

# Designing Strategic Incongruity: An Audio Device for Sharpening Pencils

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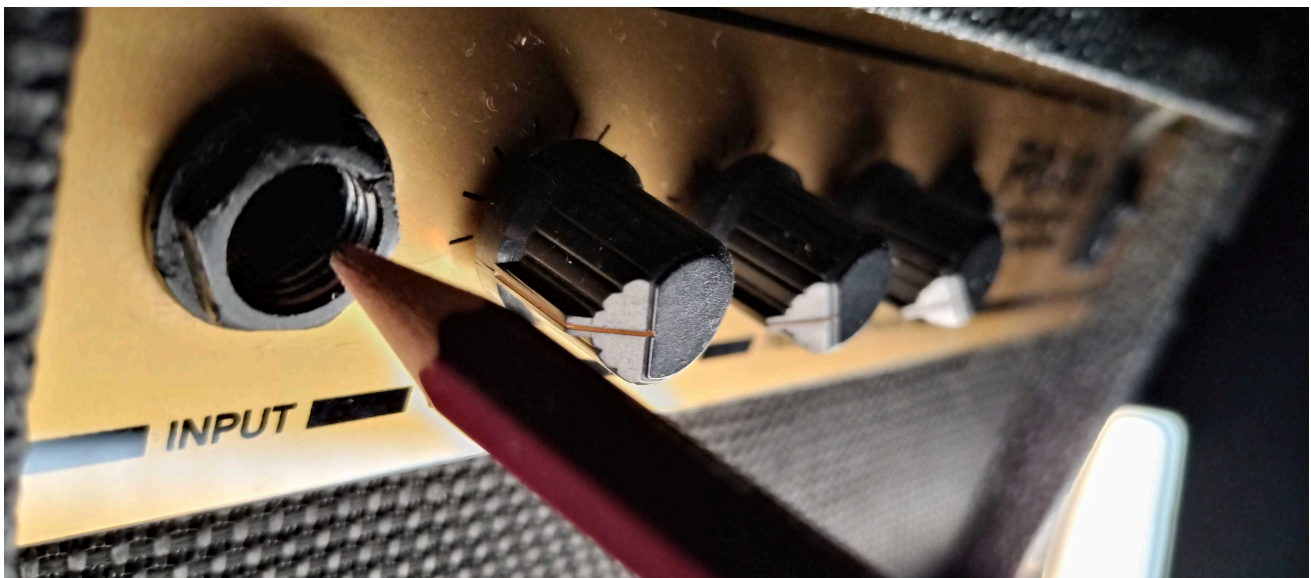


Figure 1: How the amplifier sharpens the pencil

## Abstract

This study presents an interface design methodology that introduces strategic incongruity by embedding everyday objects into existing audio equipment, bridging mundane actions and musical expression. Specifically, we modified amplifiers and mixers by replacing jack socket with manual pencil sharpeners, treating the sound of sharpening as the primary input signal. By preserving the original appearance and operational conventions of audio gear, this design recontextualizes a domestic chore as a standard audio input, inviting

users to engage in an entirely new way. Unlike prior practices that map actions to sound or repurpose objects as sources, the novelty here lies in retaining the object's function while situating it within an established musical interface. Rather than proposing new technologies, this work treats the functional discrepancy between equipment appearance and operational reality as a design resource. Through prototype exhibitions, we observed that the incongruity between musical expectations and non-musical actions elicits active engagement. This interaction was achieved with minimal instruction, demonstrating that the interface facilitates participation without complex guidance. This study reframes strategic incongruity as a design element for fostering active participation.

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## Keywords

Strategic Incongruity, Everyday Objects, Modification, Interface Design, Pencil Sharpener

## 1 Introduction

Historically, the term “instrument” referred specifically to tools designed to produce sound. However, in contemporary musical practice, objects capable of producing sound are treated as instruments, regardless of the designer’s original intent. This shift has led to numerous instances where commonplace everyday objects are incorporated into music.

The practice of integrating everyday objects into music can be broadly categorized into two tendencies based on their method of performance and interface design. One involves treating the everyday object in its original function, generating music from the act of its use. The other focuses on the sound or physical properties of the object, using it as a sonic material.

In the practice of incorporating everyday objects into music, such techniques have been frequently attempted. However, among these latter techniques, the method of substituting everyday items for existing musical forms has been relatively rare within NIME practice. While referencing existing musical forms creates clear differences, it also strongly presupposes conventional performance styles and musical understanding, leading to its cautious treatment as a new interface.

This research focuses on this point, proposing a method to design intentional incongruity—generated by incorporating an everyday object like a pencil sharpener into existing musical equipment—as an interface for musical experience. Specifically, we modified audio equipment such as amplifiers and mixers to create devices where the act of sharpening pencils, the inherent function of the everyday object, constitutes performance, while preserving the equipment’s appearance and interface. To explore variations in bodily engagement and sonic structure, three prototypes were developed and exhibited in different spatial contexts. The objective of this research is to utilize the sense of incongruity—where the device is recognized as an audio device while simultaneously functioning as an everyday object—as an interface.

## 2 Background and Related Works

In this chapter, we organize prior practices related to this study from the perspective of musical interface design. We focus on how everyday objects have been incorporated into music, and how actions and objects have functioned as interfaces in that process.

Specifically, we review the historical transition of the musical use of everyday objects and examine design approaches that produce incongruity or mismatch through such use. We also outline the background of employing pencil sharpeners and audio equipment, which form the basis of this study. Based on this discussion, we clarify the design position adopted by this research and its placement within existing practices.

### 2.1 Use of everyday objects in program music

Examples of musical works employing everyday objects can be found in program music, such as *The Typewriter* (Anderson, 1950) [1] and *Parade* (Satie, 1917) [2]. In these programmatic works, music is structured to depict or evoke scenes, narratives, or specific subjects.

In this context, the sounds of everyday objects functioned less as musical material to be heard, and more as a means of pointing to external subjects or events.

What is crucial here is that while the sounds of everyday objects were incorporated into the music, their meaning consistently depended on something external to the music itself. That is, the sounds of everyday objects were treated as symbols that reinforced scenes or narratives, and the sounds themselves were rarely required as autonomous musical material. Thus, everyday objects were positioned less as material for music and more as elements that added meaning to it.

### 2.2 Musical practice using everyday objects

The practice of incorporating everyday objects into music has developed through a shift in focus from their use in program music to depict scenes or narratives, toward attention to the sounds of the objects themselves and the actions they elicit. Through this shift, the sounds of everyday objects came to be incorporated not as symbols referring to external subjects, but as constitutive elements of musical works.

Such musical appropriations of everyday objects can be broadly organized into two orientations, depending on which aspects of the objects are emphasized. One orientation focuses on the everyday actions and bodily gestures associated with the use of objects, constructing music directly from those actions. The other emphasizes the material and acoustic characteristics of objects, treating them as musical materials.

*Musique concrète* (Schaeffer, 1948) [3] and *Water Walk* (Cage, 1959) [4] present the sounds of everyday objects themselves as music, indicating a strong interest in their material characteristics. At the same time, these works also incorporate actions and situations as part of the musical presentation and can therefore be characterized as ambivalent practices that cannot be reduced to a single orientation. In later experimental practices, the choice of which aspects of everyday objects to foreground became more explicit. In approaches that emphasize everyday actions, the act of handling an object itself is composed as music. For example, *Drawdio* (Silver, 2008) [5], which generates sound through the act of writing with a pencil, and *Experimentum Mundi* (Battistelli, 1981) [6], which frames various forms of craftsmanship as performance, both center on the structure of “music emerging from everyday activity.”

By contrast, approaches that emphasize material characteristics primarily treat everyday objects as acoustic materials. Practices in this orientation can be further divided into two categories: those that design instruments or devices optimized for the specific properties and phenomena of objects, and those that reference and reconfigure the forms of existing musical instruments or devices using everyday objects. An example of the former is *Expirator* (Berthet, 1990s) [7], which foregrounds the structural and acoustic properties of vacuum cleaners. The latter includes attempts to reconstruct established musical forms, such as drums or string instruments, using everyday

objects. While this approach can clearly articulate differences and gaps by relying on shared musical understandings as reference points, it has been difficult to position as a new musical interface due to its strong dependence on existing idioms. This study focuses on how the sense of incongruity that arises within this latter approach can function as an interface.

### 2.3 An approach that mimics existing musical forms

Among musical practices that employ everyday objects, there exists an approach that references established musical forms—such as drums, string instruments, and keyboard instruments—and reconstructs them using non-musical materials. By drawing on familiar instrumental forms and performance conventions, this approach allows performance actions to be readily understood as music, while simultaneously making perceptible the differences between the reconstructed object and the original instrument within the experience itself.

At the same time, such practices have often been treated with caution in the context of experimental music and new musical expression. Because they strongly presuppose conventional performance styles and shared musical understanding, everyday objects are frequently reduced to substitute materials. As a result, their original functions and purposes tend to be erased, and the reconstructed instruments risk being perceived as degraded or derivative copies of existing ones. Consequently, in many cases, everyday objects have been repositioned merely as materials for sound production.

Within this context, Optron (Atsuhiko, 1998) [8] occupies a distinctive position. While Optron clearly references the framework of instrumental performance—holding fluorescent lights like guitars and performing them through effects—it simultaneously preserves the identity of the fluorescent lights as lighting devices. Their original functions of illumination and control coexist with the act of performance, rather than being separated from it.

What is crucial in this practice is that the musical act of performance and the everyday act of controlling light are established simultaneously, both temporally and operationally. In many mimetic approaches, everyday objects lose their original purposes in order to function as instruments. In Optron, by contrast, fluorescent lights remain fluorescent lights. In this respect, Optron demonstrates that referencing existing musical forms does not necessarily result in a one-way transformation of everyday objects into instruments. This study is positioned close to Optron in this regard. Rather than treating existing musical forms as objects to be reproduced, it refers to them as frameworks that guide interpretation, while retaining the original functions and purposes of everyday objects and embedding them within musical contexts. The practice presented in this study does not aim at imitation itself; instead, it designs situations in which musical performance and everyday functionality are simultaneously established within an existing musical framework.

### 2.4 Consideration of the Chosen Objects

Pencil sharpening was chosen as the central subject of this study because the act of sharpening a pencil involves rotational motion, friction, resistance, and gradual reduction of material, accompanied by sound, vibration, and the passage of time. This is because this act is closely connected not only to sight and touch, but also to hearing. Despite this rich physical experience, it has rarely been treated as a musical act.

In addition, the reason that audio equipment such as amplifiers and mixers was chosen as objects to be combined with pencil sharpeners in this study is that pencil sharpeners and audio equipment have a similar input interface in the form of “holes”. This structural correspondence not only serves as a practical design contact point, but also as a perceptual cue that can leverage existing forms of understanding.

## 3 Method

Chapter 3 presents the design philosophy of the musical interface proposed in this study, the implementation methods used to materialize this philosophy, and three practical examples.

### 3.1 Design Concepts

The design approach of this research focuses on generating a sense of incongruity by embedding actions with purposes other than music into existing audio equipment, while preserving its appearance, operational conventions, and shared conceptual framework. This design philosophy is based on simultaneously satisfying the following three conditions. First, the design introduces a function with a different purpose. In this study, the everyday act of sharpening a pencil is incorporated as an action that was not originally intended for musical use. Second, changes to the appearance are minimized. By preserving the enclosure, layout, and visual form of controls typical of audio equipment, performers and audiences engage with the device by referring to their existing knowledge and expectations. As a result, discrepancies arise between what is expected and what actually occurs, allowing a sense of incongruity or hesitation to emerge as part of the experience.

Third, the operational system is preserved as much as possible. In the devices developed for this research, modification does not disable existing controls; rather, fundamental operations of audio equipment—such as volume adjustment and timbral control—continue to function. The persistence of familiar operations provides a sense that the device remains partially intelligible, rather than entirely opaque.

By satisfying these three conditions simultaneously, the proposed device creates a situation in which everyday objects and audio equipment coexist within the same interface. As a result, the device is not completely reducible to either an audio equipment or an everyday object, destabilizing the existing framework of understanding and interpretation in the musical experience. The design philosophy of this research aims to strategically incorporate

such inconsistencies and mismatches, allowing them to function as an interface for the musical experience.

### 3.2 Implementation Method

To simultaneously satisfy the three conditions outlined in Section 3.1, this study implemented a design that integrates a pencil sharpener mechanism while utilizing the internal structure of existing audio equipment. As the introduction of a function with a different purpose, the insertion port of the pencil sharpener was configured to replace the jack socket of the audio device. Although a jack socket is originally an interface for cable connections, it shares a structural similarity with a pencil sharpener in that it is a “hole that becomes functional through insertion.” This compatibility enabled the incorporation of the action of inserting and rotating a pencil into the interior of the device without significantly altering its external appearance or interface layout (Figure 2).

The sound produced during the sharpening process is captured as vibration using a piezoelectric element attached to the sharpening mechanism. Rather than recording airborne sound with a microphone, vibrations generated by contact and friction are directly sensed, thereby maintaining a clear correspondence between the physical action of sharpening and the resulting sound. The captured signal is routed to the original input circuit of the audio equipment, allowing it to be processed through existing controls such as volume and timbral adjustment (Figure 3).

In addition, the enclosure and layout of control elements were preserved as much as possible so that all conventional operational systems—such as gain control and tone shaping—remain fully functional. This allows performers to approach the device as familiar audio equipment and apply established operational techniques. At the same time, the actual generation of sound depends fundamentally on the act of sharpening a pencil, causing a discrepancy between appearance and function to become perceptible through use.

Through this implementation, actions not originally designed for musical purposes are embedded within a musical interface, while preserving the intelligibility of the device’s appearance and operational conventions. This configuration enables the emergence of a musical experience grounded in the coexistence of familiar audio control and an incongruous everyday action.

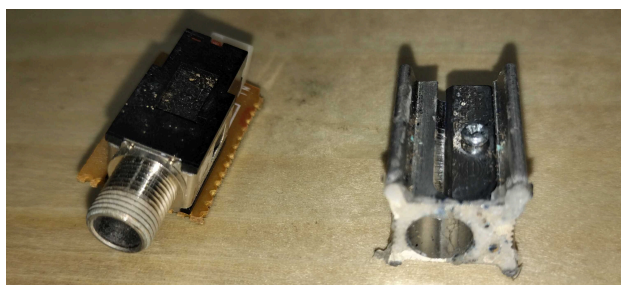


Figure 2: Shape Comparison of a Jack socket and a Pencil Sharpener

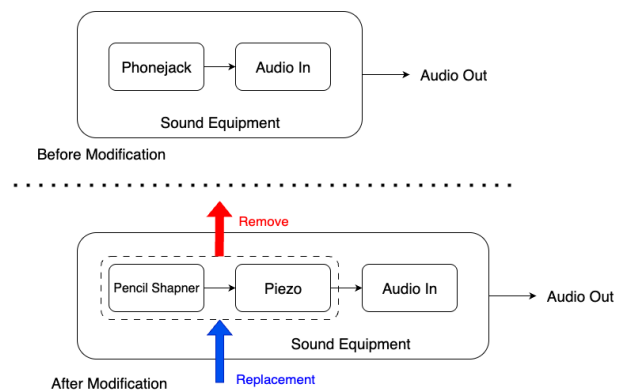


Figure 3: System diagram before and after modification

### 3.3 Prototypes

This section introduces three prototypes developed based on the design concepts and Implementation Method described in the previous section. All prototypes share the approach described thus far. However, differences in the sharpening mechanism (hand-cranked or electric) and the type of audio equipment used (amplifier or mixer) resulted in distinct forms of bodily engagement and musical behavior during performance.

For each prototype, we describe the equipment used, an overview of the implementation, and the characteristics observed during performance.

#### 3.3.1 Prototype 1: Hand-Cranked Pencil Sharpener + Guitar Amplifier

Prototype 1 integrates a hand-cranked pencil sharpener with a Louis LGA 35DSP guitar amplifier (Figure 4). The amplifier’s phone jack was replaced by the pencil sharpener’s insertion point, and vibrations generated during sharpening were captured using a piezoelectric element and routed to the amplifier input.

Because the sharpening mechanism is manually operated, pauses, anticipation, and variations in rotational motion directly influenced the timing of sound generation. As a result, the bodily rhythm of the sharpening action emerged as musical rhythm. In addition, the amplifier’s built-in distortion and tone controls were easily accessible, allowing timbral changes to become part of the performance alongside the sharpening motion.

Structurally, the pencil sharpener mechanism and the speaker are housed within the same enclosure, making acoustic feedback likely. During performance, feedback was frequently observed to fill the temporal gaps between sharpening actions.

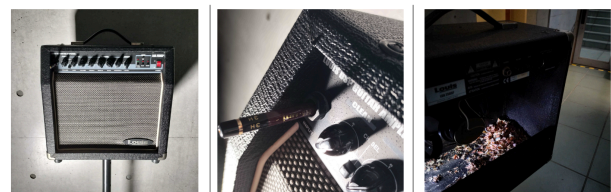


Figure 4: Prototype 1: Overall view / During performance / Pencil shavings

### 3.3.2 Prototype 2: Electric Pencil Sharpener + Guitar Amplifiers

Prototype 2 integrates electric pencil sharpeners with multiple Fender Frontman guitar amplifiers (Figure 5). In this configuration, vibrations from each electric sharpener were captured by piezoelectric elements and connected to the inputs of separate amplifiers. Due to the motor-driven mechanism, sharpening occurred continuously at a constant speed, enabling performances based on sustained sound textures. In contrast to Prototype 1, musical variation was less dependent on the sharpening gesture itself and instead foregrounded operations on the amplifier units, such as volume and tone control.

By using multiple amplifiers simultaneously, multiple pencils could be sharpened in parallel. This made it possible to construct layered sustained sounds, with each amplifier contributing an independent sonic layer.



Figure 5: Prototype 2: Overall view / During performance

### 3.3.3 Prototype 3: Hand-Cranked Pencil Sharpener + Mixer

Prototype 3 connects hand-cranked pencil sharpeners to an analog mixer (YAMAHA PM-210) (Figure 6). Each sharpener was connected to an independent input channel, allowing vibrations generated during sharpening to be processed separately. This configuration enabled performers to choose which sharpener to engage during performance. In this prototype, speakers were placed outside the enclosure, preventing acoustic feedback. As a result, the frictional and vibrational sounds produced by the sharpening action were output clearly. Through fader and equalizer controls, the sharpening sounds could be shaped as acoustic material, enabling a performance in which sharpening actions and sound processing occurred simultaneously.



Figure 6: Prototype 3: Overall view / During performance

## 4 Performance, Exhibition, and Observation

This chapter describes and analyzes the musical experiences generated through exhibition and performance practices conducted using the devices presented in the preceding chapters. The analysis is based on observations and feedback obtained in situ, rather than on quantitative user studies or controlled comparative experiments. Evaluation in this research relies on qualitative methods, including participant observation within exhibition spaces, responses from visitors, and the performer's own reflective practice. In this sense, the study is situated within a practice-based research framework. Observations were conducted across two exhibition contexts. These contexts differed significantly in terms of visitor demographics, spatial configuration, and the physical and perceptual distance between visitors and the devices. As a result, distinct modes of engagement, interpretation, and action emerged in each setting.

This chapter examines how these differing conditions shaped visitors' understanding and behavior, and what kinds of musical experiences were produced through the interaction with the devices. First, the outlines and environments of each exhibition are described (4.1). Next, notable visitor reactions and feedback are organized (4.2). Finally, these observations are analyzed across both contexts to identify recurring patterns and contrasts (4.3).

### 4.1 Overview of Exhibition and Performance

The devices developed in this research were examined through exhibitions and visitor-participatory practices. Two exhibitions were conducted; each held in a different environment and involving distinct visitor demographics.

In the first exhibition, multiple units of Prototype 1 and Prototype 2 were installed throughout the venue. Many pencils were provided, along with several conventional pencil sharpeners, allowing visitors to understand the devices by referencing the familiar act of pencil sharpening itself (Figure 7). Visitors were handed pencils, given a brief explanation, and encouraged to engage with the devices through performance. Many attendees had an interest in music and media art, and over the two-day period, numerous participants were observed interacting with the devices and attempting performances.

The second exhibition was conducted outdoors and presented Prototype 1 and Prototype 3. Given the outdoor setting, the amplifiers were mounted on stands to ensure stability during performance (Figure 8). A clearly designated pencil storage area was also provided, making it easy for passersby to pick up pencils and participate in the sharpening action.

Because this exhibition was held in a central urban area, it attracted a broader and more diverse range of visitors. Many attendees did not necessarily share a specialized background in music or art, resulting in different modes of understanding and response to the devices compared to the previous exhibition. The contrast between these two exhibition environments constitutes an important comparative axis for the observations and evaluations discussed in the following sections. The selection of prototypes in each exhibition was

influenced by the character of the space. In the first exhibition, the limited indoor space required a visually concentrated setup, and Prototype 2, with its clustered configuration of multiple amplifiers, was chosen to create a strong presence within that environment. In contrast, the outdoor exhibition took place in a wide and open area. The spatial openness allowed for greater physical distance between devices, and Prototype 3 was included to emphasize variation and diversity in configuration and interaction. The choice of prototypes was therefore closely related to the spatial and visual conditions of each exhibition.



Figure 7 : Indoor Exhibition Display



Figure 8 : Outdoor Exhibition Display

#### 4.2 Observed Reactions and Participation

One of the most notable observations across the exhibitions was that participants were generally able to begin performing with little difficulty. In many cases, simply presenting the action of "inserting a pencil" was sufficient; even without detailed operational instructions, visitors often transitioned directly into performance. Particularly in the outdoor exhibition, multiple instances were observed in which young children produced sound through the act of sharpening a pencil (Figure 9). These cases suggest that the interface enabled intuitive engagement and operation without strong reliance on verbal explanation.

In addition, attention was directed not only toward the audio equipment itself but also toward the pencil and pencil sharpener as familiar everyday objects. For many visitors, the pencil functioned as an object associated with everyday experience, evoking a sense of familiarity or nostalgia within the exhibition space. As a result, prior to understanding the apparatus as a musical device, the act of "sharpening a pencil" itself attracted attention and served as an entry point into the experience.

At the same time, many visitors initially expressed hesitation or a sense of discomfort when encountering the act of inserting a pencil into an amplifier or discovering that a pencil sharpener was embedded within audio equipment. However, this perceived strangeness appeared to play a critical role in drawing visitors closer to the device and motivating exploratory interaction. Participants engaged with the work while holding different questions and interpretations, and it was notable that modes of engagement varied rather than converging into a single, uniform understanding. Furthermore, because pencil sharpening is an action shared across age groups, the exhibitions facilitated participation by visitors of different generations. Both in the on-campus and outdoor exhibitions, individuals regardless of age or musical experience were observed engaging in the act of sharpening pencils as part of the performance. Finally, during the outdoor exhibition, several instances were observed in which performances emerged even among visitors who appeared to be of different nationalities and unlikely to share a common spoken language. In these cases, the action of inserting and sharpening a pencil was communicated through visual and bodily cues alone. This suggests that the proposed interface functioned as a means of sharing musical experience without dependence on language, relying instead on embodied and perceptually accessible actions.



Figure 9 : Children's participation

#### 4.3 Experience

Correspondence Between Design Concepts and This section analyzes the reactions observed through the exhibition and performances in relation to the three design principles outlined in Section 3.1.

First, the introduction of a function with a non-musical purpose played a central role in attracting visitors attention. The act of inserting a pencil into an amplifier and sharpening it deviated from common expectations associated with musical devices, and many visitors initially expressed confusion or discomfort. However, this sense of incongruity did not discourage participation. Instead, it motivated visitors to approach the device and experiment with its operation. Because pencil sharpening serves a purpose unrelated to music, visitors tended to focus not merely on sound production but on the meaning and structure of the action itself, which in turn deepened their engagement with the experience.

Second, preserving the external appearance of existing audio equipment contributed to both recognizability and the clear articulation of difference. Since the device visually resembled a conventional amplifier or mixer, visitors attempted to understand it based on their prior knowledge and experience. At the same time, being required to sharpen a pencil as part of the operation made the discrepancy between appearance and function immediately

apparent, producing surprise and a sense of incongruity. This structure concretely enacted both reference to and subversion of existing musical contexts through the modification of familiar audio equipment.

Third, maintaining the conventional operational framework significantly supported the formation of an experience that did not rely on verbal explanation. In the exhibitions, simply presenting the action of inserting a pencil was sufficient for many visitors to begin performing autonomously. Especially in the outdoor exhibition, the fact that young children and visitors with little musical experience were able to operate the device indicates that the interface was intuitively understandable. Because standard amplifier and mixer controls remained functional, participants could draw upon their existing knowledge and embodied experience when engaging with the device.

Through the simultaneous fulfillment of these three conditions, the practice generated an experiential structure in which confusion and understanding, strangeness and familiarity coexisted. The familiarity of the pencil as an everyday object, the strong contextual framing of audio equipment, and the gap that emerged between them encouraged diverse interpretations and modes of engagement among visitors.

From this analysis, it can be concluded that the design philosophy proposed in this study functioned as a framework for intentionally producing a gap with existing understandings and transforming that gap into a shareable musical experience.

## 5 Discussion

This study presented an approach to interface design that incorporates actions with non-musical purposes into existing audio equipment, reconfiguring it while preserving both its appearance and operational system, through the concrete practice of musically repurposing a pencil sharpener.

Observations from the exhibitions and performances showed that the act of inserting and sharpening a pencil was readily accepted as a form of performance without requiring explicit explanation. By referencing the familiar appearance and operational context of audio equipment such as amplifiers and mixers, participants were able to interpret the act as musical. At the same time, performing this action in a context different from its original purpose generated confusion and a sense of incongruity, which in turn stimulated curiosity and interpretation. This indicates that the design approach adopted in this study simultaneously provided a referential framework that supported understanding and a structure that foregrounded difference.

The distinctiveness of this research does not lie simply in the use of an everyday object as a musical material, but in the way objects with different purposes are joined while preserving their original functions. The pencil sharpener remains a device for sharpening pencils, and the audio equipment remains a device for controlling and amplifying sound. Neither is subsumed entirely into the other. Through their coexistence, the apparatus remains in an indeterminate state that

cannot be fully classified as either a musical instrument or a household object. This instability is precisely what generates a fluctuation of meaning within the experience.

A further characteristic of this practice is that pencils can be sharpened while the device continues to appear and operate as conventional audio equipment. The apparatus does not acquire the appearance of a newly designed instrument; instead, it relies heavily on the existing visual and operational conventions of amplifiers and mixers. In this respect, the work differs from practices that explicitly foreground metaphor or mimicry. For example, in *Optron*, the act of likening a fluorescent lamp to a guitar is clearly articulated as the framework for performance. In contrast, this study allows amplifiers and mixers to persist as amplifiers and mixers. Within this mimetic—or camouflaged—state, the act of pencil sharpening nonetheless becomes established as performance. This implicit, rather than explicit, transformation constitutes a key characteristic of the present work.

At the same time, the insights demonstrated in this study cannot be directly generalized across materials or actions. The physicality shared cultural familiarity, and acoustic properties of pencil sharpening are specific to this practice. Accordingly, it cannot be assumed that the same design approach would produce equivalent effects with other everyday objects or actions. Nevertheless, by demonstrating that the incongruity emerging at boundaries such as music and non-music, or performance and action, can itself function as an interface, this study provides a concrete and situated example.

In summary, this research contributes to existing practices of musically repurposing everyday objects by introducing a perspective that treats the appearance and operational conventions of audio equipment as the very conditions through which actions are understood as musical. Rather than proposing a device- or material-specific solution, it offers a practical framework for reconsidering how musical experience, interpretation, and meaning-making can be shaped as problems of interface design.

## 6 Conclusion

This study proposed an approach to interface design that treats dissonance itself as an interface. Through the concrete practice of musically repurposing a pencil sharpener, functions intended for non-musical actions were incorporated into existing audio equipment, while preserving their appearance and operational systems. These ideas were examined through a series of performances and exhibitions.

Observations from these exhibitions and performances indicated that the non-musical act of sharpening a pencil, when situated within the visual and operational context of audio equipment, generated a sense of incongruity and hesitation. Rather than obstructing participation, this dissonance functioned as an interface that prompted engagement and interpretation. These findings suggest that the design approach adopted in this study successfully enabled dissonance to operate as a mediating condition for musical experience.

At the same time, the insights obtained in this research are strongly dependent on the specific act of pencil sharpening and its cultural, bodily, and material background, and cannot be directly generalized to other everyday objects or actions. What this study presents is therefore not a completed design theory, but a situated practice that demonstrates how the boundaries between everyday objects and audio equipment, as well as between music and daily life, can be temporarily destabilized through design.

The perspective offered by this research may be reexamined under different everyday objects, actions, and design constraints, potentially giving rise to alternative musical experiences and interpretations. In this sense, this study can be positioned as a starting point for designing musical interfaces that foreground not only interaction, but also the conditions under which actions come to be understood as music.

### Ethical Standards

This research was conducted in the form of a public exhibition and performance, in which attendees were invited to freely operate and experience the installations. Participation was entirely voluntary, and no monetary or equivalent compensation was provided. At the exhibition venue, it was communicated both verbally and through the exhibition context that the work was produced as part of artistic research and that attendees' interactions could be subject to research observation.

This research did not collect any personally identifiable information. Visitor reactions and feedback were documented in a non-identifiable manner, and the analysis was conducted so as to avoid focusing on the statements or actions of specific individuals. Observations used for analysis were limited to overall tendencies and qualitative impressions.

The exhibited devices were designed to be safely operated by the general public, and appropriate precautions were taken to prevent

physical harm. In the public exhibition setting, participation by minors was permitted only with parental consent and supervision.

This research did not involve studies targeting specific vulnerable populations, experiments imposing physical or psychological burdens, or deceptive methods concealing the research objectives. Based on these considerations, the research was conducted in accordance with ethical standards generally required for practice-based art research and human–technology interaction studies.

### Acknowledgments

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### A Appendix One

As additional information, we submit the following:

#### A.1 Prototype 1 Performance Video

<https://youtu.be/qQnLFyuLugY>

#### A.2 Outdoor Exhibition Archive

[https://youtu.be/-mm4p\\_hWnll](https://youtu.be/-mm4p_hWnll)