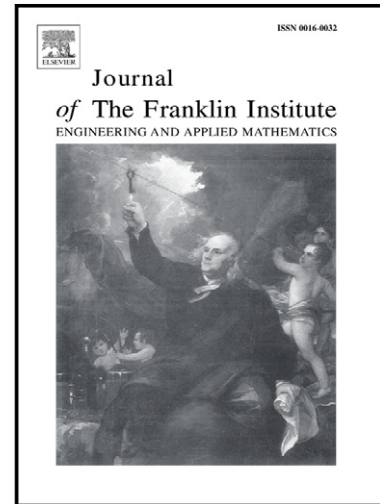


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# Consistency of the robust recursive Hammerstein model identification algorithm

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**Abstract.** In this paper, it is proposed a robust recursive algorithm for identification of a Hammerstein model with a static nonlinear block in polynomial form and a linear block described by ARMAX model. It is assumed that there is a priori information about a distribution class to which a disturbance belongs. Such assumption introduces a nonlinear transformation of the prediction error in the recursive algorithm. The obtained algorithm is robust in relation to the uncertainty of the disturbance distribution. By using the stochastic Lyapunov function and the martingale theory a strong consistency of estimated parameters is proved under generalized strict real positivity conditions, based on the theory of passive operators and the weakest possible excitation. The practical behavior of the robust algorithm is illustrated by simulations..

**Keyword** *Hammerstein model. Non-Gaussian disturbance. Robust identification. Strong consistency*

## 1. Introduction

Nonlinear models play an important role in many science areas that have developed their own approach for identification techniques [1]. As a result, many methods and concepts, whose roots are in different areas (control, mathematical statistics, machine learning, pattern recognition), are developed.

In this paper block-oriented nonlinear models are considered [2-3]. The identification of such models has been an area of active research over five decades [4]. Block - oriented nonlinear models consist of a static nonlinear element coupled in series with a linear time - invariant dynamic system. An example of such nonlinear model is a Hammerstein model. Existing identification methods of Hammerstein models can be roughly divided into parametric and nonparametric











































