

# Pulse Now

An Embodied Interface for Planetary-Scale Data Perception

## Abstract

Pulse Now is a research-through-design project investigating how a simple physical action: placing a hand at the center of a circular surface, can serve as a perceptual bridge to planetary scale phenomena. The work is grounded in analysis of spatial metaphors, such as Aristotle's Wheel Paradox and cyclical anthropological models, which inform a tangible interface design. The system translates live scientific data, specifically NASA Solar X-ray Flux and Schumann Resonances into a dynamic, generative audiovisual environment.

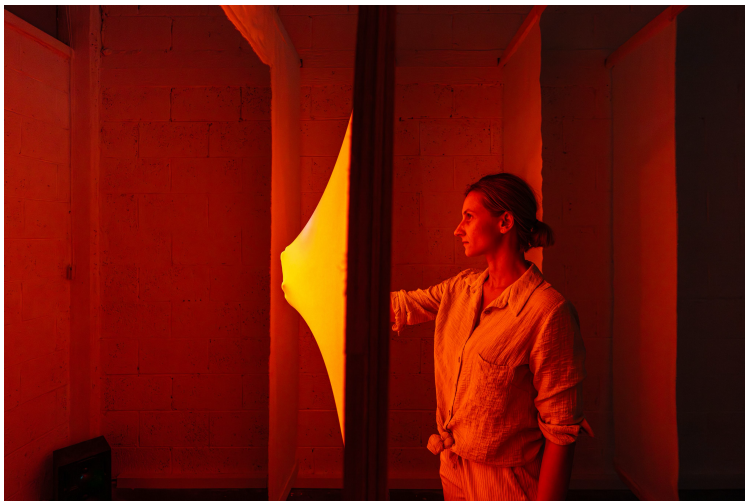
Through a critical design pivot from passive biometric monitoring to active gestural input, the project demonstrates how intentional embodiment can foster a visceral connection to vast, non-human systems. This document outlines the conceptual framework, technical implementation, and core research insights that position this work at the intersection of Art and HCI.

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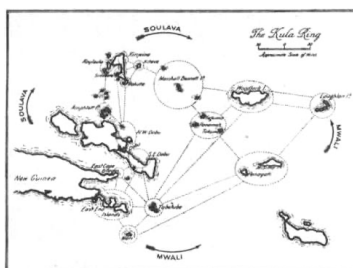
## Research Question & Motivation

### From Poetic Inquiry to Embodied Research

The project originated from a poetic inquiry into large-scale belonging: How do we, as finite beings, perceive our embeddedness within global and cosmic systems? Initial research focused on the Kula Ring and other models of non-human reciprocity. The artistic gap identified was the disconnect between scientific knowledge (reading graphs of solar activity) and visceral feeling (sensing the scale of that activity). The primary motivation shifted toward designing a new sensory channel, a technological tool that compels the user to actively perform the connection, thereby transforming abstract planetary data into a physically felt presence. This approach places Experience Design at the forefront of technological choice.



1. Installation photograph: The central gesture and generative light environment.

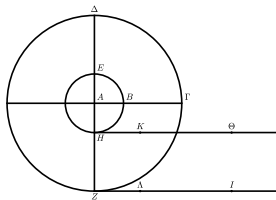


2. Conceptual influence: Map of the Kula Ring reciprocal exchange.

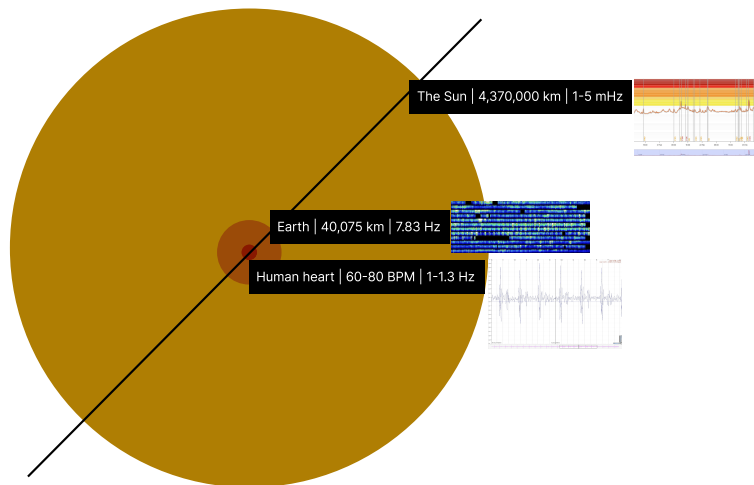
# Interface design

## Conceptual & Spatial Design: The Center as Metaphor

The central design constraint was the Embodied Metaphor. The function of the interface was determined by the symbolic meaning of the space. Drawing on Aristotle's Wheel Paradox, where the center is the only point of stillness on a moving circle, the system requires the user to perform an Act of Centering a physical pause that anchors the personal rhythm to the planetary cycle. The Required Gesture: The action of placing the hand at the geometric center of the interface is not a simple 'touch.' It is an intentional commitment: a physical anchoring that must be sustained. This foundational design decision mandated an input mechanism capable of registering depth and duration of pressure, not merely proximity.



3. Conceptual influence: Aristotle's Wheel Paradox diagram.

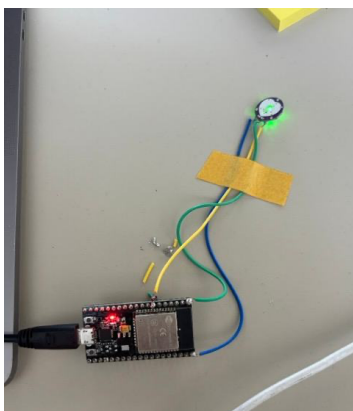


4. Conceptual flow diagram: Translating external systems into the center.

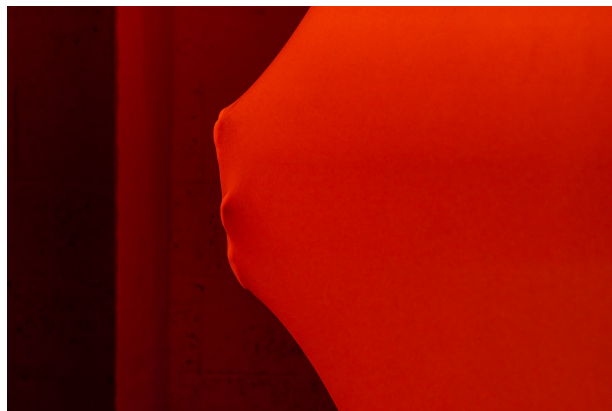
## The iterative pivot: From monitoring to commitment

The development process was defined by a crucial iterative pivot based on core conceptual incompatibility:

- The first prototype utilized a Heart Rate Sensor, based on the assumption that utilizing bio-data would create an intimate link.
- The bio-sensor demanded passive, internal monitoring from the user. This contrasted sharply with the project's primary metaphor, which required an active, outward-reaching gesture of anchoring the hand onto the external planetary system. The passive input failed to support the core act of Intentional Presence at the geometric center.
- This led to a switch to a Depth sensor which successfully measured the user's level of active commitment (depth and duration), thereby supporting the required act of physical grounding and alignment with the central metaphor.



5. Studio process: Early prototyping and desk setup.



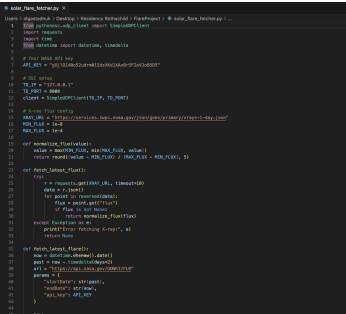
6. Installation view (Wide shot) showcasing the scale and immersion.



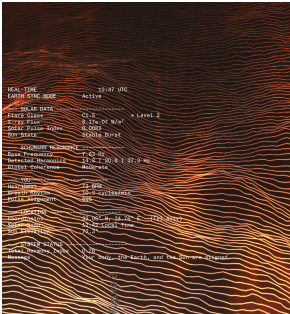
Real-time Planetary Computing

The installation is built on a custom, layered architecture designed to establish a precise, low-latency, dual-stream feedback loop:

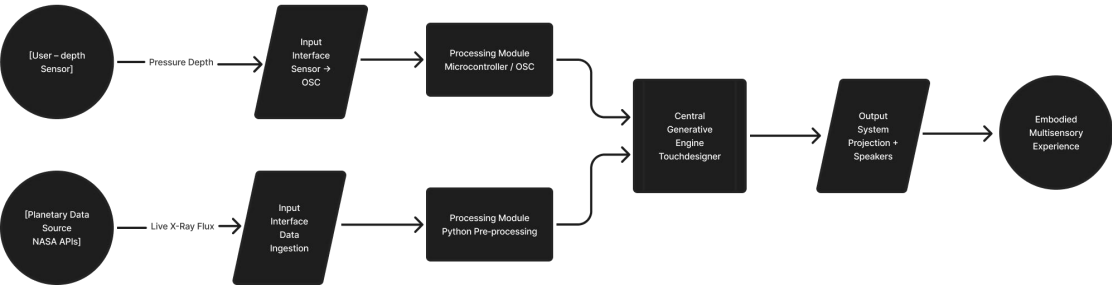
- A. Planetary Data Acquisition: A dedicated Python script polls NASA APIs for live data on Solar X-ray Flux and geomagnetic indices. Normalized data is then transmitted via OSC (Open Sound Control).
- B. Input Sensing & Control: The pressure interface utilizes an Arduino Microcontroller to read the analog pressure depth. This user input is transmitted via OSC to the central engine, directly controlling modulation and intensity parameters.
- C. Generative Engine (TouchDesigner): The TouchDesigner engine receives both data streams. Planetary data calibrates the underlying sound and visual texture (e.g., Solar Flux complexity), while the User Input amplifies or filters that environment. The Schumann resonance frequency (7.83Hz) serves as a constant, felt low-frequency drone.



7. Python script used for real-time data of NASA X-ray flux



8. System screenshot: TouchDesigner visual engine



9. System Architecture Diagram showing dual data streams.

Studio Process and Prototyping

The ability to rapidly prototype, test, and pivot was essential. The technical solution was engineered to serve the core conceptual constraint, demonstrating a design methodology where the metaphorical goal dictates the technological choice.



10. Prototyping the interface



11. Studio process

## Experience & Conclusion

The project successfully validated the potential of a Metaphor-Driven Design process. User observations consistently showed that the intentional act of anchoring led to a state of deep concentration, transforming the abstract data into an immediate, felt reality. Pulse Now concludes that intentional physical input, rather than passive monitoring, is key to designing experiential interfaces that foster cognitive and affective connection to vast data scales.



12. Installation view

## A Research Trajectory (MIT Media Lab)

Pulse Now establishes a strong foundation for an expanded program of research that I intend to pursue at the Media Lab. The project's central insight, that intentional gesture is a superior input to passive bio-monitoring for creating embodied links, provides a crucial basis for future work across my chosen groups:

For Affective Computing: I propose validating the qualitative insights of Pulse Now using rigorous physiological sensors to objectively measure the affective shift induced by the intentional anchoring gesture.

For Future Sketches: I aim to extend the generative code methodology of the piece, mapping the interaction to speculative interfaces that redefine the ritualistic relationship between body and code and new forms of digital movement.

For Cyborg Psychology / Fluid Interfaces: I seek to embed the concept of the "Anchoring Ritual" into ambient computing, investigating how technologies can be designed for Human-Machine Intimacy and the creation of new forms of somatic awareness.



13. Exhibition visitor interacting with the central pressure interface.

## Sources & References

1. Aristotle. Physics (Discussion of concentric motion and the wheel paradox).
2. Kimmerer, Robin Wall. "The Serviceberry." Emergence Magazine, 2020.
3. Malinowski, Bronislaw. Argonauts of the Western Pacific. London: Routledge, 1922 (Ethnographic study of the Kula Ring and reciprocal exchange).
4. Millar, Jeremy. With the Left Hand. Exhibition and accompanying essay on relational perception, 2009.
5. NASA. Solar Data Streams (Solar Storms, X-ray Flux, and Heliophysical Activity). <https://science.nasa.gov/sun/solar-storms-and-flares>.
6. Sacred Texts Archive. Cosmology Chart (Public Domain). <https://www.sacred-texts.com/eso/sta/img/12200.jpg>.
7. Wikipedia. "Aristotle's Wheel Paradox." [https://en.wikipedia.org/wiki/Aristotle%27s\\_wheel%27s\\_paradox](https://en.wikipedia.org/wiki/Aristotle%27s_wheel%27s_paradox).

## Image Sources

- Figure 1, 6, 12: Installation photographs. Photographer: Daniel Hanoach, 2024. (Used with permission).
- Figure 13: Exhibition visitor interaction. Source: Author (Olga Stadnuk), 2024 (Subjects were aware they were being photographed).
- Figure 4, 9: Conceptual and System diagrams (including the Architecture Diagram). Source: Author (Olga Stadnuk), 2024.
- Figure 5, 10, 11: Studio and process photographs (showing hardware/setup). Source: Author (Olga Stadnuk), 2024.
- Figure 7, 8: System screenshots (TouchDesigner/Code/Visuals). Source: Author (Olga Stadnuk), 2024.
- Figure 2: Kula Ring map photograph. Source: TOTA World, "The Kula Ring," <https://www.tota.world/article/1557/>.
- Figure 3: Aristotle's Wheel Paradox diagram. Source: Wikipedia, "Aristotle's Wheel Paradox," [https://en.wikipedia.org/wiki/Aristotle%27s\\_wheel%27s\\_paradox](https://en.wikipedia.org/wiki/Aristotle%27s_wheel%27s_paradox).