ACOUSTICS2008/2008
Normalization in count-comparison model of interaural time difference decoding

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Recent neurophysical studies suggest that binaural decoding is based on count comparison for both ITD and ILD. In such mechanisms, the neural signals are stronger in the auditory pathways leading to the ipsilateral hemisphere when a signal is presented earlier, or with higher level, to the contralateral ear. A computational model is described implementing binaural cue decoding based on count-comparison principles for ITD decoding, which is assumed to occur in medial superior olive (MSO). Pooled response of MSO is modeled as running multiplication between inputs, which are derived from ear canal signals with GTFB filtering and phase-locked impulse generator. The contralateral and ipsilateral inputs to MSO are then convolved with different responses. The model output corresponds well to neurophysiological results. In the earlier version of the model, the MSO output was normalized only with the contralateral signal, as suggested by the neuroanatomy. It has been later found out that the output of MSO model depends on ILD, which is in contradiction with psychoacoustics studies. In this study, it is proposed that the ipsilateral input to MSO is self-normalized, which provides ILD-independent ITD decoding.