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Title: IterML: A Fast, Robust Algorithm for Estimating Signals with Finite Rate of Innovation

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ABSTRACT

Recently, various methods have emerged for sub-Nyquist sampling and reconstruction of signals with finite rate of innovation (FRI). These methods seek to sample parametric signals at close to their information rate and later reconstruct the parameters of interest. Some proposed reconstruction algorithms are based on annihilating filters and root-finding. Stochastic methods based on Gibbs sampling were subsequently proposed with the intent of improving robustness to noise, but these may run too slowly for some real-time applications. We present a fast maximum-likelihood-based deterministic greedy algorithm, IterML, for reconstructing FRI signals from noisy samples. We show in simulation that it achieves comparable or better performance than previous algorithms at a much lower computational cost. We also uncover a fundamental flaw in the application of MMSE (minimum mean squared error) estimation, a technique employed by some existing methods, to the problem in question.

INDEX TERMS: Finite rate of innovation, sampling, maximum likelihood estimation, Prony's method, annihilating filter method, Gibbs sampling, stochastic algorithms.

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