Underdetermined Blind Source Separation based on Fuzzy C-Means and Semi-Nonnegative Matrix Factorization

Ossama. S. Alshabrawy\(^1\), M. E. Ghoneim\(^1\)
Mansoura University
Faculty of science, Math. Dept.,
Damietta, Egypt.
Email:
{ossama.alshabrawy@egyptscience.net, m_ghoniem02@yahoo.co.uk}

W. A. Awad\(^1\)
Port Said University
Faculty of Science, Math.& Comp. Sci. Dept., Port-Said,
Egypt
Email:
wealak@yahoo.com

Aboul Ella Hassanien\(^1\)
Cairo University
Faculty of Computers and Information, Giza, Egypt
Email:
aboitcairo@gmail.com

\(^1\)Scientific Research Group in Egypt (SRGE)
http://www.egyptscience.net

Abstract

Conventional blind source separation is based on over-determined with more sensors than sources but the underdetermined is a challenging case and more convenient to actual situation. Non-negative Matrix Factorization (NMF) has been widely applied to Blind Source Separation (BSS) problems. However, the separation results are sensitive to the initialization of parameters of NMF. Avoiding the subjectivity of choosing parameters, we used the Fuzzy C-Means (FCM) clustering technique to estimate the mixing matrix and to reduce the requirement for sparsity. Also, decreasing the constraints is regarded in this paper by using Semi-NMF. In this paper we propose a new two-step algorithm in order to solve the underdetermined blind source separation. We show how to combine the FCM clustering technique with the gradient-based NMF with the multi-layer technique. The simulation results show that our proposed algorithm can separate the source signals with high signal-to-noise ratio and quite low cost time compared with some algorithms.

Keywords: Blind Source Separation; Undetermined; Fuzzy c-means; Non-Negative Matrix Factorization

Published In:

References
