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Linear system identification using proper orthogonal decomposition

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Abstract

A least-square-based method to identify the system matrices of linear dynamical systems is proposed. The primary focus is on the identification of a reduced order model of the discretized system model. Proper Orthogonal Decomposition (POD) is used for the model reduction. The inverse problem involving the identification of the system matrices is posed in the framework of a linear least-square estimation problem. To achieve this objective, Kronecker Algebra is aptly exploited for a concise mathematical formulation to identify these matrices. Tikhonov regularisation is used to satisfy the symmetry property of the system matrices. The application of the proposed methodology is demonstrated using an example of a discrete linear dynamical system in both low and mid-frequency regimes. The robustness of the new methodology is investigated using a noise sensitivity study.