Architectural inclusivity: adaptive spaces for aural wellbeing of individuals with dissimilar sensorium

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Introduction

This paper presents research-in-progress on the potential technological enhancements for enriching aural dimensions of spatial vulnerability experiences. Through computational architecture, we seek synergies between phenomenology, mathematical models, biological systems, and design processes. Our multiple approach involves aesthetic-phenomenological and neuroscience methodologies, emphasising spatial and temporal considerations in bodily perception. We investigate technology's role in shaping positive sensory experiences, mitigating potential vulnerability in visually engaging spatial configurations.

Our findings will suggest actionable design strategies to bridge the gap between sensory diversity and spatial inclusivity. We aim to theorise relationships between non-normalised bodies, spatial design, and diverse sensory experiences, contributing to holistic environments for a broader user range.

Pilot installations and aims

A first aim of the paper is to contextualise two pilot experiential installations as platforms pursuing the field of aural adaptive spaces that we have made in Bristol: ***Space, Sound, Sensation***, and ***Facilitating ambient intelligence of acoustic atmospheres*** (Meraz 2019, Barakat 2022). They highlighted spatial features that can promote aural wellbeing experiences by exploring them with phenomenological methodologies. Our first installation was done with a performative, philosophical and artistic orientation. A second one added a pedagogical approach incorporating digital fabrication methods and testing the grounds for future systematic installations for experiential enjoyment, exploring and learning.

The second aim is to suggest the potential of technological enhancements and design strategies to make space inclusive of sensory-diverse users. On the one hand, phenomenological methodologies are outlined to explore salient dimensions offering theoretical frameworks. On the other hand, computational architecture and digital fabrication methods offer integrative synergies between mathematics, biological systems, and design processes to enhance sensory stimuli for a broader range of people.

Aural spatial phenomenology

Phenomenologically, our experience of the world emerges not simply as a matter of objective properties but as constituted by the way we perceive and interpret those properties in consciousness (Kwon 2022). When it comes to the aural experience of a space, before even having an interpretation of such an experience, several spatial features can nurture wellbeing.

- **Reverberation** refers to how sound reflects and resonates within a space.
- **Sound absorption** is the degree to which a space absorbs sound.

- **Spatial acoustics** refers to how sound travels through space and interacts with the environment.
- **Soundscapes** refer to the collection of sounds within a particular environment which can significantly impact our experience of sound.
- **Silence** can be a powerful feature in a space creating a sense of contemplation, reflection, and relaxation.

From a phenomenological perspective, these features contribute to a space that supports our subjective experience of sound and creates a sense of engagement, relaxation, and contemplation. So, how can we instrumentalise these material qualities in the design and production of space? We consider three methodologies.

An **intentional analysis** first describes and analyse subjective experiences of phenomena focusing on what consciousness is addressed to identify its noesis and noema. Aural noema and noesis will emerge as particular kinds of entities. In regards to aural perceptions, intentional analysis can be used to explore how individuals perceive and interpret sounds within a given space and over time. It explores what is approached in consciousness and the profiling of the intentional objects concretised by identifying what sound-phenomenon (noema) produces what sound-image (noesis).

The **phenomenological hermeneutic** approach follows the initial intentional analysis with various interpretation modes to understand how individuals make sense of their experiences (Eberle 2015, Schütz 1972). It explores how individuals give meaning to sounds in different spaces and times.

Finally, **ethnographic fieldwork** will involve observing and interacting with people within their ordinary environments to understand their experiences and perspectives (Kwame 2018). The ethnographic approach will be used to explore how sound is experienced and interpreted by different people in diverse anthropological, cultural and social contexts of aural experiences.

To nuance how experiences and moods can attune the perceptions of wellbeing, we distinguish between experience as a space/time-bounded phenomenon and mood as a process in which time, presentify itself, and lingers within our consciousness. So, phenomenologically, wellbeing as experience and mood are two distinct but related phenomena. Wellbeing experiences are specific and intentional acts of consciousness directed towards particular objects or phenomena that trigger that particular state. At the same time, moods are more general and pervasive affective backgrounds that attune our experience of the world as a whole as a lingering state of wellbeing in consciousness (Kiverstein 2020).

Technological enhancements

Using a neurodiversity approach, we can embrace the diversity of ways individuals experience and perceive sound. One application development of this approach would be in developing **assistive technologies for individuals with hearing impairments** (Kirjava 2022). In our case this involves using computational models designed to simulate and augment how individuals with impairments hear, taking into account the specific nature of their impairment.

This neurodiversity-inclusive approach would aim to care for **the existential authenticity of the subjective and intentional nature of aural experiences**, even in the context of technological enhancements. This approach focuses on the individual's subjectivity and the contexts in which aural experiences occur acknowledging their diversity to experience the world (Black 2022).

Another outcome of this research will be the development of **immersive sound environments**, such as virtual or augmented reality systems. This perspective would merge “authenticity and creativity” within the subjective and intentional nature of aural experiences, in a highly immersive environment.

So, phenomenologically exploring aural experiences with technological enhancements involves acknowledging and embracing the diversity of ways individuals live the world of sound. With a phenomenological perspective, our approach aims to care for the authenticity of the subjective and intentional nature of aural experiences without hindering the creativity and participation of the listener, even in contexts of sophisticated technological enhancements.

Moving forward inclusivity and mental health

As we anticipate moving forward, we suggest two **design strategies to make space inclusive of sensory-diverse users** in the **design processes** to assist in enhancing positive sensory stimuli, such as perceptions of wellbeing, for a broader range of people. Here we outline just two among other design strategies that can be employed to create sensorial inclusive spaces:

- **multisensory design** involves creating spaces that stimulate and engage multiple senses. This design approach can benefit individuals with sensory impairments, such as those with hearing or vision loss and those on the autism spectrum, who may experience sensory overload in specific environments.
- **user-centered design** involves placing users' needs at the forefront of the design process. User-centered design involves engaging with sensory-diverse individuals throughout the design process, from planning to final implementation.

Designing inclusive spaces that serve the needs of sensory-diverse users involves employing design strategies that do not ignore neurodiversity, either from the side of the material conditions of the spaces or from the views of as many consulted individuals as possible. By enhancing the perceptions of wellbeing for all users, phenomenological inclusive design can create more accessible, enjoyable, and engaging spaces for everyone. (Black 2022). Among the phenomenological themes we are interested in keeping moving forward are relationships between hearing and being, neurodiverse existential phenomenology, anthropological exploration of sensorial architectural experiences, as well as the inclusion of soundscape heritage, the sound diorama as experiential space, aural preservation, soundscape narratives, and sound activism for emancipation. We are open to collaborating with partners from diverse disciplines, from the arts and humanities, social and hard sciences, and technology, to enrich future iterations of this research path.

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Image caption

Meraz, *Space, Sound, Sensation installation,* 2019, Digital photograph, 16cm x 24cm, Saint Paul's Crypt, Bristol, England. UWE Bristol Research Repository. Retrieved January, 15, 2024 from https://uwe-repository.worktribe.com/output/847994/space-sound-sensation