MULTICOMPONENT SIGNAL: LOCAL ANALYSIS AND ESTIMATION (WedAmOR1)

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Abstract :

In previous published works, we have studied the estimation of nonstationary−monocomponent signals on short time−windows. Both of the instantaneous amplitude and frequency (IA/IF) were modeled by polynomial functions. The maximization of the likelihood function was achieved by using a stochastic optimization technique: the Simulated Annealing (SA). The proposed algorithm was superior to the existing methods in terms of estimation accuracy and robustness in the presence of low SNR (Signal to Noise Ratio). Motivated by its efficiency and optimality in the monocomponent case, this paper is an extension for the multicomponent signals. The synthesis algorithm iteratively reconstructs the signal one component per iteration. During each iteration, the IA and IF of each component are synthesized by using the ML estimators and the SA technique. Monte Carlo simulations are presented and compared to the appropriate Cramer−Rao bounds. It proves the efficiency and performance of the algorithm. Moreover it underscores the superiority to previous methods to estimate the crossing frequency trajectories which is a great challenge related to the low sample number.

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