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Sound and Design

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Editorial: Sound and Design

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Either intentionally designed or as by-products of mechanisms and processes, sounds and soundscapes are an essential presence in our contemporary environments, from notification and alarms to machinery and voice-based virtual assistants. Sound design entails a variety of practices, dealing at large with the design and craft of auditory displays to convey functions and information with aesthetic requirements. Listening is the context-dependent, human-centered, active behaviour by which we use sound to make sense of the experience with products, services, and ecosystems. A socio-technological, sound-driven approach to design is concerned about the meaning and understanding of the experience driven by listening, rather than by sound. In this paradigm shift, sound acts both as an issue and opportunity for innovative design solutions. Hence, sound-driven design is inherently embodied, situated, and human-centered.

The submissions to the Sound & Design Track of DRS 2022 demonstrate the varying roles and driving forces of sound in the design practice and research. Majority of the submissions to the track indicate the context dependency of sound in design. That is, the applicability of the designed solutions for sound are explored mainly in the field of healthcare touching upon specific contexts of intensive care units (ICUs), dementia care, and hospices. In these studies, **Sen et al.**, co-create medical audible alarms with ICU nurses as alarm users, in order to fight alarm fatigue by human-centered alarm design voicing the user's concerns. Other authors explored the qualities of healthcare sounds collectively in the form of soundscapes, as in such socio-technological environments sounds happen in multitudes as well as categories such as speech, alarms, machinery sounds. **Spagnol et al.** explore the current soundscapes of neonatal ICUs proposing design guidelines to introduce artificial intelligence to display the categorically different ICU sound events and their time-based behaviour, in order to create sonic awareness in healthcare professionals. **Houben et al.** use collected sounds for personal storytelling catering for those that suffer from neuro-degenerative conditions such as memory loss, with the aim to provide customised and pleasurable

experiences for the patients. **Gibson et al.** further investigate how sounds contribute to wellbeing and the extent to which sounds can alter the perceived quality of an environment by adopting artistic and co-creation approaches in the design process. While sound design research in the healthcare domain is on the rise, more traditional applied domains such as mobility need to tackle new challenges such as the lack of engine sound for electric mobility. **Lenzi et al.** respond to sound design with a designer-centric approach by providing a design space dedicated for acknowledging the key elements of user-centric design, such as users' listening experience (causal, semantic, reduced), their goals and the context of use as well as the informative and narrative function of design.

These studies demonstrate how design and research with sound manifest itself in applied domains and how the issues in applied studies with sound encourage the creation of new methods and approaches in sound design. For example, the design space traditionally based on functional yet aesthetically-pleasing individual sound design now seems to acknowledge categories of sounds that need to compete with each other in order to have a more harmonious sonic quality as well as a coherent narrative. There also seems to be more awareness towards what sound designers might be lacking or how they can be supported, so that designers are able to respond to the contextual needs. Such awareness allows for the creation of dedicated tools and methods acknowledging the permanence of sound in people's lives and controlling its impact as opposed to the traditional sound design approaches that solely focuses on the engineering of products for more pleasant sound output or creating e.g., auditory displays without considering its contextual relevance.

In line with designers aligning with user's needs, **Louwers et al.** explore everyday sounds in relation to fundamental human needs such as need for comfort, beauty or autonomy investigating the power of sound alone to satisfy human needs (e.g., nature sounds can be comforting or technologicals sounds can address the need for stimulation). Moreover, the work of Louwers et al. touches upon the narrative power of soundscapes demonstrating how sounds in the absence of their sources are enough to trigger memories (even in the absence of listening) and hence fulfill unmet needs, which is also partially observed in the work of **Houben et al**. The notion of soundscapes also comes back in the study of **Udsen et al.** in the form of sonic placemaking as a cultural communication tool that relies on listener's mental abilities to distinguish sounds, direct their attention while listening and searching, and finally locate sound sources.

The track also attracted papers on the qualities of acoustic data and how acoustic data can inform methodologies for design research or practice. **Barker et al.** explore possibilities for a research methodology that allows for reduction of acoustic parameters (e.g., fundamental frequency, amplitude of harmonics) used in online listening tests (e.g., audibility, sensory pleasure) with the help of acoustic computation to be used for synthetically generated sounds (e.g., alarm). **Caiola et al.** tackle another relation between sound and data by focusing on data representation via auditory and visual parameters (e.g., acoustic parameters such as volume, frequency, timbre and visual parameters such as brightness,

saturation, visual density) that are likely to correspond (e.g.,. colour and timbre; or location and pitch) to be able to provide consistent information to sonification users. Finally, the work of **Selfridge et al.** investigates the praxis of designing sound, their ethnographic investigation of two sound designers in the field of sound design for radio and film/multimedia aims at suggesting new methods for sonic interaction design.

In these contributions, sound emerges as an experiential quality of continuous engagement and participation of the listener(s) with their environment, whether this is a socio-technological soundscape, acoustic data, exhibitions, vehicles, and even the design process itself. In this respect, sound represents the downside of listening and listening takes a central role in the interactions with the objects, environment and people, thus providing designers and researchers with new avenues for sonic explorations.

We draw similarities between the established taxonomy for design research strategies by Frankel and Racine (2010) and the approaches proposed by authors in this track. Frankel and Racine proposed the following: research for design (clinical, solution-focused, practice-led), research through design (applied, project-grounded, knowledge-oriented), research about design (basic, theory-driven, epistemological). Leveraging this taxonomy, the track papers suggest the formation of following roles of listening in design:

- **Designing for listening** as a clinical approach, including sound- and evidence-based case studies and interventions with specific impact, e.g., from product sounds to soundscapes in healthcare, automotive, and the lived environment in general. [Gibson et al.; Houben et al.; Sen et al.; Spagnol et al.; Udsen et al.]
- **Designing through listening** as an applied approach, including design studies that investigate how sound and action intertwine to shape dynamic relationships between humans and objects, e.g. from sound-driven experience and design methodologies, to the effect of sound on listeners, such as emotions and alarm fatigue; [Lenzi et al.; Selfridge et al;]
- **Designing about listening** as a basic approach, including inquiries on the fundamentals of design and audition, formgiving and cognition, research methods, the role of sound-based representations and creativity. [Barker et al.; Caiola et al.; Louwers et al.]

All in all, sound-driven design represents a shift from 'designing sound' as objects to be designed toward 'designing for listening in complexity'. In the future explorations with sound, we foresee that listening as a design element will offer granularity to the design process, acknowledging the designers' and users' perceptual repertoire as the design space for creativity. This also makes the sound-driven design space essentially human-centered as well as intimate. Furthermore, the formal qualities of sounds of products and systems will also benefit from this shift as more attention will be paid to how the result of the design will be perceived or sensorily experienced. The Sound + Design Track provides valuable cases of sound-driven design, which can be of interest for the designers that want to incorporate listening in their design activity.

6. References

Barker, T., Vieira, J., Pereira, F., Marques, R., & Campos, G. (2022). Listening tests for sound design: faster optimization through lower-dimensional parameter spaces. *Proceedings of the DRS International Conference 2022*, 25 June-3 July, Bilbao, Spain.

Caiola, V., Lenzi, S., & Riccò, D. (2022). Audiovisual Sonifications. A design map for multisensory integration in data representation. *Proceedings of the DRS International Conference 2022*, 25 June-3 July, Bilbao, Spain.

Frankel, L., & Racine, M. (2010) The Complex Field of Research: for Design, through Design, and about Design, in Durling, D., Bousbaci, R., Chen, L, Gauthier, P., Poldma, T., Roworth-Stokes, S. & Stolterman, E (eds.), *Design and Complexity - DRS International Conference 2010*, 7-9 July, Montreal, Canada. https://dl.designresearchsociety.org/drs-conference-papers/drs2010/researchpapers/43

Gibson, I., Rebelo, P., & Jackson, C. (2022). *Soundscape Gardens: An Evaluation on use of the Northern Ireland Hospice's Sound Garden Installation. Proceedings of the DRS International Conference 2022*, 25 June-3 July, Bilbao, Spain.

Louwers, G., Özcan, E., Van Bommel, J., & Pont, S. (2022). Sounds that satisfy: Describing the relationship between sound and need fulfillment. *Proceedings of the DRS International Conference 2022*, 25 June-3 July, Bilbao, Spain.

Sen, A., Sen, Y., Barile, M., Palmedo, S., Walden, A., & Vicente Antunes, V. (2022). Functional and Sensible: Patient Monitoring Alarm Tones Designed with Those Who Hear Them. *Proceedings of the DRS International Conference 2022*, 25 June-3 July, Bilbao, Spain.

Selfridge, R., & Pauletto, S. (2022). Investigating the sound design process: two case studies from radio and film production. *Proceedings of the DRS International Conference 2022*, 25 June-3 July, Bilbao, Spain.

Spagnol, S., Viñas Vila, N., Akdag Salah, A., Goos, T., Reiss, I., & Özcan, E. (2022). Towards a quieter Neonatal Intensive Care Unit: Current approaches and design opportunities. *Proceedings of the DRS International Conference 2022*, 25 June-3 July, Bilbao, Spain.

Udsen, A.-S., & Halskov, Kim. (2022). Soundscape design for historical buildings as a sonic place-making process. *Proceedings of the DRS International Conference 2022*, 25 June-3 July, Bilbao, Spain.

About the Authors:

Stefano Delle Monache is a Post-Doctoral Researcher at the Faculty of Industrial Design Engineering, of Delft University of Technology. He received his PhD in Science of Design in 2012 from Iuav University of Venice. His research interests span practices, methods and representations for sound-driven design, evaluation of sound in interaction, and interactive sound models for computational artefacts. In 2020, Stefano was awarded a Marie Skłodowska-Curie Individual Fellowship. His funded project, Participatory Designing with Sounds

(PaDS, 2020 - 2022), aims at developing methods and tools to help designers and other actors to collaboratively create sound-driven designs.

Dr. Nicolas Misdariis is the head of Ircam STMS Lab / Sound Perception & Design group, and presently deputy-head of the STMS Lab. He has been working at Ircam as a research fellow since 1995 and contributed, in 1999, to the introduction of sound design in the Institute. He defended, some years ago, his HDR (Habilitation to Direct Research) on the topic of Sciences of Sound Design. Since 2010, he is also a regular lecturer in the Sound Design Master at the High School of Art and Design in Le Mans (ESAD TALM, Le Mans).

Dr. Elif Özcan, director of Critical Alarms Lab at TU-Delft and Care Technology lead at Erasmus Medical Center Rotterdam, focuses on humanising critical care technologies by sound-driven design and innovation. She runs the Vital Soundscapes project with Philips Healthcare on alarm-nurse interactions and positive sounds for patient wellbeing. She also currently investigates the quality of restorative environments by incorporating AI-powered technologies.