

Generalized Bilinear System Identification with Coupling Force Variables

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Abstract: A novel method is presented for identification of a generalized bilinear system with nonlinear terms consisting of the product of the state vector and the coupling force variables. The identification process requires a set of pulse response experiments from various pulse duration and input values for coupling force variables, indicating that the process requires experiments with multiple inputs rather than one single input at a time. Regardless of the nonlinear complexity, the identification of the generalized bilinear system can be decomposed into two linear identification problems. The decomposition method is an extended version of the work developed for identification of classical continuous-time bilinear systems. The first linear identification problem determines the state matrix, the output matrix, and the direct transmission matrix. The second identification problem computes the input matrix and coefficient matrices of nonlinear coupling terms. The resulting identified system matrices represent the input-output map of the generalized bilinear system. A simple example is given to illustrate the concept of the identification method.

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