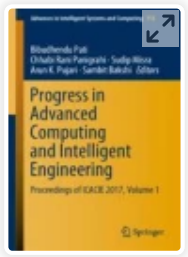

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Gradient-Based Swarm Optimization for ICA

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Abstract

Blind source separation (BSS) is one of the most interesting research problems in signal processing. There are different methods for BSS such as principal component analysis (PCA), independent component analysis (ICA), and singular value decomposition (SVD). ICA is a generative model of determining a linear transformation of the observed random vector to another vector in which the transformed components are statistically independent. Computationally, ICA is formulated as an optimization problem of contrast function, and different algorithms for ICA differ among

themselves on the way the contrast function is modeled. Several optimization techniques such as gradient descent and variants, fixed-point iterative methods are employed to optimize the contrast function which is nonlinear, and hence, determining global optimizing point is most often impractical. In this paper, we propose a novel gradient-based particle swarm optimization (PSO) method for ICA in which the gradient information along with the traditional velocity in swarm search is combined to optimize the contrast function. We show empirically that, in this process, we achieve better BSS. The paper focuses on the extraction of one by one source signal like deflation process.

Keywords

ICA **Contrast function** **Optimization**

Gradient **Particle swarm optimization**

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