BLIND SOURCE SEPARATION USING MAXIMUM ENTROPY PDF ESTIMATION BASED ON FRACTIONAL MOMENTS

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Abstract

Recovering a set of independent sources which are linearly mixed is the main task of the blind source separation. Utilizing different methods such as infomax principle, mutual information and maximum likelihood leads to simple iterative procedures such as natural gradient algorithms[1]. These algorithms depend on a nonlinear function (known as score or activation function) of source distributions. Since there is no prior knowledge of source distributions, the optimality of the algorithms is based on the choice of a suitable parametric density model.

In this paper, we propose an adaptive optimal score function based on the fractional moments of the sources. In order to obtain a parametric model for the source distributions, we use a few sampled fractional moments to construct the maximum entropy probability density function (PDF) estimation [2]. By applying an optimization method we can obtain the optimal fractional moments that best fit the source distributions. Using the fractional moments instead of the integer moments causes the maximum entropy estimated PDF to converge to the true PDF much faster .

The simulation results show that unlike the most previous proposed models [3] for the nonlinear score function, which are limited to some sorts of source families such as sub-gaussian and super-gaussian or some forms of source distribution models such as generalized gaussian distribution, our new model achieves better results for every source signal without any prior assumption for its randomness behavior.

References:

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