Localization of Sound Sources in Median-Plane with Channelized Head-Related Transfer Functions

Piotr Majdak[1], Bernhard Laback[1] and Matthew J. Goupell[1]

1 Acoustics Research Institute, Austrian Academy of Sciences, Vienna

Head-related transfer functions (HRTFs) describe sound transmission from the free-field to the ear-drum. They contain spectral features, which vary according to the sound direction and differ among listeners. Median-plane localization with modified HRTFs mostly results in a degradation of localization ability.

Cochlear-implants (CIs) are auditory prostheses, which restore hearing in the profoundly deaf by electrically stimulating the cochlea. The transmission of spectral features of the HRTFs is very limited in CIs. Thus, CI listeners show a degraded localization ability for sounds along the median plane. Main limitations result from the small number of frequency channels, limited frequency range, and channel interactions.

This study investigated the effect of the number of channels on median-plane sound localization in normal-hearing subjects listening to a simulation of electric hearing where individual HRTFs were processed with a Gaussian-tone vocoder within the frequency range 0.3 to 16 kHz.

Results show that at least nine frequency channels are required to provide spectral features without a substantial degradation of localization ability. Four of those channels cover the frequency region of the most prominent median-plane localization features (> 4 kHz).

This study is supported by FWF (P18401-B15).

(199 words)