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OUTLIER ROBUST IDENTIFICATION OF THE THERMAL POWER PLANT: COMBUSTION CONTROL AND VIBRATORY TRANSPORT

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Abstract

The goal of this paper is to contribute to environmental improvement. This goal has been achieved by the development of an algorithm that allows the optimization of fuel consumption and transport of combustion products. The paper considers the outlier – robust recursive algorithm. This algorithm is used for identification of multivariable ARMAX (Autoregressive Moving Average with Exogenous Variables) models. In this paper, we introduce pseudo-Huber loss function which is a continuous nonlinear approximation of Huber loss function and which has derivatives of all degrees. The structure of the recursive algorithm is: the relation for parameter estimation is based on Huber function and the relation for matrix gain is based on pseudo-Huber function. The novelty of this work is a new robust algorithm for recursive identification of MIMO ARMAX models. The main contributions of the paper are: (i) the new form of the extended least squares algorithm based on mixed Huber and pseudo-Huber functions; (ii) approximation of the second derivative of pseudo-Huber loss function and exact determination of matrix gain of the algorithm using the Laplace function. A special case of the algorithm, in this paper, is standard linear extended least squares algorithm. The results can be extended to an area of adaptive control, prediction, and filtering. They are suitable for practical processes such as thermal processes, vibration transport of bulk materials and other processes with multiple input variables. Practical behaviour of robust recursive procedure is illustrated by simulations.

Key words: Huber function, recursive identification, thermal power plant, vibratory conveyor

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