

# Kirma: A Tactile Sound Interface Inspired by Ancestral Coil Basketry and Andean Temporalities

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**Abstract**—*Kirma*<sup>1</sup> is a conceptual prototype for a tactile sound instrument that merges Indigenous material practices with contemporary electronic design. Inspired by the spiral logic of Andean temporality and ancestral coiled basketry, the device proposes a performative interface woven from natural fibres and conductive threads. Capacitive touch sensors embedded in the spiral structure allow for gestural interaction, which is mapped to real-time sound synthesis via embedded microcontrollers. Beyond its technical configuration, *Kirma* functions as a poetic and political artefact—an exploration of memory, ritual, and embodied knowledge through sound. It challenges dominant paradigms of interface design by centring decolonial aesthetics and ecological materials, offering a hybrid space where craft, code, and cosmology converge.

## I. INTRODUCTION / BACKGROUND

The spiral is a powerful symbol of time, memory, and continuity across many Indigenous cultures [6][7]. In the Andean world, it represents the cyclical nature of time—where the past is not behind but ahead, guiding the present and shaping the future.[10] This project draws on that cosmological principle to explore how ancestral technologies can be reimagined as contemporary electronic instruments.

The inspiration for *Kirma* emerges from the coiled basketry traditions found across Abya Yala and Africa. In North America, coiled baskets made by *Chumash* and other Indigenous peoples are not only utilitarian but also encode stories, cosmologies, and resistance [5]. In Colombia, the *cestería en rollo* of *Guacamayas* is a vibrant living tradition where artisans weave natural fibres like fique into spirals that carry both aesthetic and cultural meaning [1]. Similarly, in West Africa and the African diaspora, coiled baskets—such as the *fanner* baskets used in rice cultivation—embody ancestral knowledge systems and diasporic continuity [11].

These spiralled forms are not merely decorative; they are technologies of memory, computation, and care. They are tactile archives woven with intention and encoded with meaning [5]. *Kirma* builds on this lineage, proposing a new kind of interface that reclaims and reinterprets these traditions while integrating contemporary tools like capacitive sensors, microcontrollers, and sound synthesis.

<sup>1</sup> The name “*Kirma*” is derived from the symbolic and linguistic cosmology of the Quimbaya-Kumba people, as described by Guillermo Rendón in his work *El Misterio del Kirma* [9]. In this Indigenous worldview, “*Kirma*” represents a vital and cosmic balance, a harmonic energy that connects the human with the sacred.

Rooted in a decolonial artistic research practice, this prototype is part of my ongoing doctoral research at UWE Bristol. It investigates how the symbolic and material dimensions of ancestral technologies can be reactivated through electronic art. By weaving together fibres, circuits, and sound, *Kirma* becomes a living instrument that invites us to listen to the spiral of time.

## II. RELATED WORK

This project builds upon a growing body of artistic and academic work that reclaims ancestral technologies through contemporary media art. My previous instruments, the *Electronic\_Khipu\_* [2] and the *Kanchay\_Yupana\_* [3], are part of this lineage. The *Electronic\_Khipu\_* is a tactile sound interface that generates experimental audio compositions through the act of knotting conductive rubber cords inspired by the Andean *Khipu*. The *Kanchay\_Yupana\_* is an open-source rhythm sequencer based on the Andean *Yupana*, using light sensors and native seeds to trigger percussive patterns.

This work also resonates with the practices of artists and researchers who draw on ancestral knowledge systems to inform the design of sonic interfaces and ritual-based interaction models. For instance, Paola Torres Núñez del Prado’s *Sincretio Loom Biosynth* [12] transforms a textile loom into a biosensor-driven sound interface; Constanza Piña’s *Khipu Electrotexile Pre-Hispanic Computer* reimagines the *Khipu* as a living electromagnetic antenna [8]; and Juan C. Duarte Regino’s *AUGURY* [4] explores ancient divination practices through a multichannel sound interface driven by environmental data.

## III. IMAGINED PROTOTYPE

### A. Concept

I imagine *Kirma* as a tactile electronic sound instrument inspired by the spiral form and symbolic meaning of coiled basketry and Andean cosmology. The prototype consists of:

- A spiral-shaped structure made from natural fibres such as fique
- Conductive threads woven into the coils
- Capacitive touch sensors embedded in each spiral layer
- A microcontroller for sound synthesis
- LED indicators for visual feedback

The interaction is designed to evoke a ritualistic experience. Each touch activates a sound mapped to ancestral rhythms or frequencies, transforming the act of weaving into a sonic gesture. The spiral form not only references the temporal logic of Andean thought—where time is circular, and memory is forward-facing—but also the physical structure of coiled baskets used across Indigenous cultures.

*B. Reference images*



Figure 1 handwoven palm serving basket from Botswana



Figure 2 Handwaving process of guacamaya coil basket credits: [https://youtu.be/qeTyQxq\\_XVo](https://youtu.be/qeTyQxq_XVo)



Figure 3 AI-generated model

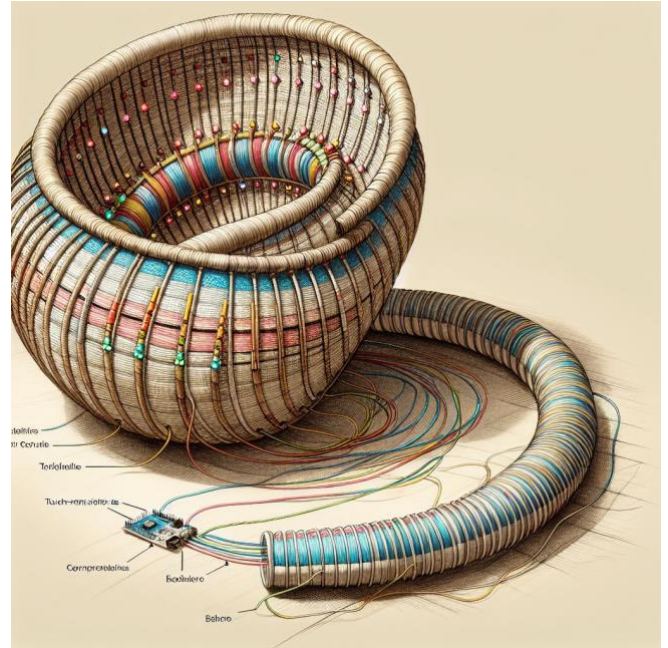


Figure 4 AI-generated model

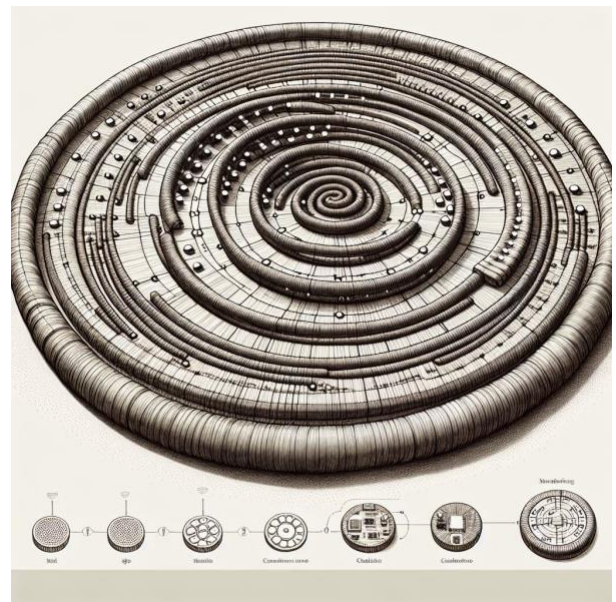


Figure 5 AI-generated model

*C. Design Framework and Build Process*

While Kirma is currently a conceptual prototype, its development could follow a modular and iterative approach:

1) *Structure and Materials:* The base spiral could be constructed using a flexible but durable natural fibre such as fique or cabuya coiled around a lightweight frame (e.g., bamboo or recycled PLA). The coils would be spaced to allow for the integration of conductive threads and sensors.

2) *Sensing System:* Capacitive touch sensing could be implemented using conductive embroidery threads stitched into the coils. Each layer of the spiral could act as an independent capacitive zone connected to a multiplexer to expand the number of touch inputs.

3) *Microcontroller and Sound Engine*: A Bela board is ideal for low-latency audio processing and could be embedded in the base of the instrument. Alternatively, a Teensy 4.1 or Raspberry Pi Zero 2 W could be used for prototyping, running Pure Data patches or SuperCollider scripts for sound synthesis.

4) *Feedback and Interaction*: LED indicators could be embedded along the spiral to provide visual feedback when a touch is registered. These could be controlled via PWM pins or addressable LEDs to reflect intensity or frequency.

5) *Power and Portability*: The system could be powered via USB or a rechargeable LiPo battery with a power management module. A compact form factor would allow the instrument to be wearable or table-mounted for performance.

6) *Software and Mapping*: The capacitive inputs would be mapped to sound parameters such as pitch, filter cutoff, or sample triggering. A custom Pure Data patch or Max/MSP environment could allow for real-time modulation based on touch duration, pressure (estimated via capacitance variation), or gesture patterns.

#### IV. RESPONSIBLE INNOVATION

*Kirma* is grounded in a practice of responsible innovation that centres on cultural respect, sustainability, and epistemic justice. Rather than appropriating ancestral technologies, the project emerges from lived experience, long-term research, and a commitment to honouring the communities and cosmologies that inspire it.

The use of natural materials such as fique, the integration of handcraft techniques, and the emphasis on open-source, low-cost electronics reflect a conscious effort to align technological development with ecological and social responsibility. The design process privileges embodied knowledge and collaborative making over extractive or industrial models.

By situating the instrument within a decolonial framework, *Kirma* challenges dominant narratives of innovation and proposes alternative futures rooted in memory, ritual, and reciprocity. It is not only a tool for sound but a gesture of reparation and reactivation of silenced technologies.

#### V. AUTHOR BIO(S) / EXPERIENCES

Patricia Cadavid H. is an immigrant, artist, and researcher from Abya Yala. Her work explores the intersection of ancestral Andean technologies, decolonial theory, and experimental sound performance. Through speculative prototyping and tangible interfaces, she reactivates silenced knowledge systems and proposes new ways of listening rooted in memory and ritual.

She is the creator of the *Electronic\_Khipu\_* and *Kanchay\_Yupana//*, instruments inspired by Andean ancestral technologies. These instruments have been presented at Ars Electronica, ISEA, IN-SONORA, and other international festivals. Her research has been published in the *Computer Music Journal* (MIT Press) and recognised by the NIME community with an honorary mention for the Pamela Z Award for Innovation, Diversity, and Inclusion.

Patricia is currently a PhD candidate at UWE Bristol, where she investigates the reuse of ancestral technologies as new interfaces for musical expression within a decolonial framework. <https://www.patriciacadavid.net/>

#### VI. ACKNOWLEDGEMENTS

This prototype is being developed as part of my ongoing doctoral research at UWE Bristol, where I explore the reuse of ancestral Andean technologies in the creation of new experimental sound interfaces for live performance.

This work is also a tribute to the territories that hold memory in their fibres and to the hands that continue to weave futures from ancestral threads.

This proposal also benefited from Microsoft Copilot (GPT-4), an AI-based assistant that supported the image sketches.

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