Gradient iterative algorithm for rational models based on Gram-Schmidt orthogonalization method

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Research Article

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Abstract

An improved gradient iterative algorithm, termed as Gram-Schmidt orthogonalization based gradient iterative algorithm, is proposed for rational models in this paper. The algorithm can obtain the optimal parameter estimates in one iteration for the reason that the information vectors obtained by using the Gram-Schmidt orthogonalization method are independent of each other. Compared to the least squares algorithm and the traditional gradient iterative algorithm, the proposed algorithm does not require the matrix inversion and eigenvalue calculation, thus it can be applied to nonlinear systems with complex structures or large-scale systems. Since the information vector of the rational models contains the latest output that is correlated with the noise, a biased compensation Gram-Schmidt orthogonalization based gradient iterative algorithm is introduced, by which the unbiased parameter estimates can be obtained. Two simulated examples are applied to demonstrate the efficiency of the proposed algorithm.

Full Text

Due to technical limitations, full-text HTML conversion of this manuscript could not be completed. However, the manuscript can be downloaded and accessed as a PDF.

Figures

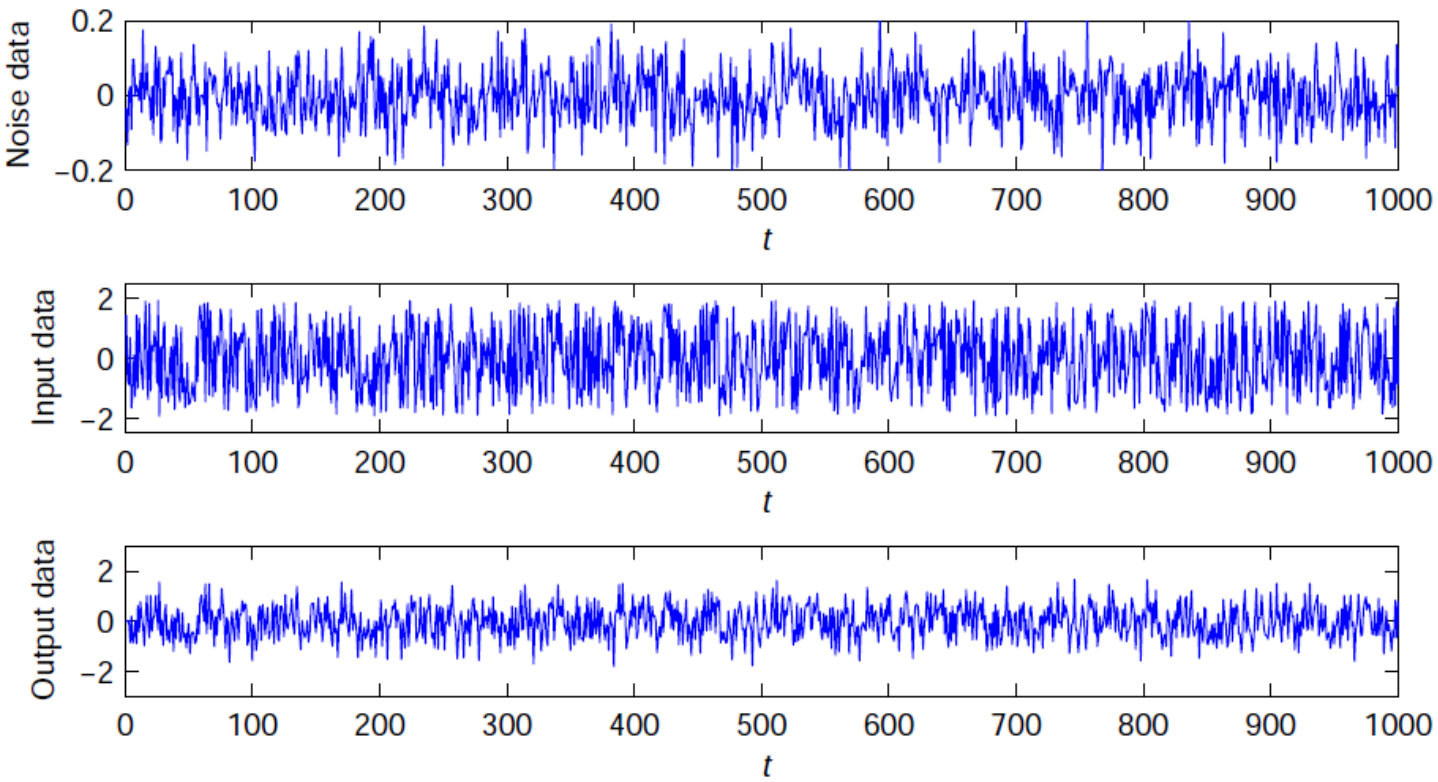

Figure 1

The simulation data

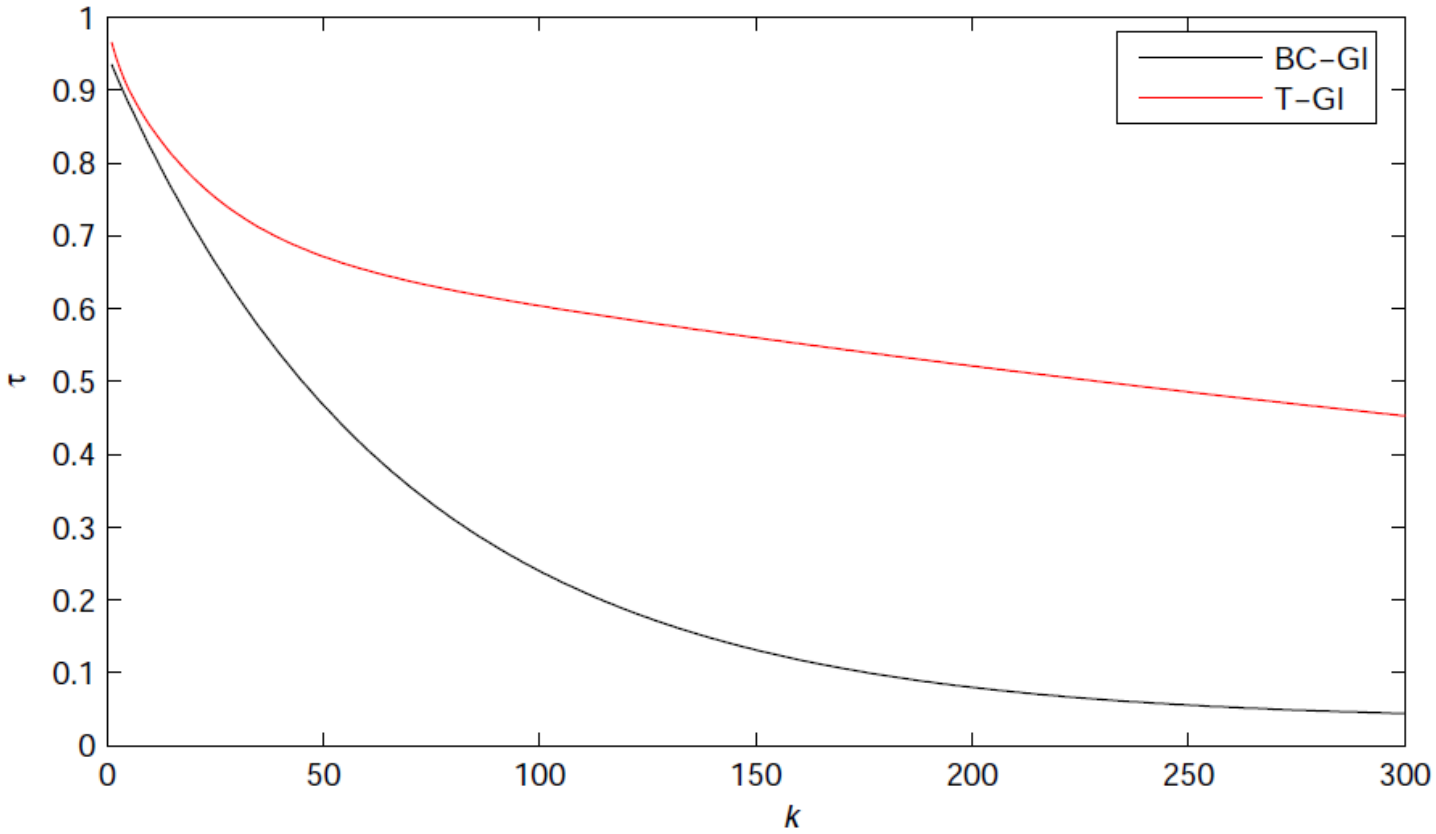

Figure 2

The parameter estimation errors versus k

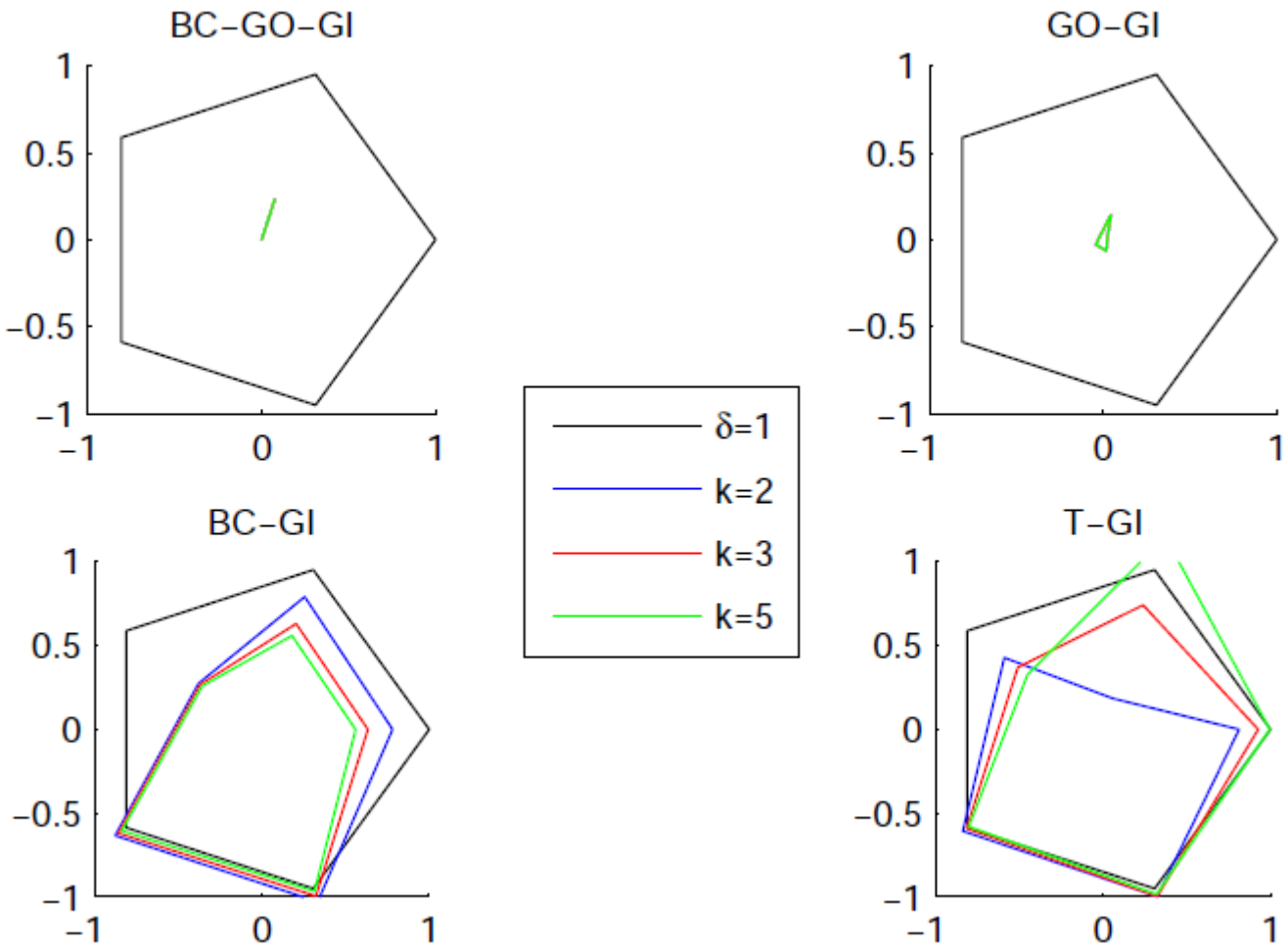

Figure 3

The relative errors of each element in the parameter vector

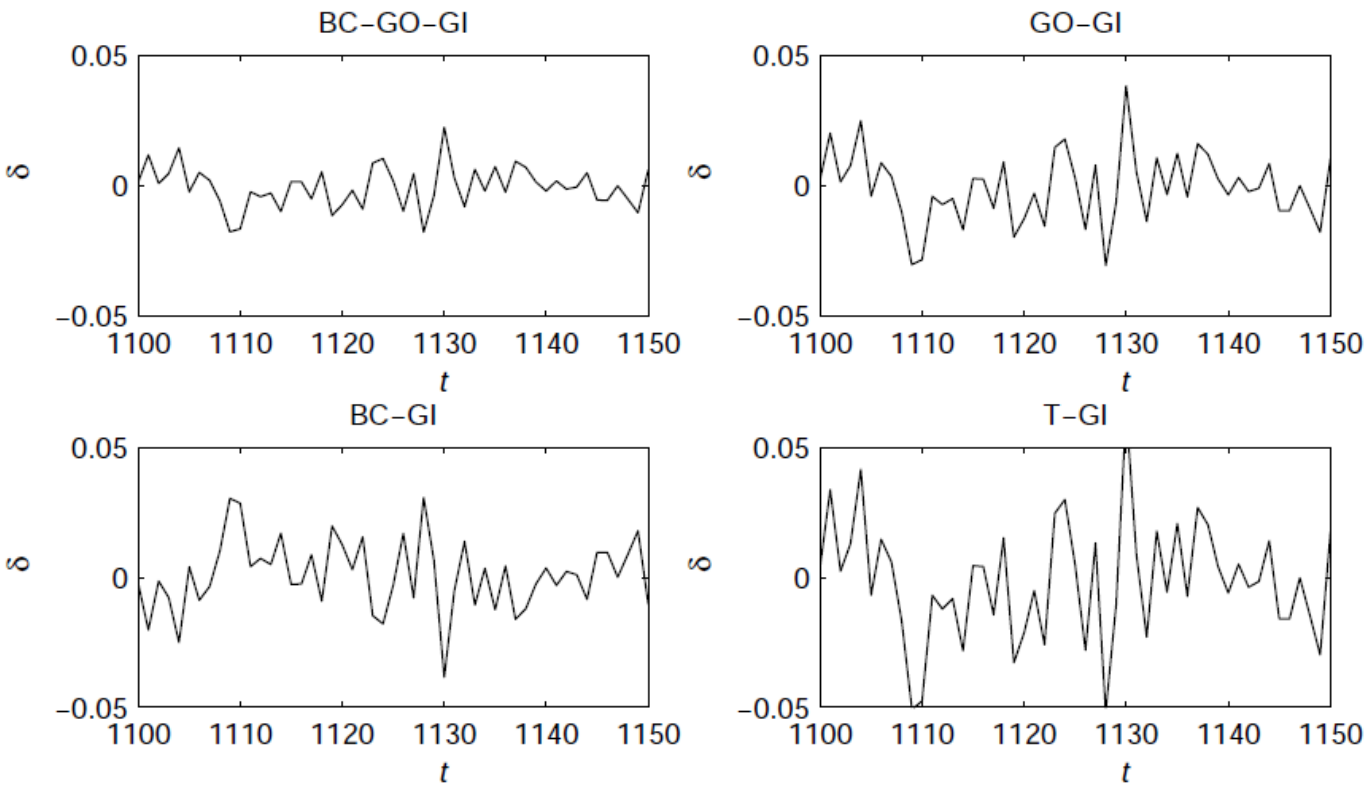

Figure 4

The output estimation errors