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The Technology of Binaural Listening Binaural Hearing; a Working Bibliography for Investigation of the Efficiency of Binaural Listening Among the Hearing Impaired Binaural Hearing The Technology of Binaural Understanding The Perceived Benefits of Binaural Listening in Cochlear Implant Recipients with and Without a Hearing Aid in the Opposite Ear Binaural Interference Some Measures of Listening Abilities of Experienced Binaural Hearing Aid Users The Challenges of Restoring Binaural Hearing The Influence of Interaural Asymmetries on Binaural Hearing Benefits in Adults with Cochlear Implants Binaural and Spatial Hearing in Real and Virtual Environments The Technology of Binaural Understanding The Effects of Binaural Amplification on the Speech Discrimination Performance of Normal Hearing Subjects Effectiveness of Binaural Hearing Aids Selection of Binaural Hearing Aids for Individual Subjects Binaural Effects in Normal and Impaired Hearing Binaural Sensitivity in Children with Normal Hearing and Children with Bilateral Cochlear Implants Spatial Hearing Models of Binaural Hearing for Sound Lateralisation and Localisation A Theory of Binaural Hearing A Comparison of Monaural and Binaural Listening in Three Levels of Ambient Noise Report A Test of Binaural Hearing A Contribution to the Study of Binaural Hearing Binaural Speech Recognition in Noise and the Effect of Context Auditory Neuroscience Hearing The Combined Effects of Binaural Hearing and Rerverberation on Speech Intelligibility in Noise Dynamic aspects of perception in binaural listening Evaluation of a Binaural Listening System Using a Monophonic Input A Study of Binaural Hearing Aid Performance Physiology and Psychophysics of Binaural Hearing Clinical Topics in Hearing Aid Research Principles and Applications of Spatial Hearing Impact of Binaural Beats on Heart Rate Variability Temporary Threshold Shift and Other Factors Related to the Fitting of Binaural Hearing Aids Impact of Head-Tracking on the Listening Experience of Binaural Music Perceptual Differences Between One-channel and Two-channel Binaural Listening Factors Affecting Binaural Unmasking in Listeners with Cochlear Implants Robust Binaural Noise-reduction Strategies with Binaural-hearing-aid Constraints A Comparison of the Effects on Speech Intelligibility by Monaural Versus Binaural Listening Under Several Conditions

The Technology of Binaural Listening Feb 19 2023 This book reports on the application of advanced models of the human binaural hearing system in modern technology, among others, in the following areas: binaural analysis of aural scenes, binaural de-reverberation, binaural quality assessment of audio channels, loudspeakers and performance spaces, binaural perceptual coding, binaural processing in hearing aids and cochlea implants, binaural systems in robots, binaural/tactile human-machine interfaces, speech-intelligibility prediction in rooms and/or multi-speaker scenarios. An introduction to binaural modeling and an outlook to the future are provided. Further, the book features a MATLAB toolbox to enable readers to construct their own dedicated binaural models on demand.
Report May 30 2021
Dynamic aspects of perception in binaural listening Oct 23 2020
Effectiveness of Binaural Hearing Aids Feb 07 2022
Binaural Sensitivity in Children with Normal Hearing and Children with Bilateral Cochlear Implants Nov 04 2021 Binaural hearing provides a listener with access to interaural time and interaural level differences (ITDs and ILDs). Binaural hearing aids in spatial hearing skills, such as sound localization or the ability to segregate speech in noisy environments. These spatial hearing abilities are vital for young children, as they spend a remarkable amount of time in noisy environments, such as a classrooms or playgrounds. Children with normal hearing (NH) perform well on spatial hearing tasks by the age of 4-5. Although children with bilateral cochlear implants (BiCIs) perform better than children with unilateral implants, they still perform worse than their NH peers when tested on the same tasks. Some factors that may be responsible for this gap in performance include (1) the lack of temporal fine structure present in current clinical processing, (2) neural degradation due to lack of early acoustic hearing, (3) surgical issues leading to differing depths of electrode array insertion between the two ears, and (4) the lack of temporal synchronization between the two implants. The specific aims of this dissertation are to (1) investigate the extent to which the high-rate amplitude modulated stimuli are the limiting factor in performance by studying the ability of NH children to utilize envelope ITDs as transmitted by stimuli that renders fine structure information for ITDs imperceptible, (2) examine binaural sensitivity to binaural cues in children with BiCIs using low-rate pulsatile stimuli on pitch matched pairs to understand whether children with BiCIs have the ability to utilize these cues, (3) examine the effects of perceived interaural pitch mismatch on a pitch comparison task and a task measuring ITD sensitivity to evaluate the efficacy of pitch matching in children, (4) examine the effects of stimulus rate on ITD sensitivity in order to determine if high-rate amplitude modulated stimuli can elicit ITD sensitivity, and (5) investigate cognitive factors that may predict performance on tasks of binaural sensitivity, to better understand if specific cognitive factors may be predictors of binaural performance. Together, the five aims of this dissertation are designed to provide a better insight into why children with BiCIs demonstrate poor spatial hearing abilities.
A Comparison of the Effects on Speech Intelligibility by Monaural Versus Binaural Listening Under Several Conditions Oct 11 2019
Selection of Binaural Hearing Aids for Individual Subjects Jan 06 2022
Principles and Applications of Spatial Hearing May 18 2020
The Technology of Binaural Understanding Nov 16 2022 This book offers a computational framework for modeling active exploratory listening that assigns meaning to auditory scenes. Understanding auditory perception and cognitive processes involved with our interaction with the world are of high relevance for a vast variety of ICT systems and applications. Human beings do not react according to what they perceive, but rather, they react on the grounds of what the percepts mean to them in their current action-specific, emotional and cognitive situation. Thus, while many models that mimic the signal processing involved in human visual and auditory processing have been proposed, these models cannot predict the experience and reactions of human users. This book presents a model that incorporates both signal-driven (bottom-up), and hypothesis-driven (top-down) processing.
Perceptual Differences Between One-channel and Two-channel Binaural Listening Jan 14 2020
Spatial Hearing Oct 03 2021 The field of spatial hearing has exploded in the decade or so since Jens Blauert's classic work on acoustics was first published in English. This revised edition adds a new chapter that describes developments in such areas as auditory virtual reality (an important field of application that is based mainly on the physics of spatial hearing), binaural technology (modeling speech enhancement by binaural hearing), and spatial sound-field mapping. The chapter also includes recent research on the precedence effect that provides clear

experimental evidence that cognition plays a significant role in spatial hearing.The remaining four chapters in this comprehensive reference cover auditory research procedures and psychometric methods, spatial hearing with one sound source, spatial hearing with multiple sound sources and in enclosed spaces, and progress and trends from 1972 (the first German edition) to 1983 (the first English edition) -- work that includes research on the physics of the external ear, and the application of signal processing theory to modeling the spatial hearing process. There is an extensive bibliography of more than 900 items.

A Test of Binaural Hearing Apr 28 2021

Binaural and Spatial Hearing in Real and Virtual Environments May 10 2022 The current popular and scientific interest in virtual environments has provided a new impetus for investigating binaural and spatial hearing. However, the many intriguing phenomena of spatial hearing have long made it an exciting area of scientific inquiry. Psychophysical and physiological investigations of spatial hearing seem to be converging on common explanations of underlying mechanisms. These understandings have in turn been incorporated into sophisticated yet mathematically tractable models of binaural interaction. Thus, binaural and spatial hearing is one of the few areas in which professionals are soon likely to find adequate physiological explanations of complex psychological phenomena that can be reasonably and usefully approximated by mathematical and physical models. This volume grew out of the Conference on Binaural and Spatial Hearing, a four-day event held at Wright-Patterson Air Force Base in response to rapid developments in binaural and spatial hearing research and technology. Meant to be more than just a proceedings, it presents chapters that are longer than typical proceedings papers and contain considerably more review material, including extensive bibliographies in many cases. Arranged into topical sections, the chapters represent major thrusts in the recent literature. The authors of the first chapter in each section have been encouraged to take a broad perspective and review the current state of literature. Subsequent chapters in each section tend to be somewhat more narrowly focused, and often emphasize the authors' own work. Thus, each section provides overview, background, and current research on a particular topic. This book is significant in that it reviews the important work during the past 10 to 15 years, and provides greater breadth and depth than most of the previous works.

Impact of Binaural Beats on Heart Rate Variability Apr 16 2020 A binaural beat is an auditory illusion that occurs when each ear is listening to a tone that is slightly different from the other ear. It is theorized that listening to binaural beats increases brain activity in the frequency range corresponding to the frequency of beats presented. Hence, individuals listen to binaural beats intending to entrain their brains to experience a specific mental state.

Evaluation of a Binaural Listening System Using a Monophonic Input Sep 21 2020

Temporary Threshold Shift and Other Factors Related to the Fitting of Binaural Hearing Aids Mar 16 2020

The Challenges of Restoring Binaural Hearing Jul 12 2022

Auditory Neuroscience Jan 26 2021 An integrated overview of hearing and the interplay of physical, biological, and psychological processes underlying it. Every time we listen—to speech, to music, to footsteps approaching or retreating—our auditory perception is the result of a long chain of diverse and intricate processes that unfold within the source of the sound itself, in the air, in our ears, and, most of all, in our brains. Hearing is an "everyday miracle" that, despite its staggering complexity, seems effortless. This book offers an integrated account of hearing in terms of the neural processes that take place in different parts of the auditory system. Because hearing results from the interplay of so many physical, biological, and psychological processes, the book pulls together the different aspects of hearing—including acoustics, the mathematics of signal processing, the physiology of the ear and central auditory pathways, psychoacoustics, speech, and music—into a coherent whole.

A Comparison of Monaural and Binaural Listening in Three Levels of Ambient Noise Jun 30 2021

Clinical Topics in Hearing Aid Research Jun 18 2020 Clinical Topics in Hearing Aid Research provides a topic-driven review of modern research in hearing aids. Readers will find this text easy to understand with clear clinical messages that are easily applied to routine practice.

Binaural Speech Recognition in Noise and the Effect of Context Feb 24 2021 Abstract: Listening and understanding speech in noisy environments is a situation that many people encounter in their daily lives. This problem is exacerbated by old age or the presence of a hearing loss. The purpose of the present study was to investigate two components that contribute to successful word recognition in noise. The first component is the advantage of binaural over monaural listening and the second is the role of contextual cues. Ten normal hearing young adults aged 20-24 years old participated. Sentences from the Speech Perception in Noise (SPIN) test were presented to the subject through insert ear phones simultaneously with multitalker babble as background noise under three conditions: 1) noise and signal presented to the right ear, 2) noise and signal presented to the left ear, and 3) noise and signal presented to both the left and right ears. The subject was told to repeat the last word in each sentence and the responses were scored as correct or incorrect. Results show that subjects perform better on word recognition tasks in the binaural listening condition versus the monaural listening conditions. Performance was also better with high predictability sentences in which the context can be useful for word recognition. Literature has shown that older adults also rely on context for word recognition, so it can be expected that for the older adults who are hard of hearing word recognition would be most successful when listening with two ears and when presented with high contextual information.

Robust Binaural Noise-reduction Strategies with Binaural-hearing-aid Constraints Nov 11 2019 The objective of the dissertation research is to investigate noise reduction methods for binaural hearing aids based on array and statistical signal processing and inspired by a human auditory model. In digital hearing aids, wide dynamic range compression (WDRC) is the most successful technique to deal with monaural hearing losses. This WDRC processing is usually performed after a monaural noise reduction algorithm. When hearing losses are present in both ears, i.e., a binaural hearing loss, independent monaural hearing aids have been shown not to be comfortable for most users, preferring a processing that involves synchronization between both hearing devices. In addition, psycho-acoustical studies have identified that under hostile environments, e.g., babble noise at very low SNR conditions, users prefer to use linear amplification rather than WDRC. In this sense, the noise reduction algorithm becomes an important component of a digital hearing aid to provide improvement in speech intelligibility and user comfort. Including a wireless link between both hearing aids offers new ways to implement more efficient methods to reduce the background noise and coordinate processing for the two ears. This approach, called binaural hearing aid, has been recently introduced in some commercial products but using very simple processing strategies. This research analyzes the existing binaural noise-reduction techniques, proposes novel perceptually-inspired methods based on blind source separation (BSS) and multichannel Wiener filter (MWF), and identifies different strategies for the real-time implementation of these methods. The proposed methods perform efficient spatial filtering, improve SNR and speech intelligibility, minimize block processing artifacts, and can be implemented in low-power architectures.

Binaural Hearing; a Working Bibliography for Investigation of the Efficiency of Binaural Listening Among the Hearing Impaired Jan 18 2023

A Theory of Binaural Hearing Aug 01 2021

Binaural Hearing Dec 17 2022 The field of Binaural Hearing involves studies of auditory perception, physiology, and modeling, including normal and abnormal aspects of the system. Binaural processes involved in both sound localization and speech unmasking have gained a

broader interest and have received growing attention in the published literature. The field has undergone some significant changes. There is now a much richer understanding of the many aspects that comprising binaural processing, its role in development, and in success and limitations of hearing-aid and cochlear-implant users. The goal of this volume is to provide an up-to-date reference on the developments and novel ideas in the field of binaural hearing. The primary readership for the volume is expected to be academic specialists in the diverse fields that connect with psychoacoustics, neuroscience, engineering, psychology, audiology, and cochlear implants. This volume will serve as an important resource by way of introduction to the field, in particular for graduate students, postdoctoral scholars, the faculty who train them and clinicians.

The Effects of Binaural Amplification on the Speech Discrimination Performance of Normal Hearing Subjects Mar 08 2022

The Perceived Benefits of Binaural Listening in Cochlear Implant Recipients with and Without a Hearing Aid in the Opposite Ear Oct 15 2022

Hearing Dec 25 2020 Hearing: An Introduction to Psychological and Physiological Acoustics is concerned with the physiology and psychophysics of audition. It aims to introduce the new student to the sciences of hearing and to rekindle the interests of the experienced reader. The book begins with an overview of the auditory system. This is followed by separate chapters on theories of hearing; the routes over which sound is conducted to the inner ear; the cochlear mechanism; the auditory nerve and pathways; and psychoacoustic methods. Subsequent chapters cover the theory of signal detection; how sensitivity for one sound is affected by the presence of another sound; loudness; pitch; aspects of binaural hearing; and speech perception. This book provides both an introduction and a broad overview of the field of hearing science for the advanced undergraduate student or the postgraduate student in such disciplines as audiology and psychology. It should be an extremely useful guide to these students, as well as to those researchers who wish to refresh their knowledge of the field beyond their areas of specialization.

Binaural Effects in Normal and Impaired Hearing Dec 05 2021

The Technology of Binaural Understanding Apr 09 2022 Sound, devoid of meaning, would not matter to us. It is the information sound conveys that helps the brain to understand its environment. Sound and its underlying meaning are always associated with time and space. There is no sound without spatial properties, and the brain always organizes this information within a temporal–spatial framework. This book is devoted to understanding the importance of meaning for spatial and related further aspects of hearing, including cross-modal inference. People, when exposed to acoustic stimuli, do not react directly to what they hear but rather to what they hear means to them. This semiotic maxim may not always apply, for instance, when the reactions are reflexive. But, where it does apply, it poses a major challenge to the builders of models of the auditory system. Take, for example, an auditory model that is meant to be implemented on a robotic agent for autonomous search-&-rescue actions. Or think of a system that can perform judgments on the sound quality of multimedia-reproduction systems. It becomes immediately clear that such a system needs • Cognitive capabilities, including substantial inherent knowledge • The ability to integrate information across different sensory modalities To realize these functions, the auditory system provides a pair of sensory organs, the two ears, and the means to perform adequate preprocessing of the signals provided by the ears. This is realized in the subcortical parts of the auditory system. In the title of a prior book, the term Binaural Listening is used to indicate a focus on sub-cortical functions. Psychoacoustics and auditory signal processing contribute substantially to this area. The preprocessed signals are then forwarded to the cortical parts of the auditory system where, among other things, recognition, classification, localization, scene analysis, assignment of meaning, quality assessment, and action planning take place. Also, information from different sensory modalities is integrated at this level. Between sub-cortical and cortical regions of the auditory system, numerous feedback loops exist that ultimately support the high complexity and plasticity of the auditory system. The current book concentrates on these cognitive functions. Instead of processing signals, processing symbols is now the predominant modeling task. Substantial contributions to the field draw upon the knowledge acquired by cognitive psychology. The keyword Binaural Understanding in the book title characterizes this shift. Both books, The Technology of Binaural Listening and the current one, have been stimulated and supported by AABBA, an open research group devoted to the development and application of models of binaural hearing. The current book is dedicated to technologies that help explain, facilitate, apply, and support various aspects of binaural understanding. It is organized into five parts, each containing three to six chapters in order to provide a comprehensive overview of this emerging area. Each chapter was thoroughly reviewed by at least two anonymous, external experts. The first part deals with the psychophysical and physiological effects of Forming and Interpreting Aural Objects as well as the underlying models. The fundamental concepts of reflexive and reflective auditory feedback are introduced. Mechanisms of binaural attention and attention switching are covered—as well as how auditory Gestalt rules facilitate binaural understanding. A general blackboard architecture is introduced as an example of how machines can learn to form and interpret aural objects to simulate human cognitive listening. The second part, Configuring and Understanding Aural Space, focuses on the human understanding of complex three-dimensional environments—covering the psychological and biological fundamentals of auditory space formation. This part further addresses the human mechanisms used to process information and interact in complex reverberant environments, such as concert halls and forests, and additionally examines how the auditory system can learn to understand and adapt to these environments. The third part is dedicated to Processing Cross-Modal Inference and highlights the fundamental human mechanisms used to integrate auditory cues with cues from other modalities to localize and form perceptual objects. This part also provides a general framework for understanding how complex multimodal scenes can be simulated and rendered. The fourth part, Evaluating Aural-scene Quality and Speech Understanding, focuses on the object-forming aspects of binaural listening and understanding. It addresses cognitive mechanisms involved in both the understanding of speech and the processing of nonverbal information such as Sound Quality and Quality-of- Experience. The aesthetic judgment of rooms is also discussed in this context. Models that simulate underlying human processes and performance are covered in addition to techniques for rendering virtual environments that can then be used to test these models. The fifth part deals with the Application of Cognitive Mechanisms to Audio Technology. It highlights how cognitive mechanisms can be utilized to create spatial auditory illusions using binaural and other 3D-audio technologies. Further, it covers how cognitive binaural technologies can be applied to improve human performance in auditory displays and to develop new auditory technologies for interactive robots. The book concludes with the application of cognitive binaural technologies to the next generation of hearing aids.

Some Measures of Listening Abilities of Experienced Binaural Hearing Aid Users Aug 13 2022

Binaural Interference Sep 14 2022 Binaural interference occurs when the speech input to one ear interferes with the input to the other ear during binaural stimulation. The first published study on binaural interference twenty-five years ago demonstrated that some individuals, particularly older individuals, perform more poorly with two hearing aids than with one and/or more poorly with binaural than monaural stimulation on electrophysiologic as well as behavioral measures. Binaural interference is relevant to every audiologist because it impacts the successful use of binaural hearing aids and may explain communicative difficulty in noise or other challenging listening situations in persons with normal-hearing sensitivity as well as persons with hearing loss. This exciting new book written by two highly respected audiologists first traces the history of its study by researchers, then reviews the evidence, both direct and indirect, supporting its reality. This is followed by a

discussion of the possible causes of the phenomenon and in-depth analysis of illustrative cases. The authors outline a systematic approach to the clinical detection, evaluation and amelioration of individuals who exhibit binaural interference. Suggestions are furnished on improved techniques for evaluation of the binaural advantage in general and on sensitized detection of the disorder in particular. The book ends with recommendations for future directions. Given the adverse impact of binaural interference on auditory function and its occurrence in a significant subset of the population with hearing loss, as well as in some individuals with normal-hearing sensitivity, research on binaural interference only recently has begun to flourish, and adaptation of audiologic clinical practice to identify, assess, and manage individuals with binaural interference has yet to become widespread. The authors intend for the book to provide impetus for pursuing further research and to encourage audiologists to explore the possibility of binaural interference when patient complaints suggest it and when performing audiologic evaluations. The book is intended for practicing clinical audiologists, audiology students, and hearing scientists.
Physiology and Psychophysics of Binaural Hearing Jul 20 2020
The Combined Effects of Binaural Hearing and Rerverberation on Speech Intelligibility in Noise Nov 23 2020
The Influence of Interaural Asymmetries on Binaural Hearing Benefits in Adults with Cochlear Implants Jun 11 2022 Binaural hearing gives rise to important spatial hearing abilities, including sound localization and segregation of speech from noise. Individuals with severe-to-profound hearing loss in one ear who receive a unilateral cochlear implant (SSD-CI), and individuals with severe-to-profound hearing loss in both ears who receive bilateral cochlear implants (BiCIs) experience reduced benefits of binaural hearing compared to normal hearing (NH) listeners, making it difficult for many patients to communicate in the complex acoustic environments frequently encountered in daily life. However, the implications of hearing loss are not limited to behavioral performance. Successful communication requires mental resources, including engagement of attentional mechanisms and listening effort. Individuals with hearing loss frequently report elevated listening effort compared to individuals with normal hearing, which is associated with adverse outcomes including stress, fatigue, and social withdrawal. Therefore, it is imperative to investigate factors limiting binaural benefits and contributing to elevated listening effort in CI patients. Binaural hearing relies on the successful integration of information across ears. Thus, interaural asymmetries in the delivery and encoding of information have the potential to limit binaural hearing abilities in CI patients. BiCI patients can experience interaural asymmetries due to pathological and surgical factors, and SSD-CI patients have inherent interaural asymmetry due to the difference in signal fidelity between acoustic and electric hearing. The overarching goal of this dissertation was to investigate the effect of across-ear asymmetries on binaural hearing outcomes in CI patients. The studies described in the subsequent chapters provide important insight into the amount of listening effort exerted by individuals with SSD and BiCIs in various listening conditions, elucidate potential mechanisms limiting binaural unmasking benefit in BiCI patients, and explore a novel avenue for the objective assessment of binaural fusion.
Factors Affecting Binaural Unmasking in Listeners with Cochlear Implants Dec 13 2019 Many listeners with bilateral cochlear implants show sensitivity to binaural information when stimulation is provided with single electrodes in both ears. However, there is wide variability in binaural hearing performance with single-electrode stimulation, and performance with multi-electrode stimulation can degrade relative to performance with single-electrode stimulation. Two studies were conducted to further our understanding of the binaural hearing performance of listeners with cochlear implants. In Study 1, binaural unmasking i.e., the improvement in signal detection between diotic and dichotic stimulus conditions, was examined in children with bilateral cochlear implants. Diotic and dichotic signal detection thresholds with multi-electrode stimulation, using three electrode-pairs (three electrodes in each ear) spaced widely along the electrode array, were examined relative to performance with each of the three electrode-pairs individually. Of interest was whether multi-electrode performance was better or worse than the best single-electrode performance. Additionally, Study 1 sought to determine whether interaural time difference sensitivity is advantageous for binaural unmasking in listeners with cochlear implants by comparing the magnitude of binaural unmasking between children who showed interaural time difference sensitivity and those who did not show interaural time difference sensitivity. In Study 2, the relationship between binaural and monaural hearing performance was examined in adults with cochlear implants using single-electrode stimulation. It was hypothesized that binaural sensitivity is affected by characteristics at the auditory periphery and may show a relationship with monaural hearing performance. Binaural measures including dichotic signal detection and interaural time difference discrimination were examined. Monaural measures including dynamic range and amplitude modulation detection, were obtained in each ear. In addition, differences in loudness growth between ears were examined in relationship to dichotic signal detection, to investigate whether asymmetries in loudness growth interfere with processing of binaural information in stimuli which vary in intensity over time. These two studies attempted to improve understanding the binaural hearing performance of listeners with cochlear implants with both single- and multi-electrode stimulation. A greater understanding of binaural hearing performance of listeners with cochlear implants may lead to interventions which allow listeners with cochlear implants to receive greater advantages from binaural hearing.
A Study of Binaural Hearing Aid Performance Aug 21 2020
Impact of Head-Tracking on the Listening Experience of Binaural Music Feb 13 2020
A Contribution to the Study of Binaural Hearing Mar 28 2021
Models of Binaural Hearing for Sound Lateralisation and Localisation Sep 02 2021

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