EFFECTIVE SOURCE SEPARATION ALGORITHM USING NMF AND SPARSE NMF FOR ACOUSTIC FALL DETECTION

Yanlin Wang

Dr. Dominic Ho, Thesis Supervisor

ABSTRACT

In applications such as audio denoising, it is favorable to decompose a recording into its respective sources. Two commonly used methods are principal component analysis (PCA) and independent component analysis (ICA). However, such approaches perform poorly when no training data is given.

To overcome these issues, we propose another promising and effective algorithm, which is based on non-negative matrix factorization (NMF). The method works by decomposing the time-frequency domain of the signal into separated parts which correspond to respective sources.

The sparsity constraint is introduced to address the number of the bases. The sparse NMF is then proposed to find the appropriate number of bases during the factorization, which yields more convincing and accurate model of the original data.

To verify the advantage of the proposed method, we develop an acoustic fall detection system. For the simulated tasks, we find that sparse NMF based source separation is better than its NMF based counterpart in terms of approximation accuracy and detection performance. Overall, the result demonstrates that our proposed approach is a powerful separation method and motivates further work in source separation.