The effect of interaural-level-difference fluctuations on the externalization of sound

Real-world sound sources are usually perceived as externalized and thus properly localized in both direction and distance. This is largely due to (1) the acoustic filtering by the head, torso, and pinna, resulting in modifications of the signal spectrum and thereby a frequency-dependent shaping of interaural cues and (2) interaural cues provided by the reverberation inside an enclosed space. This study first investigated the effect of room reverberation on the spectro-temporal behavior of interaural level differences (ILDs) by analyzing dummy-head recordings of speech played at different distances in a standard listening room. Next, the effect of ILD fluctuations on the degree of externalization was investigated in a psychoacoustic experiment performed in the same listening room. Individual binaural impulse responses were used to simulate a distant sound source delivered via headphones. The ILDs were altered using a gammatone filterbank for analysis and resynthesis, where the envelopes of the left and right-ear signals were modified such that the naturally occurring fluctuations of the ILDs were restricted. This manipulation reduced the perceived degree of externalization. This was consistent with the analysis of short-term ILDs at different distances showing that a decreased distance to the sound source also reduced the ILD fluctuations. © 2013 Acoustical Society of America.

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