Variance Analysis of Subspace Identification Methods
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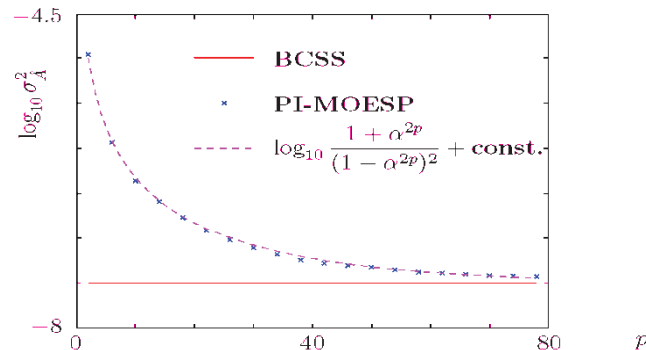Faculty of Engineering
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Fig.1 Mean squared error (MSE) vs $f = p$.

Fig.2 Comparison of BCSS(Bias Compensated State Space Model Identification Method and PI-MOESP method (when f is fixed to 2)

Content:

 Control engineering is a highly developed fundamental discipline of the engineering, in which systematic design methods of control systems are developed based on the optimization by using mathematical models of the plant. System identification is one of the control engineering fields which estimates the plant model systematically from the input/output data of the plant. Subspace identification is a comparatively new method and has attracted attention from the middle of the 1990s. However, we have to say its analysis on the mathematical characteristics such as the variance of the estimate is not sufficient.

 We have proposed a variance analysis method which enables a comparison of some subspace identification methods, analysis on the relation between the design parameters and the variance, etc.

In the subspace identification methods, singular value decomposition(SVD) of a matrix is utilized and it makes difficult to analyze the perturbations on the estimates. In this research, instead of analyzing the perturbations on the singular vectors, analysis of the perturbation on the singular subspace is adopted and this makes it easy to analyze the variance of the estimates.