communication between the subsystems is subjected to a delay of one time-step. Two methods for constructing a contractive coprime factorisation for the full-order system are proposed. This factorisation forms an augmented system which is reducible by the structure-preserving balanced truncation method. A reduced-order contractive coprime factorisation is obtained from which the reduced-order system can be formed. A robustness theorem is also provided to interpret the error bound from coprime factors reduction in terms of robust stability of the closed-loop system. A numerical example is considered at the end of the paper.

MSC:

93B11 System structure simplification

93D09 Robust stability

93B28 Operator-theoretic methods

Keywords:

structure-preserving model reduction; balanced truncation; coprime factors reduction; interconnected linear parameter-varying systems; contractive coprime factorisations; robust stability analysis

Software:

SDPT3; YALMIP

Full Text: DOI

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