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Title:

Localizing Sources with an Artificial Head Using Head-Above-Torso Rotations

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Abstract:

Artificial heads are capable of capturing sound fields in a human-like manner since they reproduce the acoustic properties of an average human head by replicating its physiological features. These features comprise the size and shape of the head, the pinnae and the ear canals as well as properties of the tissue. One capability of humans that has recently received more attention is rotating the head above the torso – also while listening. Such dynamic listening is utilized by humans as an additional degree of freedom for the auditory system to, e.g., resolve front-back-confusions.

This contribution provides a quantitative analysis of the impact of head-above-torso rotations on the head-related transfer functions both by means of acoustic measurements and numerical simulations. Furthermore, it presents an algorithmic approach for binaural source localization that replicates human dynamic listening. The approach utilizes an artificial head that is capable of silent head-above-torso rotations, allowing for meaningful recordings while the head is moving. The localization algorithm exploits the dependency between the instantaneous position of the head in relation to the sound source(s) and the recorded binaural signals. It is demonstrated that taking the movement of the head into account facilitates resolving front-back-confusions in a human-like manner.

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