

A framework for geometry acquisition, 3-D printing, simulation, and measurement of head-related transfer functions with a focus on hearing-assistive devices - DTU Orbit (08/11/2017)

A framework for geometry acquisition, 3-D printing, simulation, and measurement of head-related transfer functions with a focus on hearing-assistive devices

Individual head-related transfer functions (HRTFs) are essential in applications like fitting hearing-assistive devices (HADs) for providing accurate sound localization performance. Individual HRTFs are usually obtained through intricate acoustic measurements. This paper investigates the use of a three-dimensional (3D) head model for acquisition of individual HRTFs. Two aspects were investigated; whether a 3D-printed model can replace measurements on a human listener and whether numerical simulations can replace acoustic measurements. For this purpose, HRTFs were acoustically measured for four human listeners and for a 3D printed head model of one of these listeners. Further, HRTFs were simulated by applying the finite element method to the 3D head model. The monaural spectral features and spectral distortions were very similar between re-measurements and between human and printed measurements, however larger deviations were observed between measurement and simulation. The binaural cues were in agreement among all HRTFs of the same listener, indicating that the 3D model is able to provide localization cues potentially accessible to HAD users. Hence, the pipeline of geometry acquisition, printing, and acoustic measurements or simulations, seems to be a promising step forward towards in-silico design of HADs.

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