

Book review on “The technology of binaural understanding” by Jens Blauert and Jonas Braasch (Eds.)



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Rather than a consolidated author textbook, this tome at 800+ pages follows the trend of publishing collections of curated works spanning a central theme viewed from various angles. The book comprises 25 articles in 5 sections. This latest in the series of texts on spatial hearing takes the subject matter to the next level, touching on aspects of cognition, knowledge, and action on the part of the listener in mental space construction through audition. The context of the collection is “models” towards binaural understanding, which are presented with varying levels of detail and technical complexity.

Section I dives into the principal ideas behind several categories of auditory models of human cognitive auditory processing, followed by a collection of auditory attention experiments. Section II includes a pedagogical introduction to Auditory Space Formation, touching on neurological, acoustic, and cognitive elements from source localization to the sensation of envelopment and concert hall quality. This is followed by discussions of biological processing elements and their relation to sound localization in mammals, an exposé on advances in spatial perception in the context of concert hall quality, and the importance of level dynamics and energy spatial distribution on perceived hall quality. This is followed by precedence effect studies. Real-world cases address musicians’ adaptation to room acoustic conditions. This section concludes with binaural models to identify early reflections. Section III presents an introduction to psychophysical models for sound localization with audio-visual stimuli, a historical overview of cross-modal interaction research, including head orientation effects and source localization, and a review of recent studies and conceptual/technical issues regarding auditory augmented reality.

Section IV presents an overview of “quality”, including a conceptual model framework, implementations, and their limitations. Language is highlighted in the context of room acoustic appreciation, followed by aesthetics and production/reproduction elements, concluding with principles of binaural processing applied to speech. Section V offers a clear discussion on perceptual and technical differences between Wave Field Synthesis (WFS) and Higher Order Ambisonics (HOA) and resulting auditory illusions, a presentation of binaural auditory illusions, then focusing on real/virtual room disparities. Focus turns to head rotation, studies exploring dynamic binaural rendering and “active listening” with visually impaired participants, and an overview of cross-modal perception, attention, and action, including a model and evaluation in robotics. The collection concludes with an overview of principal elements in context aware assisted hearing devices and investigations of dynamic-range compression.

Lacking a more coherent approach in style, depth, and detail across chapters, one wonders if a more focused/selective curation with editing to reduce repetition would have resulted in a more guided trajectory.

As a researcher active and interested in many of the topics touched upon, I was pleased to come across new perspectives and new references in the numerous and thorough overview sections.

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