Session 3aPP

Psychological and Physiological Acoustics: Localization and Precedence (Poster Session)

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Contributed Papers

All posters will be on display from 8:30 a.m. to 12:00 noon. To allow contributors an opportunity to see other posters, contributors of odd-numbered papers will be at their posters from 8:30 a.m. to 10:15 a.m. and contributors of even-numbered papers will be at their posters from 10:15 a.m. to 12:00 noon.

3aPP1. Spatial unmasking of nearby pure-tone sources in a simulated anechoic environment. Norbert Kopčo (Dept. of Cognit. and Neural Systems, Boston Univ., Boston, MA 02215, kopco@cns.bu.edu) and Barbara G. Shinn-Cunningham (Boston Univ., Boston, MA 02215)

Spatial unmasking of nearby pure-tone sources masked by broadband noise was studied in a simulated anechoic environment. The predicted amount of binaural unmasking was calculated using interaural differences from a spherical-head model [B. G. Shinn-Cunningham, S. G. Santarelli, and N. Kopčo, J. Acoust. Soc. Am. (in press)] and the Colburn model of binaural processing [H. S. Colburn, J. Acoust. Soc. Am. **61**, 525–533 (1977)]. Predictions were generated for several spatial configurations of signal and masker in the horizontal plane (varying target and masker azimuthal positions and distances) and for multiple tone frequencies. Predictions were compared with behaviorally measured detection thresholds obtained with headphone simulations using individually measured HRTFs. Results show that changes in detection threshold for free-field signals are dominated by monaural effects due to large interaural level differences. Overall, spatial unmasking effects are very large for nearby sources due to simple energy effects at the better ear. Binaural unmasking is observable only for a subset of spatial configurations where the energy of signal and/or noise at both ears is sufficient to allow binaural processing, and even for these configurations the effect is generally weaker than that observed with distant sources. [Work supported in part by AFOSR Grant F49620-98-1-0108.]

3aPP2. Spatial unmasking for nearby speech sources in a simulated anechoic environment. Jason Schickler (Hearing Res. Ctr., Dept. of Biomed. Eng., Boston Univ., Boston, MA 02215), Norbert Kopčo, Barbara G. Shinn-Cunningham, and Ruth Y. Litovsky (Boston Univ., Boston, MA 02215, shinn@cns.bu.edu)

The ''cocktail party effect'' is traditionally studied with sources varying in azimuth, where binaural and level cues are large. In these conditions, speech intelligibility improves dramatically when the target speech and maskers are spatially separated. In the present study, we investigated spatial unmasking of nearby sources for several configurations of target and sources varying in distance and azimuth. Targets were sentences from the IEEE corpus and maskers were speech-shaped noise. Locations were simulated over headphones using anechoic head-related transfer functions (both individually measured and using a spherical-head model). Speech reception thresholds were measured adaptively, varying target level while keeping masker level constant. For nearby sources, overall energy effects (due to changes in target and masker level with distance) are large. Therefore, target level was normalized to equate the signal-to-noise ratio at the better ear in all conditions. This approach allowed direct measurement of binaural unmasking in the various conditions. Overall energy effects (removed by the normalization) are also reported. Results are compared with detection threshold measurements from similar experiments. [Work supported in part by AFOSR Grant F49620-98-1-0108 to BGSC and NIDCD Grant DC02696 to RYL.]

3aPP3. Localization of ripple-spectrum noise. Ewan A. Macpherson (Kresge Hearing Res. Inst., Univ. of Michigan, Ann Arbor, MI 48109)

Ripple-spectrum stimuli were used to investigate the level of spectral detail important for use of spectral cues for vertical-plane localization. Free-field localization judgments were obtained for 250-ms, 0.5–16 kHz noise bursts with various log-ripple spectra. Ripple density was varied between 0.25 and 8 cycle/octave at a depth of ±20 dB. Depth was varied between ±5 and ±20 dB at a density of 1 cycle/oct. Multiple ripple phases were employed at each combination of density and depth. ±20-dB rippled spectra substantially increased errors in vertical-plane localization in the range 0.5–2 cycle/oct. When systematic errors occurred, judgments were biased toward the location at which the listener's directional transfer function (DTF) best matched the rippled source spectrum filtered by the target-location DTF. At 1 cycle/oct, localization accuracy was degraded only for ripple depths at or above ±15 dB. Although the upper limit for ripple discrimination is 10 cycle/oct [Supin *et al.*, J. Acoust. Soc. Am. **106**, 2800–2804 (1999)], these results indicate that detail finer than 2 ripples/oct does not strongly influence spectral cue processing. This has significance for localization modeling and for virtual-stimulus synthesis. [Work supported by NIH Grants R01DC00420 and T32DC00011.]

3aPP4. Free-field and virtual studies of the precedence effect in the median–sagittal plane: Duration effects. Gerald Ng, Roberto Dizon, Ruth Litovsky, and H. Steven Colburn (Hearing Res. Ctr., Boston Univ., 44 Cummington St., Boston, MA 02215)

The study of precedence in the median–sagittal plane is made difficult by poor localization ability in this plane, as well as by front–back confusions. We report on both free-field and virtual localization studies in which

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