

Recipe for a ghost catcher: an infrasound-powered hybrid instrument-sonic installation

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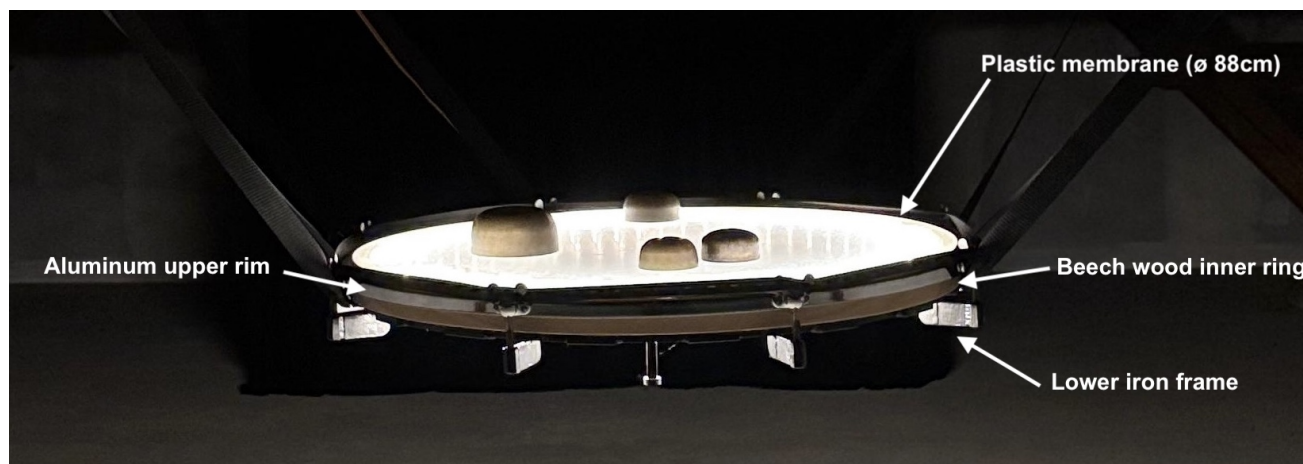


Figure 1: CLSTR1.

Abstract

This paper delineates the technical build of the interface CLSTR1, an acoustic object that generates acoustic distortion soundscapes (namely the phenomenon here referred to as CLSTR0) when infrasound and low frequency sound are transduced to its membrane and excite metal objects resting on its surface. Through artistic implementations, this paper shows how this acoustic object affords a wide range of modes of interaction that may welcome from none to many human operators—resulting in artistic settings as varied as autonomous sound installations or multiple performers actively playing with CLSTR1 at the same time. Since CLSTR1 semi-autonomously generates aural and visual patterns on a physical surface, it is argued that this interface provides novel technological stacks for interactive sound art practice that can integrate the nuances of acoustic instrument building in tandem with creative computational technologies such as computer vision and AI-powered synthesis. Reflecting on the work of Alvin Lucier and Nicole L’Huillier, this paper traces the aesthetic and practical influences that inspired and shaped the design and artistic outputs of CLSTR1. This research interprets the unpredictable entropic soundscapes and visual patterns of CLSTR0 as agential—not only in the metaphorical sense but as a technical delimitation of the autonomy of the interface’s own changing sonic and visual patterns as active interactive factors, foreign to the intentionality of a given human operator.

Keywords

infrasound, interactive installations, acoustic instrument design, physical interfaces

1 Introduction

During my percussion performance studies, I encountered a phenomenon that I call CLSTR0: a distortion-like acoustic phenomenon that occurs when metal objects rebound in response to the vibration (usually infrasonic) of the surface on which they are laid. At first, I learnt to produce it with the percussion instruments that I had at hand: a timpano, several Japanese metal singing bowls, and a Lunason bassnicophone. [9] The long, non-linear, sustained resonance of this acoustic distortion was sonically and visually so interesting in its unpredictable and complex harmonic content that I started to wonder how I could exhibit this sonic phenomenon rather than perform it. In my initial view, this acoustic phenomenon was aesthetically so substantial on its own that I would be remiss to share it with an audience as musical material instead of as a sound installation. Furthermore, I wanted to allow people to freely interact with this sound phenomenon—letting them come in contact with CLSTR0 on their own terms and explore the physics that make it possible with their own ears and hands. The task was then to build a physical object that would allow this sound to be exhibited in a permanently flexible interactive situation.

2 Background

It is important to consider that I came across CLSTR0 by pure chance; though at first, I believed it to be a distant distorted guitar coming from another room afar, I soon realized that this sound found me otherwise: headed home on a winter night in 2021, as I was exiting a percussion practice room at the Hochschule



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für Musik Basel, where my unfinished setup of Rebecca Saunders' percussion solo *dust* was, my fingertip hit a bassnicophone that was resting on top of a timpano, which incidentally had a metal bowl turned upside-down on the timpano skin: the low, inaudible vibration that my flesh triggered on the bassnicophone was reflected by the timpano, making the metal bowl vibrate, audibly. It was as if a ghost whispered distortion. [1] I quickly learnt that this accidental encounter was very fortunate because the distortion effect would not work even when the bowl was placed just a few centimeters off its original position when the bassnicophone was placed at a different angle. CLSTR0 was a black-boxed sonic phenomenon for which I knew the ingredients (i.e., the instruments needed to produce it), but not yet a recipe to manifest it. I searched for this recipe through tedious empirical experimentation, trying out different permutations and placements of metal bowls on the different membranes. The more effective position configurations that were collected, the more was understood about how the three initial objects influenced one another (i.e., stimulant frequency, membrane, and metal objects). This process inspired me to create ways of interacting with this sound in its own terms—not as a sound to be used for composition or performance, but rather an aesthetically self-sufficient sound phenomenon that can be the permanent subject of a sonic installation.

The artistic goal of setting CLSTR0 purely as an acoustic phenomenon instead of musical material shifted the focus of my practice from music performance to sound art.

Alvin Lucier's works and writing have greatly informed the construction of CLSTR1: pieces like *Music for Snare Drum, Pure Wave Oscillators and One or More Reflective Surfaces* (1990), or *Music on a Long Thin Wire* (1977) set up a given sound phenomenon as an aesthetic enclave, untethered from musical discourse or representative narratives. [8] This compositional mindset was essential for me to develop an aesthetic discourse that staged CLSTR0 as a physical phenomenon and not a musical device, while still having a foothold on artistic practice. This can be appreciated in my sound installation *La semilla y su quietud* (2024), where four timpani drums were set up across a hall and stimulated by subwoofers, triggering the phenomenon of CLSTR0, allowing the audience to listen to it from any distance they like.



Figure 2: *La semilla y su quietud* (2024).

Heavily inspired by Lucier's installations showcasing 'the poetry that we use to call science,' [8] *La semilla y su quietud* allowed the sound I found through performance to be experienced without a performer. But the sound of CLSTR0 was just one factor that

made this phenomenon so aesthetically robust. Another central factor that was still missing in *La semilla y su quietud* was the interactive experience. I was looking to build a device that allowed for flexible interaction—where once the object was installed, it could autonomously produce CLSTR0, and the audience could choose to interact with it, or performers could operate it and perform music with it. After these interactions came to an end, this newly designed object would continue to sound.

Nicole L'Huillier's Membranas are examples of installations that render sonic phenomena interactive through their visual and haptic materialities. In their multiple shapes and sizes, they interface with their surroundings as acoustic receptors that manifest their presence through the visual 'loudness' of their materiality. [7] They suggest and embody a unique form of microphony: one that does not seek to be a hidden instrument—openly inviting any listener to interact—, one that does not filter out wind, and instead takes in the whole mass of sound through the thick silicon membrane as a 'sonorous assemblage'. This assemblage, commonly known as 'noise' (*ruído*), is not meant to be purified; it is precisely the central chaotic phenomenon that the Membranas channel. From my direct experiences with the Membranas, as well as in conversations with L'Huillier, I learnt to embrace what we once called 'the oasis of endless chaos:' the wild, unruly phenomenon (be it the noisy sound mass that is transmitted through the Membranas, or the unpredictable distortion soundscapes of CLSTR0) that—although it could be physically modeled, parameterized, and instrumentalized for more quantitative practices—is just given the proper environment where it can unfold. [7]

Committed to building an instrument where CLSTR0 could display its bare, aesthetically compelling physics, and where people could feel welcome to interact with it flexibly at any given moment without limiting the unpredictability of this phenomenon, CLSTR1 was designed.

3 Technical Outline

CLSTR1 is a module designed to interface with the phenomenon CLSTR0 under the mentorship of Lunason GmbH founder Domenico Melchiorre. The 'oasis of chaos' of CLSTR0—visually and acoustically—is, in itself, the aesthetic discourse that CLSTR1 is designed to channel. An interface designed to sustain this sonic and visual metastability—in all its raw noisiness, CLSTR1 is designed to 'stay with the trouble' that CLSTR0 presents. [5]

It is difficult to map the control parameters of an interface designed to interact with sound as a complex, chaotic stream of activity by definition. The approach to this challenge has been to simply outline which components of the instrument are interactive and allow the audience to discover for themselves how the sound is affected by their specific interactions. [11] As an interface, CLSTR1 does not aim to quantize and parameterize CLSTR0; instead, it keeps the box black and opens it for the audience to interact with its darkness.

As will be shown in chapter 4, the pieces that result from an object that acts as a hybrid instrument-installation consequently result in compositions of hybrid natures as well. An interface of this kind is unique in that it turns compositions into composition-installations (like *Resignadina*), installations into interactive installation-performances (like *Los Grandes Vuelos*), and digital instruments into physically embedded computation tools (like the patch used for *Mineral Neurons*). [6, 10]

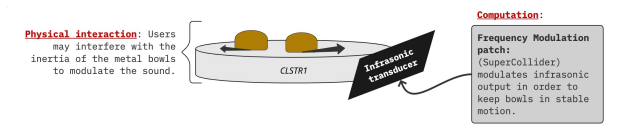


Figure 3: Diagram of CLSTR1 stimulated by a large transducer.

3.1 Mapping

Interactive parameters:

- **Exciters:** the objects that are placed on top of the membrane (usually flat-sided Japanese singing bowls) bounce rapidly, producing a buzzing constant tone. In response to the constant vibration, the objects crawl and shift their positions at an indeterminate pace—autonomously altering the points of tension on the membrane, and thus organically modulating the distortion soundscape (i.e. CLSTR0). Although these objects modulate the sound autonomously, users may interact with them, influencing the complex inertia of the system.
- **Membrane:** the tense, irregularly textured plastic membrane (such as the Remo *Renaissance* Timpani drum skins, or any plastic membrane sand-papered for texture) is the surface where the exciters set off their unpredictable whispers. The tension is set by the tuning screws and influenced by the weight applied upon it—be it by the exciters or by adding pressure by hand.

Stimulant source: as a modular interface, CLSTR1 works with an external low frequency source that is transduced to its body (the contact point between the low frequency source and CLSTR1 may vary at the discretion of the performer). The main tools for low frequency transduction explored throughout the course of the development of this sonic object have been:

- **Lunason’s bassnicophone:** this instrument is struck with a soft mallet while resting it on top of two small pieces of polypropylene foam directly on the membrane, above the inner lip of the wooden ring.
- **Low-end transducer:** attaching a transducer to the frame of the instrument allows for endless ways to transfer low-frequencies into the instrument while affording the flexibility of digital audio synthesis. The specific model preferred for the purposes of this research was the Dayton Audio BST-1 Bass Shaker.

The frequency range that generates CLSTR0 on the membrane of CLSTR1 ranges between 9 and 34Hz.

4 Case studies

The first piece that used CLSTR1 was *Mineral Neurons* (2025), where it served as a generator of visuals through a generative Touch Designer patch, as well as a source for timber-transfer real time AI audio synthesis, where three performers were interacting at all times with its autonomous audio-visual unfolding. The resulting sound mass of this piece is a combination of CLSTR1’s randomly morphing distortion soundscape, reinterpreted by real time timber-transfer models filtering the complexity of the sound into a random audio result parallel to its acoustic source. [3]

In *Los Grandes Vuelos* (2025), CLSTR1 was used as an interactive sound installation, where the audience was welcome to move the metal bowls as they liked in order to discover the sound for



Figure 4: *Mineral Neurons* (2025) performed at Sónar (Barcelona).

themselves, while a computer vision patch tracked the motion of the bowls, providing a computationally controlled interactive environment. [2]



Figure 5: Audience interacting with sound installation *Los Grandes Vuelos* (2025).

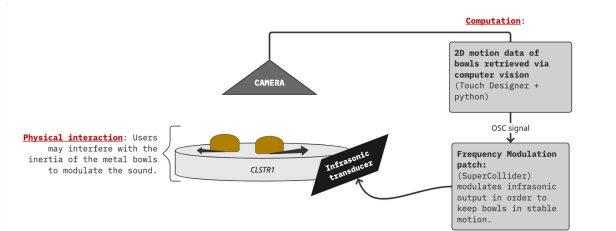


Figure 6: Technical diagram of *Los Grandes Vuelos*.

Resignadina (2025) is a live audio essay that narrates the story of a fictional drug distributed by a fictitious Mexican government. In this piece, CLSTR1 is used as a generative digital-acoustic tool for improvising portions of a multi-track audio essay. This piece was premiered at Steve Goodman's (aka. Kode9) workshop *Cognitive Warfare*. [4]



Figure 7: Performance of *Resignadina* (2025).

Through these diverse implementations, sound is distributed between the performance of the instrument itself and the interactions of the audience. CLSTR1 proves to be a flexible physical generative environment that welcomes many hybrid formats of sound art.

5 Future research and limitations

This paper has been limited to demonstrating the artistic motivation behind building CLSTR1 and some of its artistic implementations. As this research continues to develop, there will be more rigorous analysis of audience interaction, as well as feedback from other users on this interface.

CLSTR1 is the first in a planned series of modules exploring CLSTR0, with the next direction being non-digital infrasound generation—since stimulant frequencies have so far been digitally synthesized. Drawing on how the bassnicophone and other Lunason instruments naturally produce infrasound, we are developing an acoustic infrasonic source to induce low frequencies into CLSTR1's frame—an underexplored direction in instrument design that the Lunason team and I are excited to pursue.

6 Conclusion

CLSTR1 works as a physical extrapolation of a sound that was originally bound to percussion performance. Through interface design, it was possible to address physical phenomena in line with the work of Lucier and L'Huillier, which led to the building of an object that gave this specific sonic phenomenon the opportunity to be dealt with in other aesthetic areas, bringing diverse disciplines and traditions together into the same space or object.

Through the artistic implementations of CLSTR1, it has been shown that critical instrumental design can not only extend a performer's instrumental capacities but also a musician's artistic reach outside of music and into other artistic disciplines—in this case, sound installation, sonic fiction, and interaction design.

7 Ethical Standards

There were no conflicts of interest detected during the core development or peripheral outputs of this artistic research project.

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