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Assessment of the potential of spontaneous coarse body movements for control of hearing devices in specific acoustic environments

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Sensing body movements such as head and eye movements might provide relevant data in addition to acoustic data for improving the analysis of the acoustic scene and detecting the hearing wish of a subject. This information might then be used to control the signal processing of the hearing aid, e.g., enhancing a desired source that is embedded in a complex acoustic scene consisting of several active sources. To date, however, no significant data are available that show the practical feasibility of such an approach. As part of an extensive research project investigating this topic, this contribution reports on a first pilot study that measured gestural reactions of 11 normal-hearing subjects to realistic acoustic scenes. Subjects were asked to attend to details of a complex scene, while optionally performing a digit triplet speech reception test integrated into the scene. Several distracting or surprising sounds were additionally played. Three different sensor modes recorded gestures and responses to the scene: Skeleton tracking provided by a Kinect sensor, head tracking provided by an IR camera, and discrete speech test responses provided by a touch screen. After the completion of each scene, the subjects answered a questionnaire asking about details of the sound sources. Two scenes were used, a train station scene and a car traffic scene, both taken from a database of virtual realistic and spatially complex acoustic scenes [1]. Scenes were rendered using higher-order Ambisonics to a circular array of loudspeakers. Subjects were able to move freely within an area of approx. 2 m2 in the center of the array, allowing natural body movements. In our experience, the proposed method is suitable for assigning to the subject realistic auditory perception tasks of different and reproducible complexity and tracking the behaving subject.

Literatur:
[1] Grimm et al, “Realistic spatially complex acoustic scenes for space-aware hearing aids and computational acoustic scene analysis”, Proceedings DGA 2013.