Frequency-Weighted Discrete-Time LPV Model Reduction Using Structurally Balanced Truncation

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Abstract:

This paper proposes a method for frequency weighted discrete-time linear parameter-varying (LPV) model reduction with bounded rate of parameter variation, using structurally balanced truncation with a priori (nontight) upper error bounds for each fixed parameter. For systems with both input and output weighting filters, guaranteed stability of the reduced-order model is proved as well as the existence of solutions, provided that the full-order model is stable. A technique based on cone complementarity linearization is proposed to solve the associated linear matrix inequality (LMI) problem. Application to the model of a gantry robot illustrates the effectiveness of the approach. Moreover, a method is proposed to make the reduced order model suitable for practical LPV controller synthesis.

Keywords:

cone complementarity problem, Discrete-Time LPV System gantry robots, LMI, Structurally balanced Truncation

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