Cramer-Rao Lower Bound for Parameter Estimation of Multiexponential Signals

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Abstract

The Cramer Rao Lower Bound on the mean square error of unbiased estimators is widely used as a measure of accuracy of parameter estimates obtained from a given data. In this paper, derivation of the Cramer-Rao Bound on real decay rates of multiexponential signals buried in white Gaussian noise is presented. It is then used to compare the efficiencies of some of the techniques used in the analysis of such signals. Specifically, two eigendecomposition-based techniques as well as SVD-ARMA (Singular Value Decomposition Autoregressive Moving Average) method are tested and evaluated. The two eigenvector methods were found to outperform SVD-ARMA with minimum norm being the most reliable at very low SNRs (Signal to Noise Ratios).