Navigating Timbre: Locomotion as Epistemic Practice in Immersive Acoustic Environments

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Abstract

Contemporary audio visualization technologies predominantly reduce sound to amplitude-based representations, obscuring the multidimensional complexity of timbre. This paper examines "Inside Sound," a room-scale virtual reality installation that transforms spectral audio analysis into navigable three-dimensional space, proposing that physical locomotion through acoustic data constitutes a distinct mode of sonic knowledge. Drawing on Gibson's ecological approach to perception and theories of embodied cognition (Clark, 1997; Varela et al., 1991), this work argues that walking through constellations of spectral features (Spectral Centroid, Flux, and Spread) reconfigures the epistemological relationship between listener and sound object. Rather than passive audition, participants engage in what we term "navigational listening," where the body becomes an instrument of timbral analysis. This paper investigates how the transposition of typically invisible acoustic properties into spatial affordances challenges conventional distinctions between listening and looking, creating what we characterize as an "inverted synesthesia." The analysis reveals implications for sound studies, immersive experience design, and accessibility, arguing that spatial navigation offers cognitive access to sonic dimensions otherwise restricted to computational or expert musical listening.

Keywords: embodied cognition, timbre, virtual reality, ecological perception, navigational epistemology, sound studies

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Introduction

The history of representing sound visually is marked by a progressive reduction of acoustic complexity. From oscilloscopes to contemporary digital audio workstations, visualization paradigms have consistently privileged amplitude, the loudness of sound, over timbre, the multidimensional quality that distinguishes a flute from a violin playing the same pitch. This reductive tendency reflects both technical constraints and perceptual assumptions: amplitude maps cleanly onto visual intensity, while timbre's spectral complexity resists straightforward graphic translation.

Yet timbre constitutes what acoustician John Grey described as the "primary vehicle of musical expression" (Grey, 1977), encoding information about sound sources, production mechanisms, and acoustic environments. When we recognize a friend's voice or identify an approaching vehicle by engine sound, we rely on timbral discrimination. Computational audio analysis has developed methods for quantifying timbral features, including Spectral Centroid (brightness), Spectral Flux (rate of change), and Spectral Spread (frequency distribution), yet these remain largely inaccessible to non-expert listeners except through specialized visualization interfaces that demand trained interpretation.

"Inside Sound" proposes an alternative: making spectral analysis physically navigable. Rather than viewing timbral data as graphs or spectrograms, participants walk through room-scale virtual environments where each point in three-dimensional space represents a moment in time analyzed through computational timbral metrics. This design raises a direct question: does physical locomotion through acoustic data constitute a mode of knowledge distinct from both passive listening and visual analysis?

Figure 1
Conceptual Visualization of Timbral Space as Navigable Particle Constellation

Note. Each luminous point represents a moment in time analyzed through spectral features, creating an acoustic constellation that participants can physically explore.

This paper argues that it does. Drawing on James Gibson's ecological approach to perception (Gibson, 1979) and contemporary theories of embodied cognition (Clark, 1997; Varela et al., 1991), we propose that navigational engagement with spectral data creates what we term an "epistemic affordance structure," a configuration where knowledge emerges through bodily movement rather than contemplative observation. In doing so, the installation inverts the conventional synesthetic relationship: instead of "seeing sounds," participants "navigate timbre," transforming invisible acoustic properties into spatial features that solicit bodily exploration.

The analysis proceeds in four movements. First, we situate the work within existing approaches to audio visualization and immersive sound art, identifying the gap between computational audio analysis and embodied sonic experience. Second, we develop a theoretical framework for understanding navigation as an epistemic practice, drawing on ecological perception and phenomenology. Third, we examine how "Inside Sound" instantiates this framework through specific design choices regarding spatial mapping, gestural interaction, and temporal navigation. Finally, we consider broader implications for sound studies, accessibility, and the design of immersive cognitive environments.

From Visualization to Navigation: Rethinking Audio Representation

The Amplitude Paradigm and Its Limits

Audio visualization technologies have evolved since their origins in analog oscilloscopes, yet they remain largely bound to what we might call the "amplitude paradigm." Whether in professional audio software like Pro Tools or consumer applications like Spotify's visualizers, the dominant approach maps sound amplitude onto visual intensity, brightness, or geometric scale. This design choice reflects both the historical development of audio technology, where volume control was the primary manipulation affordance, and perceptual assumptions about cross-modal correspondence between loudness and brightness.

Psychoacoustic research demonstrates, however, that amplitude represents only one dimension of auditory experience. Timbre, variously defined as the quality that distinguishes sounds of equal loudness and pitch, encompasses spectral envelope, temporal evolution, and harmonic structure (McAdams & Bigand, 1993). These properties carry precise information: a saxophone's "breathy" quality derives from noise in its spectral profile; a piano's percussive attack creates its characteristic temporal envelope; a violin's vibrato manifests as periodic frequency modulation. Reducing these multidimensional phenomena to amplitude visualization is akin to representing a painting solely through its average brightness.

Contemporary audio analysis software has developed visualization techniques for spectral content: spectrograms, Mel-frequency cepstral coefficients (MFCCs), and wavelet transforms. Yet these representations demand specialized training to interpret. A spectrogram's vertical axis represents frequency, its horizontal axis time, and color intensity typically indicates amplitude at specific frequency bands. Reading this representation requires translating visual patterns into sonic meanings: horizontal lines indicate sustained tones, vertical strikes suggest percussive attacks, and diagonal sweeps represent glissandi. This translation is learned, not immediate, accessible primarily to sound engineers and researchers.

Immersive Sound Art and Spatial Audio

Parallel developments in sound art have explored spatial approaches to sonic experience, though typically emphasizing acoustic space rather than timbral space. Works like Janet Cardiff's "The Forty Part Motet" (2001) or Ryoji Ikeda's "data.tron" series create immersive environments where listeners navigate through distributed sound sources. These installations demonstrate that physical movement can alter sonic experience, not merely by changing the mix of sounds one hears, but by creating what Brandon LaBelle terms “acoustic territories” (LaBelle, 2006) that invite active exploration rather than passive reception.

Such works, however, generally maintain a conventional relationship between physical space and sonic space: sounds emanate from specific locations, and moving changes what one hears through proximity and acoustic propagation. “Inside Sound” proposes something different: the space itself represents timbral properties rather than source locations. Each coordinate in the virtual environment corresponds not to where a sound is produced but to what that sound is, its spectral character at a specific moment in time.

This shift has precedent in data sonification and visualization practices that map abstract data to spatial or sensory dimensions. Works like Rebecca Fiebrink's “Sonic Mapping Project” or Natasha Barrett's “Isostasie” translate environmental or scientific data into sound. Yet these typically maintain a unidirectional flow: data becomes sound, which is then heard. “Inside Sound” proposes bidirectional engagement: spectral analysis generates spatial structure, which participants then navigate, creating a feedback loop between acoustic properties and embodied movement.

The Question of Epistemic Access

This review reveals a gap between two modes of engaging with timbral complexity. On one hand, computational analysis provides precise quantification of spectral features but presents them through representations requiring technical expertise to interpret. On the other hand, immersive sound art creates embodied sonic experiences but typically maintains conventional relationships between space and sound. Neither approach fully addresses how non-expert listeners might develop intuitive, embodied understanding of timbral structure.

The question driving “Inside Sound” is whether physical navigation can bridge this gap, whether walking through spectral data might constitute a form of knowledge that is neither purely analytical nor merely experiential, but rather what philosopher Alva Noë calls “sensorimotor knowledge” (Noë, 2004): understanding grounded in the coordination of perception and action.

Theoretical Framework: Navigation as Epistemic Practice

Gibson's Ecological Approach and Direct Perception

James Gibson's ecological approach to visual perception (Gibson, 1979) provides theoretical grounding for understanding navigation as knowledge production. Gibson challenged the then-dominant view of perception as mental construction from impoverished sensory data, arguing instead that perception is direct: organisms perceive affordances, action possibilities offered by environmental structures, without requiring inferential processing.

A staircase affords climbing to an able-bodied adult but presents an obstacle to a wheelchair user or a crawling infant. This affordance is not a property of the stairs alone nor of the perceiver alone, but of the relationship between the two. Perceiving affordances requires movement: we discover what surfaces afford by exploring them through locomotion and manipulation.

Applied to “Inside Sound,” Gibson's framework suggests that spectral constellations afford specific navigational actions: approaching bright timbres, retreating from harsh ones, circling around unstable spectral flux. These affordances are not symbolic representations requiring interpretation but environmental structures that directly specify action possibilities. The question becomes: what kind of knowledge emerges from exploring such affordances?

Embodied Cognition and Enactive Knowing

Contemporary embodied cognition theory extends Gibson's insights, arguing that cognition itself emerges from sensorimotor engagement rather than preceding it (Clark, 1997; Varela et al., 1991). On this view, knowing is not passive reception of information but active engagement with environmental structures through bodily action. Varela, Thompson, and Rosch's concept of “enaction” emphasizes that cognitive structures arise from recurrent sensorimotor patterns, what Lakoff and Johnson term “image schemas” (Lakoff & Johnson, 1999).

Consider how we understand containment: not through abstract logical rules but through embodied experiences of being in rooms, putting objects in boxes, seeing liquids in containers. This sensorimotor understanding then structures how we think about abstract domains. We speak of being “in love,” ideas being “in” our heads, or arguments having “content.”

Applied to timbral navigation, this suggests that moving through spectral space might create embodied understanding of timbre's relational structure. Rather than learning that high Spectral Centroid indicates brightness through verbal instruction, participants might develop direct sensorimotor knowledge: approaching points high in the vertical dimension correlates with hearing brighter timbres. This is not symbolic knowledge about timbre but practical knowledge of how timbral variation structures navigable space.

Phenomenology of Spatial Sound

Maurice Merleau-Ponty's phenomenology of perception offers additional perspective, particularly his analysis of how space is constituted through bodily possibility rather than geometric abstraction (Merleau-Ponty, 1945/2012). For Merleau-Ponty, space is not an empty container awaiting objects but a structured field of potential actions. We experience “up” as the direction from which objects might fall, “near” as within reach, “far” as requiring locomotion.

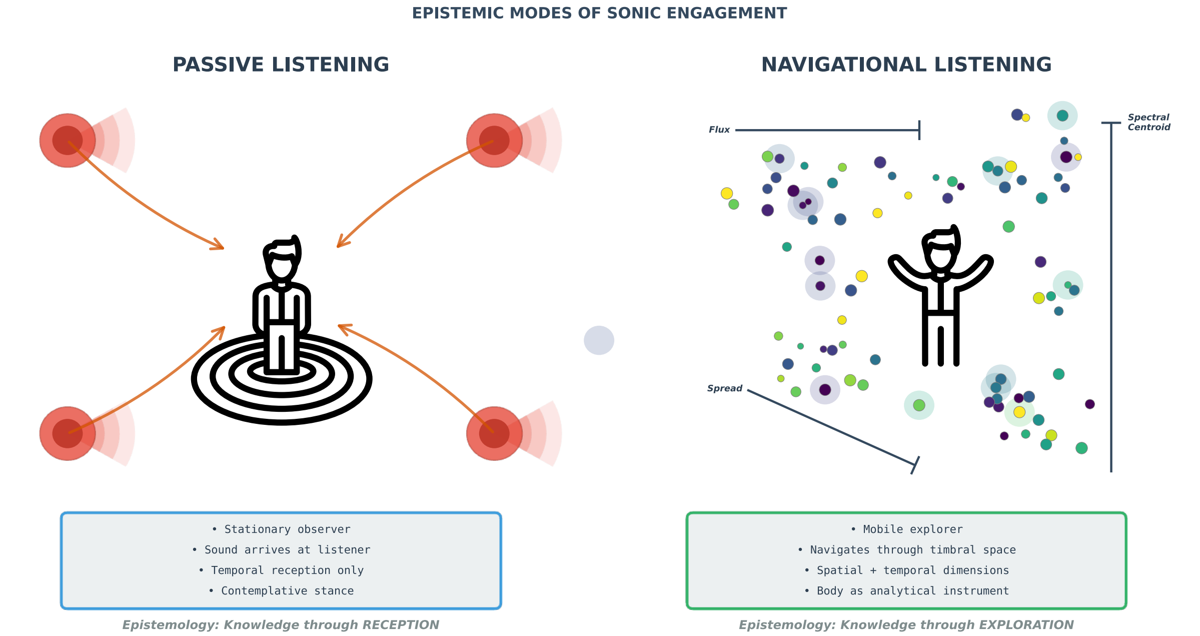
This phenomenological insight becomes salient when considering how “Inside Sound” creates what we might term “timbral spatiality,” a configuration where spectral relationships structure navigational possibilities. High Spectral Centroid is not merely represented as “up” on an arbitrary axis; it becomes literally above, requiring upward navigation. Spectral Flux's rate of change manifests as depth, requiring forward or backward movement. Spectral Spread's distribution appears as breadth, demanding lateral exploration.

This spatialization is not arbitrary mapping but creates what Don Ihde calls a “technological mediation” (Ihde, 1990) that reorganizes perceptual relationships. Just as eyeglasses make the distant near or telescopes bring celestial bodies into viewing range, “Inside Sound” makes invisible spectral properties accessible to bodily navigation. The question is whether this accessibility constitutes genuine epistemic access or merely novel experience.

The Concept of Navigational Listening

Synthesizing these theoretical resources, we propose the concept of "navigational listening," a mode of auditory engagement where sonic knowledge emerges through the coupling of bodily movement and acoustic perception. This differs from conventional listening in four key respects.

Figure 2
Epistemic Modes of Sonic Engagement



Note. Left: passive listening positions the auditor as stationary receiver of sonic information arriving from distributed sources. Right: navigational listening transforms the listener into mobile explorer moving through timbral space structured by spectral features (Centroid, Flux, Spread), where the body becomes an instrument of acoustic analysis.

First, it is inherently active rather than passive. Traditional listening positions the auditor as relatively stationary recipient of sonic information. Navigational listening requires continuous decision-making about where to move next, creating what Shaun Gallagher calls "motor intentionality" (Gallagher, 2005): purposive action that precedes reflective thought.

Second, it is inherently relational. Rather than focusing on individual sounds in isolation, navigational listening reveals how sounds relate to each other through spatial proximity. Timbres that are spectrally similar cluster together; abrupt timbral changes create navigational gaps. This relational structure becomes directly perceptible through movement patterns required to traverse the space.

Third, it creates proprioceptive anchoring for abstract concepts. Spectral Centroid becomes associated with vertical ascent and descent; Spectral Flux with forward and backward motion; Spectral Spread with lateral breadth. These associations are not merely metaphorical but grounded in sensorimotor experience, what cognitive linguists call "experiential basis" for abstract thought (Lakoff & Johnson, 1999).

Finally, navigational listening enables discovery through exploration. Rather than being told what to notice, participants discover timbral patterns by wandering: encountering bright clusters, traversing regions of rapid spectral change, or noticing how certain sounds create dense constellations while others produce sparse distributions. This discovery-based learning aligns with constructivist educational theory (Papert, 1980), where understanding emerges from active exploration rather than passive reception.

Inside Sound: Instantiating Navigational Epistemology

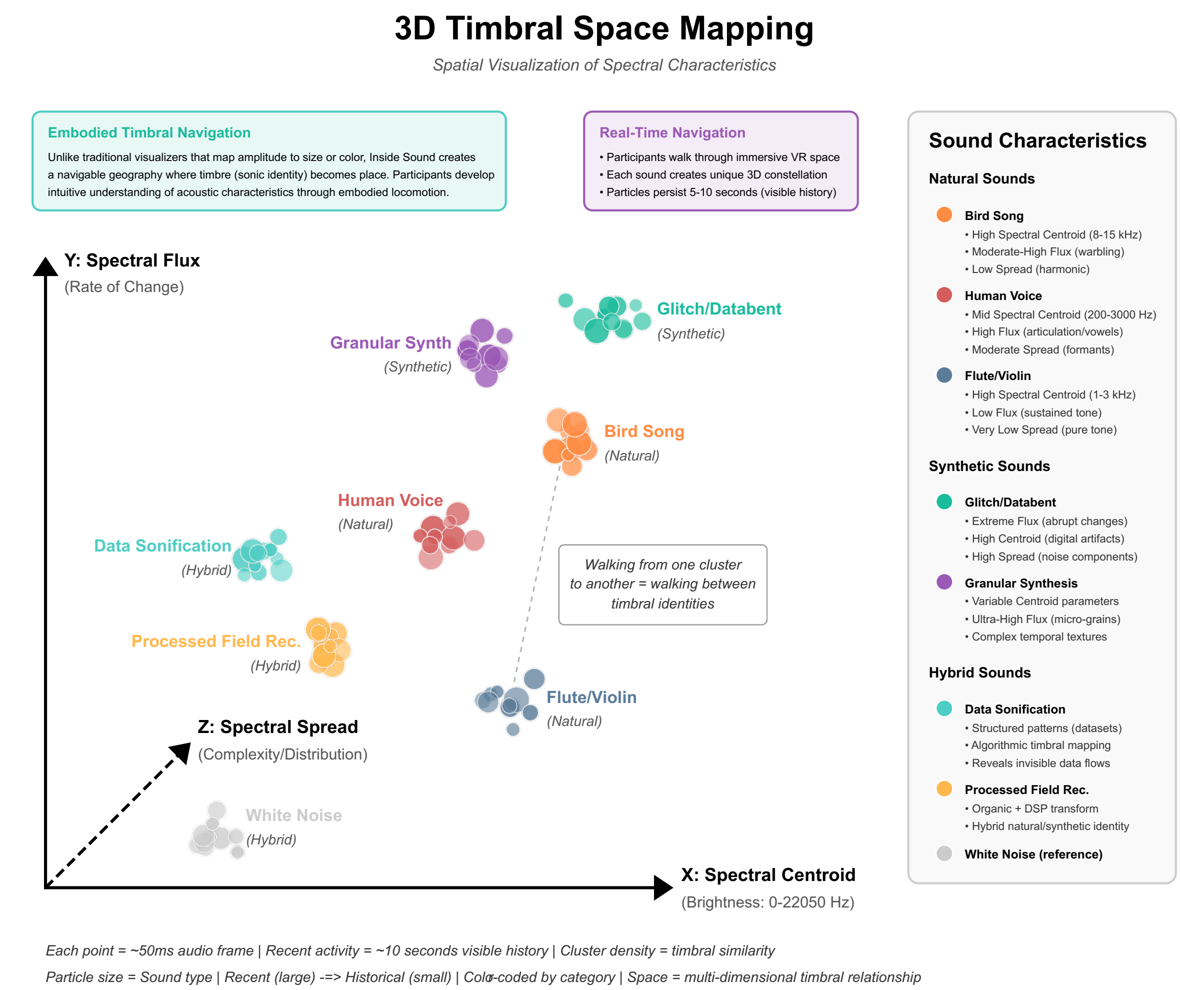
Spatial Mapping as Epistemic Infrastructure

“Inside Sound” materializes the concept of navigational listening through specific design choices that transform spectral analysis into spatial affordances. The operation maps three dimensions of timbral variation onto three dimensions of navigable space.

The vertical axis (Y) carries Spectral Centroid, the center of mass of the spectrum, commonly understood as brightness. High Centroid values appear elevated, requiring upward navigation; low Centroid values settle toward ground level. The depth axis (Z) carries Spectral Flux, measuring the rate of spectral change between consecutive analysis frames. Rapidly changing timbres recede into depth; stable timbres remain proximate. The lateral axis (X) carries Spectral Spread, quantifying the distribution of spectral energy across frequency bands. Concentrated spectra cluster centrally; diffuse spectra sprawl laterally.

Figure 3

Three-Dimensional Timbral Space Mapping



Note. Spectral characteristics (Centroid, Flux, Spread) create navigable acoustic constellations spanning natural sources (bird song, human voice, acoustic instruments), synthetic textures (glitch/databending, granular synthesis), and hybrid compositions (data sonification, processed field recordings), revealing the expanded timbral palette accessible through navigational engagement.

This mapping is not arbitrary. The vertical dimension exploits what George Lakoff identifies as the “MORE IS UP” conceptual metaphor (Lakoff & Johnson, 1980), grounding the abstract notion of spectral brightness in the concrete experience of elevation. The depth dimension leverages the perceptual principle that moving objects appear to approach or recede, creating intuitive correspondence between spectral change and spatial distance. The lateral dimension utilizes the embodied understanding of spread and concentration: tightly clustered objects versus distributed arrays.

These mappings create what J.J. Gibson termed a “layout,” a persistent spatial structure that remains stable across time. While the specific sounds change and new analysis points continuously appear, the relationship between spectral properties and spatial coordinates persists. Bright timbres always appear elevated; rapidly changing sounds always recede. This stability enables participants to develop sensorimotor expectations: approaching an elevated point anticipates encountering brightness; moving forward anticipates confronting spectral change.

Temporal Navigation and the Star-Trail Effect

A key design element addresses the temporal dimension of sound: how to represent the continuous flow of acoustic events in a spatial medium. “Inside Sound” employs what we call the “star-trail effect”: recent analysis points glow brightly and connect through luminous trails, while older points fade into darkness. This creates a visual history of acoustic evolution, similar to long-exposure photography of celestial motion.

This temporal visualization serves three epistemic functions. First, it makes visible the temporal patterns of spectral change: rapid sequences create dense trails, while stable timbres produce sparse, disconnected points. Second, it enables participants to trace spectral evolution backward, discovering how current timbral configurations emerged from previous states. Third, it creates anticipatory structures: trailing patterns suggest probable future trajectories, though the actual unfolding may deviate.

The metaphorical choice of stellar navigation is deliberate. Just as ancient navigators used constellations to orient themselves spatially, participants use spectral constellations to orient themselves timbrally. The night sky becomes a conceptual model for understanding how discrete analysis moments cluster into recognizable patterns, what we might term “timbral constellations.”

Gestural Interaction and Agency

While navigation provides the primary mode of engagement, “Inside Sound” supplements locomotion with hand gestures enabling participants to switch audio sources, manipulate playback time, and select different spectral feature combinations. These interactions establish epistemic agency: the capacity to formulate questions and test hypotheses about timbral structure.

Consider the ability to switch between audio sources drawn from three categories: natural (bird songs, human voice), synthetic (glitch textures, granular synthesis), and hybrid (data sonification, processed field recordings). This enables comparative analysis grounded in bodily movement: participants might discover that bird songs create vertical oscillations (corresponding to pitch modulations in Spectral Centroid) while glitch textures produce chaotic, widely distributed patterns. Such discoveries are not delivered through explanation but emerge from exploratory navigation.

Similarly, temporal manipulation (scrubbing through audio, slowing or accelerating playback) enables hypothesis testing. If a participant notices dense clustering in one region, they can slow time to examine whether this density arises from many similar timbres or rapid repetition of a single timbral type. This transforms navigation from passive observation into active inquiry.

The capacity to reconfigure which spectral features map to which spatial dimensions further enhances epistemic flexibility. By swapping Centroid and Flux mappings, participants can discover whether patterns they attributed to brightness actually arise from spectral change rates. This comparative navigation reveals that timbral structure is not unitary but emerges from the interaction of multiple spectral dimensions.

Inverted Synesthesia: From Seeing Sound to Navigating Timbre

Traditional synesthesia describes experiences where stimulation of one sensory modality triggers automatic perception in another: hearing colors or seeing sounds. Audio visualization technologies create what we might call "artificial synesthesia," deliberately mapping acoustic parameters onto visual dimensions. "Inside Sound" proposes something different: what we term "inverted synesthesia."

Rather than making sounds visible, the installation makes spectral properties navigable. The inversion replaces visual perception with proprioceptive and kinesthetic modalities. Participants do not primarily see timbre; they feel it through the effort of ascent when approaching bright sounds, the bodily rotation required to examine lateral spectral spread, the forward lean into regions of rapid change.

This inversion has implications beyond interface design. Vision operates at a distance, enabling observation without engagement. Proprioception and kinesthesis are inherently involved: one cannot perceive one's own movements without making them. By grounding timbral knowledge in these embodied modalities, "Inside Sound" shifts sonic understanding from observational to participatory.

This approach also addresses accessibility considerations often overlooked in audio visualization. Conventional spectrograms or waveforms serve primarily sighted users with technical training. Navigational engagement potentially opens alternative pathways to timbral understanding for blind and low-vision participants who excel at spatial navigation through auditory and haptic cues. While current VR technology remains predominantly visual, the underlying design principle (making abstract properties navigable rather than merely visible) suggests future implementations through haptic interfaces or auditory depth cues.

Discussion: Implications and Limitations

Epistemological Claims and Challenges

The central claim of this analysis, that navigation constitutes genuine epistemic access to timbral structure, faces important challenges. Skeptics might argue that what appears to be knowledge is merely novel experience: participants enjoy walking through spectral visualizations but do not actually learn about timbre in ways that transfer to conventional listening contexts.

This challenge demands empirical investigation beyond the scope of this theoretical analysis. Three considerations, however, support the stronger epistemological claim. First, educational research on embodied learning demonstrates that sensorimotor engagement can facilitate conceptual understanding (Abrahamson & Lindgren, 2014). Students who physically enact mathematical relationships show improved problem-solving compared to those receiving only symbolic instruction.

Second, research on spatial cognition reveals that navigational knowledge often proves more robust and transferable than declarative knowledge (Meilinger, 2008). We remember routes we have walked better than routes we have read about; we understand building layouts we have explored more deeply than those we have studied through floor plans.

Third, the concept of "instrumental understanding" from musical cognition suggests that bodily engagement with sonic structures can create knowledge distinct from both acoustic analysis and passive listening (Windsor & de Bézenac, 2012). Musicians know musical intervals not merely by hearing them but through the bodily gestures required to produce them. "Inside Sound" proposes that similar instrumental understanding might extend to spectral properties through navigational gestures.

Implications for Sound Studies

This work contributes to sound studies' ongoing interrogation of listening practices and sonic epistemologies. Recent scholarship has examined how different technological mediations, from stethoscopes to sonograms, create distinct modes of sonic knowing (Kassabian, 2013; Sterne, 2003). "Inside Sound" extends this investigation by proposing that VR environments enable embodied sonic epistemologies previously unavailable.

The concept of navigational listening also challenges sound studies' implicit privileging of audition over other sensory modalities in sonic knowledge production. While scholars rightly critique ocularcentric bias in Western epistemology, simply asserting the primacy of hearing risks creating an equally limited "auralcentrism." "Inside Sound" suggests that robust sonic knowledge might emerge from multimodal integration (hearing coordinated with proprioception, vision, and kinesthesis) rather than any single sensory channel.

The work also engages ongoing debates about algorithmic listening and computational sound analysis. Critics worry that reducing sound to computable features impoverishes acoustic experience, subordinating human perception to machine logic (Miyazaki, 2012). "Inside Sound" proposes an alternative: using algorithmic analysis not to replace human listening but to create new affordances for embodied sonic exploration. The algorithm does not dictate what to hear; it structures what to navigate.

Design Implications for Immersive Environments

For practitioners creating immersive experiences, this analysis suggests three design principles. First, consider how abstract data might become not merely visible but navigable, structuring space in ways that solicit bodily exploration rather than contemplative observation. Second, attend to the temporal dimension: how can dynamic data create histories, trails, and anticipatory structures rather than presenting isolated snapshots? Third, provide agency through interaction that enables hypothesis formation and testing rather than passive reception.

More broadly, the work challenges common assumptions about VR's primary value proposition. Industry discourse often emphasizes "presence," the feeling of "being there" in virtual environments. "Inside Sound" suggests an alternative goal: creating spaces that afford new forms of knowing rather than simulating familiar experiences. The value lies not in replicating concert halls but in enabling cognitive access to properties typically invisible or abstract.

Accessibility Considerations

While current implementation relies on visual perception to observe spectral constellations, the underlying principle, making abstract properties navigable, suggests accessibility opportunities. Future iterations might employ spatial audio cues that encode proximity to high-

Centroid regions, haptic feedback indicating Spectral Spread, or auditory depth cues representing Spectral Flux. Such implementations would realize the promise of embodied access to timbral structure for blind and low-vision users.

Accessibility extends beyond sensory impairment, however. The concept of “epistemic accessibility” asks who can access particular forms of knowledge. Traditional spectral analysis requires expertise in signal processing and acoustic theory. “Inside Sound” proposes democratizing this access through embodied engagement, potentially enabling non-experts (children, musicians without technical training, curious listeners) to develop intuitive understanding of spectral structure.

This democratization has political dimensions. Jonathan Sterne argues that technologies of sonic reproduction create “listening publics” with specific capacities and limitations (Sterne, 2003). Who can meaningfully engage with spectral analysis shapes who participates in conversations about sound quality, acoustic design, and music production. By creating alternative pathways to spectral knowledge, navigational listening might reshape these publics.

Limitations and Future Directions

This analysis faces three limitations. First, it remains theoretical, requiring empirical validation through user studies examining what participants actually learn from navigational engagement. Do they develop transferable understanding of timbre? Can they identify spectral features in conventional listening contexts after training in “Inside Sound”?

Second, the work focuses on room-scale VR, requiring expensive equipment and physical space. Future research might explore how principles of navigational listening translate to other platforms: smartphone AR, web-based 3D environments, or purely auditory implementations.

Third, the current audio library, while diverse, represents limited sonic territory. Expanding to include speech, environmental sounds, or non-Western musical traditions might reveal whether current spatial mappings retain epistemic utility across broader acoustic diversity.

Finally, this analysis barely addresses the aesthetic dimensions of the experience. While focusing on epistemology, we should recognize that navigation through spectral constellations can be beautiful, meditative, or playfully exploratory. The relationship between aesthetic experience and knowledge production deserves deeper investigation.

Conclusion

“Inside Sound” proposes that making timbre navigable creates epistemic affordances unavailable through conventional listening or visual analysis. By transforming spectral audio features into spatial coordinates, the installation enables what we term “navigational listening,” knowledge emerging from the coordination of bodily movement and acoustic perception.

This approach draws on Gibson's ecological perception, embodied cognition theory, and phenomenology to argue that physical locomotion through acoustic data constitutes genuine knowledge production rather than merely a novel experience. Participants develop proprioceptive understanding of spectral relationships, discover timbral patterns through exploration, and gain intuitive access to acoustic properties typically requiring specialized technical expertise.

The broader implications extend beyond this specific installation. “Inside Sound” demonstrates how immersive technologies might create new modes of knowing that are neither purely sensory nor abstractly symbolic but emerge from the coupling of perception and action. This suggests possibilities for embodied data exploration across domains: navigating genetic sequences, walking through economic models, or exploring mathematical spaces through bodily movement.

The work also challenges conventional hierarchies in sonic epistemology. By positioning navigation alongside hearing and analysis as a legitimate mode of sonic knowing, “Inside Sound” expands our understanding of how humans can meaningfully engage with acoustic complexity. The body becomes not merely a vehicle for the listening ear but an instrument of timbral investigation in its own right.

As we develop increasingly sophisticated computational analysis of sound, from machine listening algorithms to AI-generated audio, the question of how non-experts access and understand these capabilities grows urgent. “Inside Sound” suggests that the answer might lie not in simplifying complexity but in creating embodied pathways through it. Not seeing sound or hearing data, but navigating the invisible: walking through the algorithmic spaces that increasingly mediate our sonic world.

Navigational listening represents more than an interface or artistic experiment. It proposes a rethinking of the relationship between abstract knowledge and embodied experience, suggesting that the most profound understanding emerges not from distanced observation but from bodily immersion in the very structures we seek to comprehend.

Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this work, the author used Claude (Anthropic) for language editing, drafting assistance, and formatting. The author independently conceptualized and structured the argument of this paper, all iterations on the prose across all sections, and the generation of the associated conference presentation materials (slides and speaker notes). The final manuscript was formatted in accordance with the IAFOR submission guidelines. The author has thoroughly reviewed, edited, and revised all content, taking full responsibility for the accuracy, originality, and integrity of the published work.

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