Identification of Fifth-order Wiener and Hammerstein Channels based on the Estimation of an Associated Volterra Kernel

Abstract

In this paper, we consider the problem of identification of fifth-order Wiener and Hammerstein nonlinear communication channels using the estimation of an associated Volterra kernel. We exploit the special form of the fifth-order associated Volterra kernel for deriving two algorithms that allow to estimate the parameters of the linear part of these channels. In the case of a Wiener channel, the associated Volterra kernel is a tensor satisfying a rank-one PARAFAC decomposition whose the parameters can be estimated by means of an alternating least squares (ALS) algorithm. In the case of a Hammerstein channel, its associated Volterra kernel is a diagonal tensor, which leads to a closed-form solution for estimating the parameters of the linear block. The coefficients of the nonlinear block modeled as a fifth degree polynomial are then estimated by means of the standard non recursive least squares (LS) algorithm. The performance of the proposed identification methods is illustrated by means of Monte Carlo simulation results.

References
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Index Terms

Computer Science

Operating Systems

Keywords

Wiener and Hammerstein models, Volterra kernels, PARAFAC decomposition, Channel estimation, ALS algorithm