

MONAURAL SOURCE SEPARATION USING SPECTRAL CUES

Barak A. Pearlmutter and Anthony M. Zador

NUI Maynooth, Co. Kildare, Ireland & Cold Spring Harbor Laboratory, USA

Animals use a variety of binaural and monaural cues to perform sound localization. Important cues include intra-aural intensity and phase disparity, and monaural spectral filtering by the head and pinnae (via the head-related transfer function, or HRTF). Such cues are also important in helping to separate individual acoustic sources in a noisy environment, such as the voices at a cocktail party.

Here we propose a model for how the auditory cortex could use monaural spatial filtering (the head-related transfer function, HRTF) arising from the head and external ears for improved source separation. Each acoustic source is assumed to have a different known position in space, and is therefore subject to preprocessing by a different linear filter before being combined with the other sources. We illustrate the utility of spectral cues with an idealized example in which the HRTF allows two sources to be recovered perfectly with a single ear. We then provide a more general framework in which sources are represented in an overcomplete basis, which we posit to exist in the primary auditory cortex. The model makes specific testable predictions about cortical response properties.