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IDENTIFICATION OF ERRORS-IN-VARIABLES MODEL VIA BIAS-COMPENSATED INSTRUMENTAL VARIABLES TYPE METHOD

Masato Ikenoue[1], Shunshoku Kanae[2], Zi-Jiang Yang[2]
and Kiyoshi Wada[2]

[1]Department of Electrical Engineering
Ariake National College of Technology
150, Higashihagio-machi, Omuta, Fukuoka 836-8585, Japan
ikenoue@ariake-nct.ac.jp

[2]Department of Electrical and Electronic Systems Engineering
Kyushu University
744, Motooka, Nishi-ku, Fukuoka 819-0395, Japan
{ jin; yoh; wada }@ees.kyushu-u.ac.jp

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Abstract. *It is well known that least-squares (LS) method gives biased parameter estimates when the input and output measurements are corrupted by white noises. One possible approach for solving this bias problem is the bias-compensation based method such as the bias-compensated least-squares (BCLS) method. In this paper, a new bias-compensation based method is proposed for identification of noisy input-output system. The proposed method is based on compensation of asymptotic bias on the instrumental variables type (IV-type) estimates by making use of noise variances estimates. In order to obtain the noise variances estimates, an overdetermined system of equations is introduced, and the noise variances estimation algorithm is derived by solving this overdetermined system of equations. From the combination of the parameter estimation algorithm and the noise variances estimation algorithm, the proposed bias-compensated instrumental variables type (BCIV-type) method can be established. The results of a simulated example indicate that the proposed algorithm provides good estimates.*
Keywords: Identification, Estimation, Errors-in-variables model

1. **Introduction.** Recently, consistent estimation methods for identification of linear discrete-time system in the presence of input and output noises, which are usually called "errors-in-variables" (EIV) model, have received much attention because of their important applications in signal processing, communications and control systems.

Several methods have been proposed to estimate unknown parameters of EIV model. Joint Output (JO) method [1] and Koopmans-Levin (KL) method [2] require *a priori* knowledge about the values of variances or the ratio to measurement noises.

Bias-compensated least-squares (BCLS) method is proposed by Sagara et al. [3] and it has been extended by Wada et al. [4] to the input-output noise case without any *a priori* knowledge of noise variances. BCLS method based on compensation of asymptotic bias on the least-squares (LS) estimates by making use of noise variances estimates is very efficient method for estimation of noisy input-output system parameters. In recent years, BCLS method has been developed to improve the estimation accuracy and several recursive algorithms have been proposed [5, 6, 7].