

Physical and perceptual differences of selected approaches to realize an echolocation scenario in room acoustical auralizations

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ABSTRACT

Human echolocation describes the exploration of an acoustical environment by emitting sounds and analyzing the returning reflections by auditory processing. Virtual acoustic environments provide a different approach to investigate the perception room acoustical details using echolocation. Human echolocation can be emulated in headphone based virtual acoustic environments by creating corresponding Oral Binaural Room Impulse Responses (OBRIRs). The presented study considers the case of an echolocator positioned close to a large reflecting surface in an anechoic room. So far, it remains challenging to model the complex acoustics in the nearfield of mouth, reflecting surface and the ears.

Previously, we conducted a Repertory Grid experiment to study the perceptual differences of OBRIRs generated from measurements with a mouth simulator, simulations based on ray-tracing and a spherical head model with a circular piston. Audible deviations in the perception of the first reflection were documented and classified.

In this paper we present a detailed analysis of the physical differences between the selected approaches. Furthermore, the observations from the listening experiment are discussed with regard to the varying physical properties.

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