Identification of MIMO State Space Model in Delta-form

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An efficient method for identification of MIMO state space model in delta-form has been developed by combining partial least squares (PLS) regression, balanced realization, and balanced truncation. In the developed method, a MIMO system is decomposed into multiple SISO systems each of which is represented by a high-order ARX model and the parameters of the ARX models are estimated by PLS. Then, SISO state space models for respective SISO ARX transfer function are found through realization and combined to a MIMO state space model. Finally, a minimal balanced MIMO state space model is obtained through balanced realization and truncation. The proposed method was applied to the design of LQG control for temperature control of rapid thermal processing equipment.