A framework for computational modelling of interaural time difference discrimination of normal and hearing-impaired listeners

Different computational models have been developed to study the interaural time difference (ITD) perception. However, only few have used a physiologically inspired architecture to study ITD discrimination. Furthermore, they do not include aspects of hearing impairment. In this work, a framework was developed to predict ITD thresholds in listeners with normal and impaired hearing. It combines the physiologically inspired model of the auditory periphery proposed by Zilany, Bruce, Nelson, and Carney [(2009). J. Acoust. Soc. Am. 126(5), 2390–2412] as a front end with a coincidence detection stage and a neurometric decision device as a back end. It was validated by comparing its predictions against behavioral data for narrowband stimuli from literature. The framework is able to model ITD discrimination of normal-hearing and hearing-impaired listeners at a group level. Additionally, it was used to explore the effect of different proportions of outer- and inner-hair cell impairment on ITD discrimination.