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Matrix Integral Equations Arising in Parametric Model Order Reduction

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We consider $\mathcal{H}_2 \otimes \mathcal{L}_2$ -optimal model order reduction of parametric linear time-invariant dynamical systems, where coupled matrix integral equations arise in the first-order necessary conditions (FONC). The quality of the reduced-order model is measured using the \mathcal{H}_2 norm for the parametric system, which is averaged in the \mathcal{L}_2 -norm over the parameter domain.

We motivate the FONC and aim to satisfy them using an optimization-based approach that involves solving sequences of small-scale Lyapunov equations and tall and skinny Sylvester equations.

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