SNR Enhancement of Damped Exponential Signals in Noise*

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Abstract

In this paper, it is shown that the use of a particular autocorrelation estimator, with fixed-length window, allows to improve the SNR of damped exponential signals in noise. A simple method based on a polynomial approximation of a geometric series is derived in order to compute the optimal window length in both single and multiple mode cases. Using multiple simulations, the results achieved with the original Kumaresan and Tufts method, which operates directly on data, are compared to those obtained when the same algorithm is applied to the autocorrelation estimates. It appears that, on signals consisting of one and two damped complex exponentials in white noise, the latter approach performs better than the Kumaresan-Tufts method when using the optimal window length.

Key words: Damped sinusoid; Frequency estimation; Signal enhancement.