NUBIS ET NUCLEI: A STUDY ON NOISE AND PRECISION

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Abstract

This study sets out to explore the perception of noise, as well as the recovery of meaning or information that it might contain, in arts, science, and daily life. It is realized as an installation based on an arrangement of nitinol drums that create a sonic environment evolving in time and space. The nitinol drums are driven by digital random noise. The observer is free to explore the sonic environment, and will discover regions in time and space with a "meaningful" signal. This discovery of a clear signal in a noisy background holds strong analogies to the scientific search for a nuclear resonance performed in the nuClock project.

The motivation of our work is to explore and understand noise in a way that leads to alternative modes of orientation within our increasingly complex and technologized world. We do not consider noise to be dissonant or semantic-free, but rather as raw data, which treasures a tremendous potential [1]. Thus, noise is not an inextricable residual that falls out of the symbolic order, but rather calls for new methods and approaches to process this dynamic yet unpredictable raw material [2]. We are interested in the close connection between noise (in a mathematical sense) to measurability and precision [1].

Our work is performed in close collaboration with a group of researchers from nuclear and quantum physics. This team of physicists, the "nuClock" consortium, seeks to detect and characterize an elusive nuclear state in the unique isotope Th-229. This state forms the basis of a future *nuclear* clock that holds the potential to outperform today's atomic clocks. With a precision of up to 20 digits, it would be used for global navigation, synchronization of telecommunication networks, and basic research. The first step in its implementation is the detection of a very faint frequency masked by strong noise.

This collaborative study on noise and precision is undertaken at the crossing of the technological and the metaphorical. Its point of departure is our mutual interest in noise: this is where our practices cross, literal technically, phenomenologically, and philosophically. In science, noise is mainly an obstacle to overcome by improving statistics. Yet it is information incognito. Noise is the condition for the constitution of meaning.

The study will take the shape of a sculptural sound installation; see Fig. 1. The installation consists of a number of custom-made acoustic instruments, nitinol drums. The digitally controlled instruments derive from string drums, using nitinol as instrumental wire. Nitinol is a superelastic shape memory alloy out of nickel and titanium that exhibits robotic and acoustic effects. These drums are arranged in a cloud-like formation and suspended from the ceiling. We create an acoustic environment that interlaces percussive rain-like noises and sounds with standing tones of picked and amplified resonance frequencies. This system renders the digital input of noise into a standing momentum that appears to evolve in time.

Besides the interaction of the observer with the cloud of instruments, the work addresses the acoustic sense, the ear and its neurological correlative. We chose to work with embodiment and sonification instead of visualization for three reasons: (1) The acoustic sense has a finer time resolution than the visual: our ear is the primary organ to measure rhythm and time. (2) In contrast to vision, which captures only a fraction of our surroundings, hearing covers the entire sphere around us [3]. (3) Acoustic phenomena (*e.g.* diffraction, reflection, damping, harmonics, interference and resonance) reveal complex behavior and strange effects that have been described as "a set of mystical visions of nature" [4]. Note that until the advent of digital communication, precise timing signals (*e.g*. church bells, reference frequencies) were all acoustic [5].

We now describe the technological implementation: White noise is digitally fed into the control system. The signals are randomly distributed over the field of nitinol drums. Each drum, consisting of a tube of variable length and material, has its own characteristic resonance frequency: in this way, the drums act as a set of random band pass filters, giving rise to standing tones, harmonics, and drones. The drums are arranged such that local acoustic signal patterns appear: the atmosphere is noisy and precise at the same time. Eventually, this study is also an experiment and exercise in awareness and fine-tuning.

A future extension of the installation will involve an analog feedback system, which allows the observer to alter the sonic environment by changing position within the field of nitinol drums. Thus, by probing various locations within the cloud of noise, he is challenged to define "meaningfulness" of a potential signal, and to develop a search strategy.

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References and Notes

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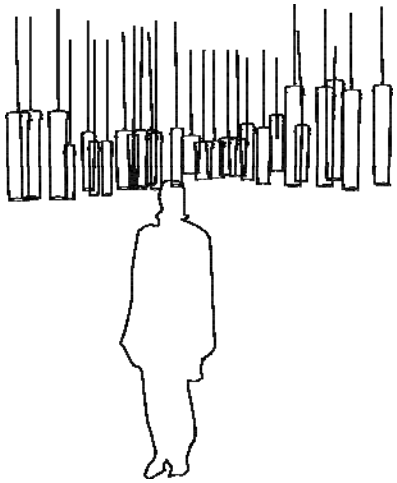

Fig. 1. Sketch of the installation, showing an observer moving below a cloud of nitinol drums. (© Kerstin Ergenzinger)