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Title:

Head-Tracked Spatial Audio: What is the Motion-to-Sound Latency of your Device?

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Abstract:

Spatial audio with head-tracked binaural rendering enhances immersion by adjusting source positions to the listener's orientation. The resulting auditory illusion is that the audio scene appears fixed in the surrounding world, increasing the ability of source localization, the sensation of source externalization and ultimately improving the quality of experience. A seamless listening experience, however, depends on a low latency between head movement and the resulting sound at the ears, denoted as Motion-to-Sound (M2S) latency. Accordingly, measuring M2S latency is a crucial aspect for system performance assessment.

The present paper is dedicated to measuring M2S latency of arbitrary head-tracked spatial audio systems in a black-box manner, i.e., without requiring any a priori information or modification of the rendering algorithm and with high degree of compatibility with a variety of spatial audio formats. A motorized head and torso simulator (HATS) is used to generate reproducible motion while simultaneously recording the rendered signal from the device under test (DUT) that is to be analyzed. We propose novel approaches to signal analysis and juxtapose constant-speed and impulsive motion measurements. An extensive evaluation examines the ability of the methods to perform measurements and reveals significant differences in the rendering behavior of various commercial off-the-shelf spatial audio devices.

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