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ON BIAS-COMPENSATED LEAST-SQUARES ALGORITHM VIA PREFILTERING

Masato Ikenoue

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

Shunshoku Kanae, Zi-Jiang Yang and Kiyoshi Wada

Department of Electrical and Electronic Systems Engineering
Kyushu University
6-10-1, Hakozaki, Higashi-ku, Fukuoka 812-8581, Japan
{jin, yoh, wada} @ees.kyushu-u.ac.jp

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Abstract. *In this paper, two bias-compensated least-squares (BCLS) algorithms (BCLS-α algorithm and BCLS-β algorithm) are proposed for identification of linear discrete-time system in the case where the input measurement is corrupted by white noise and the output measurement is corrupted by colored noise. It is well known that BCLS method is based on compensation of asymptotic bias on the least-squares (LS) estimate by making use of noise variances estimates. The main feature of proposed algorithms is to introduce an auxiliary multivariate estimator using prefiltered data in order to estimate input noise variance and output noise covariances. Some simulation results indicate that the proposed methods provide good estimates.*
Keywords: System identification, Estimation, Least-squares method

1. **Introduction.** Many identification methods are based on the assumption that the input measurement is noise-free. However, this condition is not satisfied in most practical situations. For instance, the noise may be introduced to the system input by the sensor itself or by the ambient environment, which cannot always be ignored. In the presence of input noise, those methods have been shown to give erroneous results. Several methods have been proposed to estimate unknown parameters of linear discrete-time system in the presence of input and output noise. Joint Output (JO) method [6] 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 and Wada [5] and it has been extended by Wada *et al.* [7] 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) estimate by making use of noise variances estimates can give consistent estimates for unknown parameters of linear discrete-time system in the presence of input and output noises. In recent years, BCLS method has been developed to improve the estimation accuracy and several algorithms have been further proposed