Spectrogram Factorization Using Phase Information

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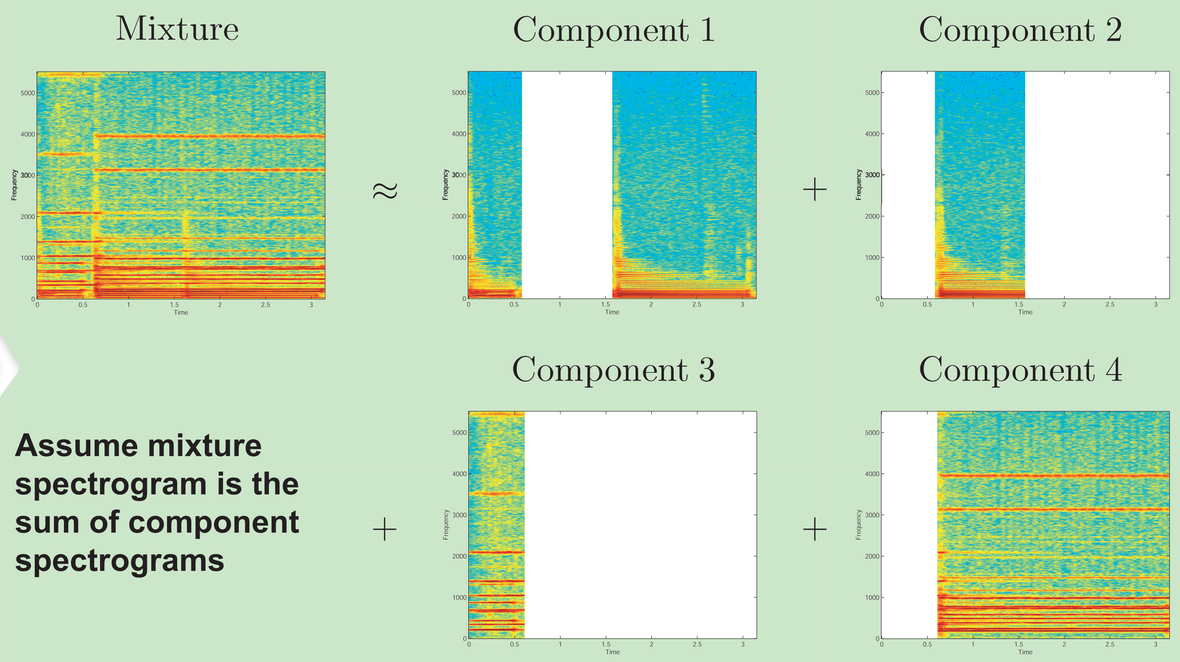
http://www.cc.gatech.edu/cpl/projects/musicaudio/magspec.htm

Summary

Spectrogram factorization methods have been proposed for single channel source separation. These methods assume that the mixture spectrogram is a linear combination of the source spectrograms. However, the mixture spectrogram additionally depends on the (unknown) phase of the sources. This paper investigates the role of phase in estimating the source spectrograms from the mixture spectrogram and incorporates a probabilistic representation of phase to improve separation.

Spectrogram Factorization



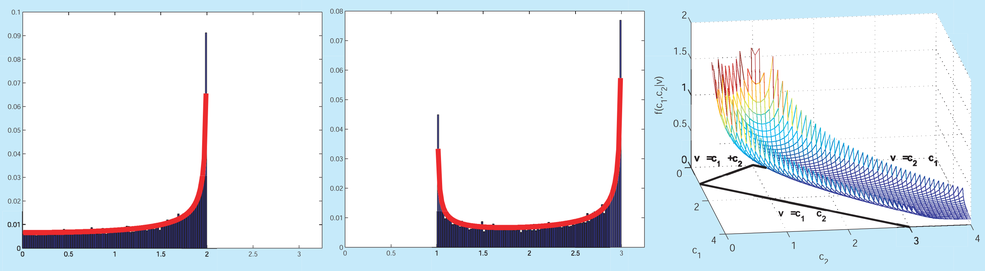
Random Phase

$$\text{for R components :} \quad v = \sqrt{\sum_{ij}^{R} c_i c_j \cos(\theta_{ij})}$$

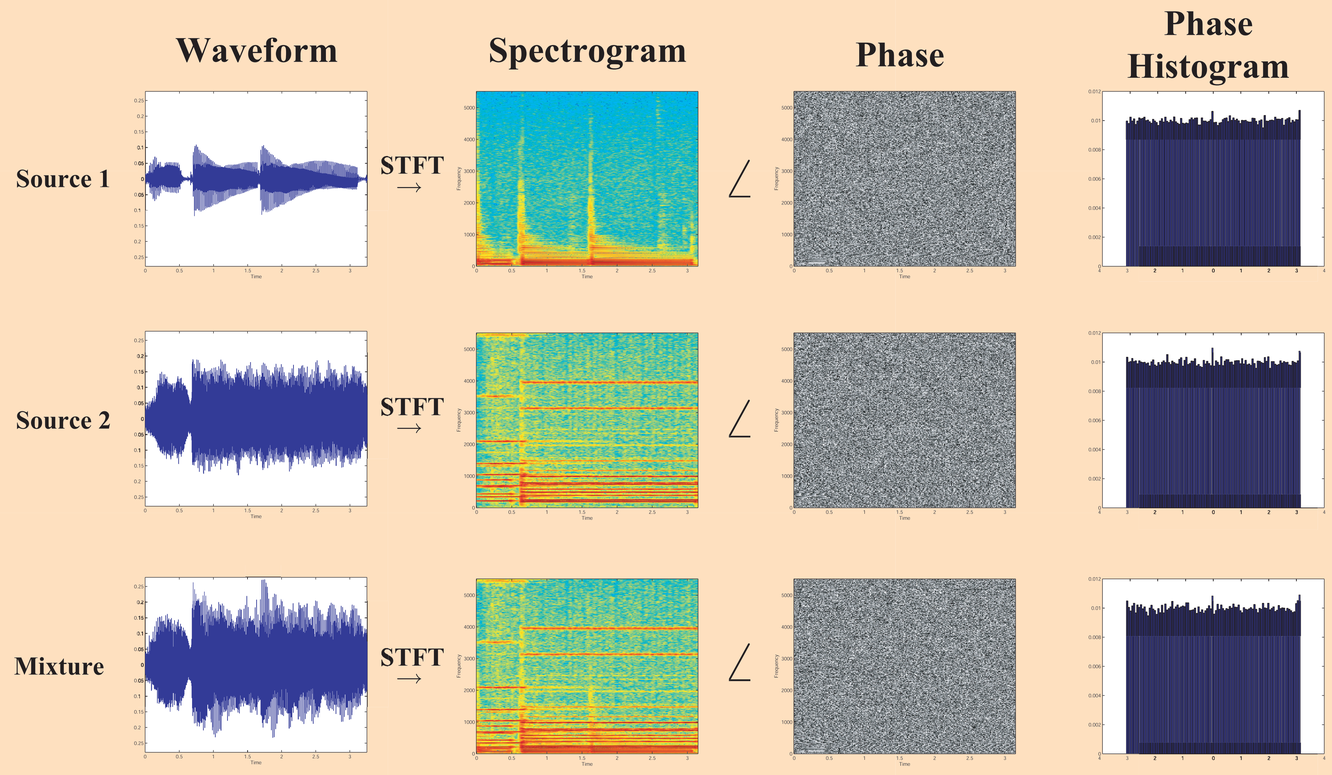
$$\text{for two components :} \quad v = \sqrt{c_1^2 + c_2^2 + 2c_1 c_2 \cos(\theta)}$$

$$p(v|c_1, c_2) = \frac{2v}{\pi\sqrt{-(v + c_1 + c_2)(v + c_1 - c_2)(v - c_1 + c_2)(v - c_1 - c_2)}}$$

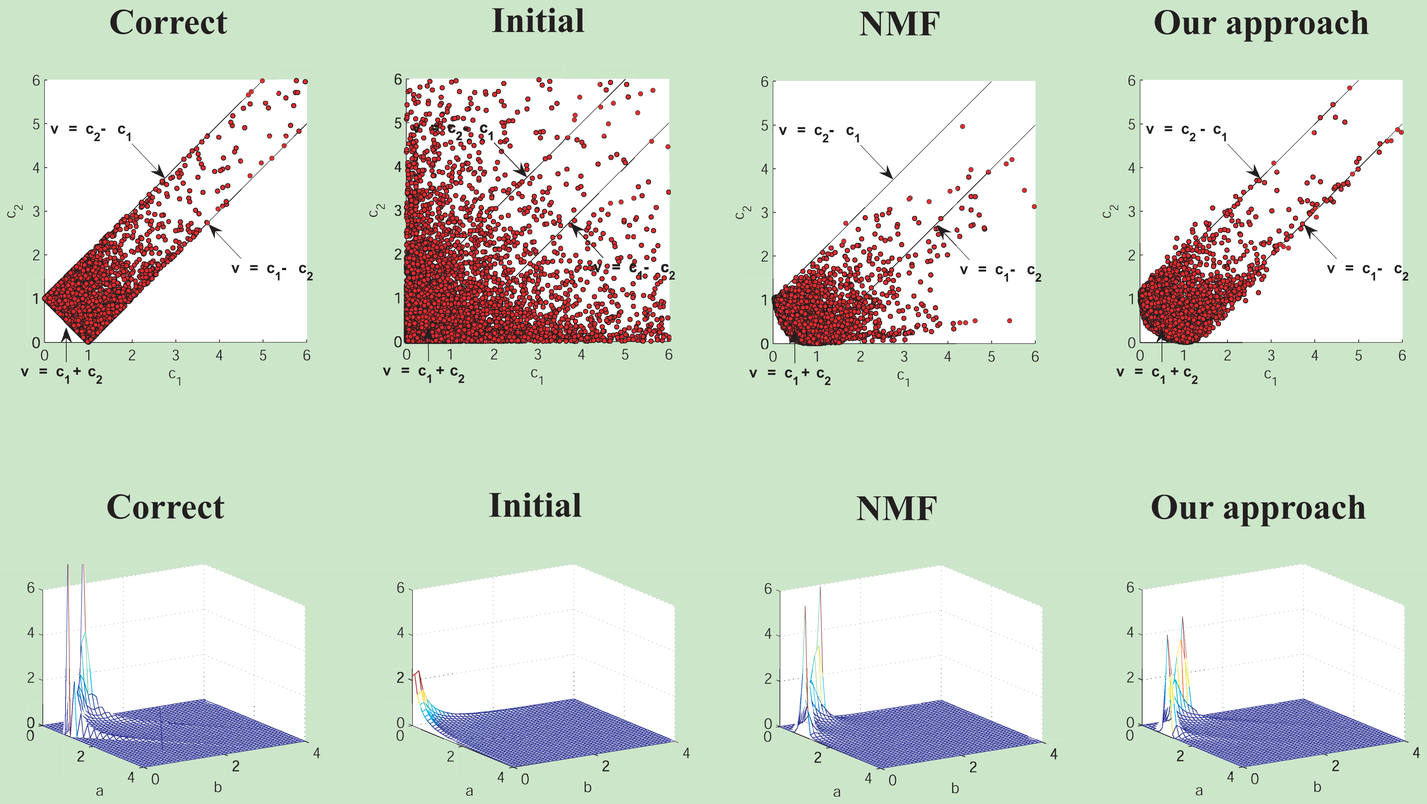
$p(v|c_1 = 1, c_2 = 1)$ $\quad$ $p(v|c_1 = 2, c_2 = 1)$ $\quad$ $p(c_1, c_2|v = 1)$



Short-time Fourier Transform



Results



Future Work