FREQUENCY DOMAIN EXPLOITS FOR SYMMETRIC ADAPTIVE DECORRELATION

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ABSTRACT

Symmetric adaptive decorrelation (SAD) is a semi-blind method of separating convolutely mixed signals. While it has restrictions on the physical layout of the demixing equipment, restrictions not present for many other *blind source separation* (BSS) techniques, it is more ideally suited for some applications (for example, live sound mixing) due to the fact that no post-processing is required to ascertain which *output* corresponds with which *source*. Since the SAD algorithm is based on second-order statistics (SOS), it also tends to have a lower computational load when compared with those based on *higher order statistics*. In order to increase the efficiency of the SAD algorithm, a multibranched recursive structure is investigated. While a nominal gain in efficiency *is* attained, we move away from this approach in pursuit of more substantial gains. A *frequency-domain symmetric adaptive decorrelation* (FD-SAD) algorithm is proposed, with savings increasing not only with larger filter sizes, but also with increasing the number of sources. The convergence and stability of this new algorithm is proven. A trade-off of the FD-SAD algorithm is that it introduces a delay in the output, which renders the algorithm unsuitable for real-time applications. Therefore a hybrid approach is also proposed that does not suffer from the lag of the frequency domain approach. While the proposed algorithm *is* slightly less computationally efficient than the pure frequency domain algorithm, it is significantly more efficient than the time-domain approach. A comparison of the frequency domain and hybrid algorithms shows that both achieve separation equivalent to the time-domain algorithm in a real-world environment. The proposed adaptations could also be used to extend other BSS approaches (such as *Triple-N ICA for Convolutive mixtures* (TRINICON) [1], which can also be based on SOS), and a comparison of the proposed methods with TRINICON is explored.

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