INCORPORATING PHASE INFORMATION FOR SOURCE SEPARATION VIA SPECTROGRAM FACTORIZATION

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.

Probabilistic Representation of Phase
\[ p(v) = p_\theta(v) = \frac{1}{(2\pi)^{n/2}} \left| \mathbf{I} \right|^{1/2} e^{-|v|^2/2} \]

For R components:
\[ v = \sum_{j=1}^{R} c_j \cos(\theta_j) \]
For two components:
\[ v = \sqrt{v_1^2 + v_2^2 + 2v_1v_2 \cos(\theta)} \]
\[ p(v|c_1, c_2) = \frac{1}{2\pi} \left| \mathbf{I} \right|^{1/2} e^{-|v|^2/2} \]
\[ p(v|c_1 = 1, c_2 = 1) = \frac{1}{2\pi} \left| \mathbf{I} \right|^{1/2} e^{-|v|^2/2} \]
\[ p(v|c_1 = 2, c_2 = 1) = \frac{1}{2\pi} \left| \mathbf{I} \right|^{1/2} e^{-|v|^2/2} \]
\[ p(v|c_1 = 1, c_2 = 1) = \frac{1}{2\pi} \left| \mathbf{I} \right|^{1/2} e^{-|v|^2/2} \]

Results
Scatter plots of one representative trial:
- Correct
- Initial
- NMF
- Our approach

Future Work
- 3 Components
- 5 Components
- 10 Components
- 20 Components

As the number of components increases, the mixture approaches a Rayleigh distribution. Use this to extend technique to more components.