Summary 2:

Fast HRFT measurement system with unconstrained head movements for 3D audio in virtual and augmented reality applications

Traditionally, head related transfer functions (HRTF) are measured in an echo free room using load speakers, places at different locations to play excitation signals, which is recorded by binaural microphones placed at the user's ear canal. This is time cumbersome and implies constrains on user's head movement. To relax this constraint on head movement, not natural to human behavior, a fast continuous HRTF acquisition technique was proposed. Users are encouraged to move their head/s to cover the entire 2D grid while a head tracker is used to track the head orientation. To support continuous extraction of HRFTs, several adaptive signal-processing algorithms have been developed and evaluated. Adaptive weights are optimized for hybrid progressive-activation based NLMS approach, which is combines the advantage of both. (Progressive based NMLS algorithm is best for "non-return" movements. Activation based NLMS algorithm is best for random movements with multiple returns.) This method is capable of achieving HRTF measurements almost perceptually identical to ones obtain from traditional methods. In the propose system, user would be seated with binaural microphone and head tracker attached, with the loudspeaker and laptop placed 1m in front of them. The laptop will show the user their coverage and direct them in the less covered direction. The process takes an average of 1 to 2 minutes, significantly reducing time and removes the constraint of head movement from the measuring process.

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abstract={Binaural audio plays an indispensable role in virtual reality (VR) and augmented reality (AR). Binaural audio recreates the sensation of the three dimensional auditory experience using Head- Related Transfer Functions (HRTFs). HRTFs are as unique as our fingerprint. To achieve an immersive audio experience, HRTFs measured from every particular user is required. Nowadays, the conventional methods for HRTF measurements requires a wellcontrolled environment, hardly any movement of the user, and projecting to the user a high level of unpleasant sound in a rather long duration. Such difficulties have greatly limited the use of individually measurement HRTFs and hinder the authenticity of immersive audio. To solve these problems, we proposed a fast and convenient HRTF

measurement system that is an order of magnitude faster and more importantly, it does not place any constraints on the user's movement. With the help of a head-tracker and advanced adaptive signal processing algorithms, this system is able to achieve satisfactory HRTF measurement accuracy. In this demonstration, we will present a fast real-time HRTF acquisition system and show how the individualized HRTFs improve the audio experience in VR/AR applications.},
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