Traceless

XUEDAN GAO, Aalto University, Finland
XINCHEN LIU, Aalto University, Finland

1 Program Notes

Traceless is an interactive sound installation with visual projections that invites participants to use handheld controllers for audio and tactile interaction. Ice, a symbol of power in deep time and fragility in the Anthropocene, is a medium and a collaborator in this work. The installation captures the sounds of ice melting and dripping, and the visual projections compare two contrasting timescales: the slow, natural progression of glacial formation and the rapid, human-accelerated retreat occurring today. By immersing participants in the multisensory experience, *Traceless* encourages them to rethink the role of humans in reshaping natural processes and to imagine a de-anthropocentric future.

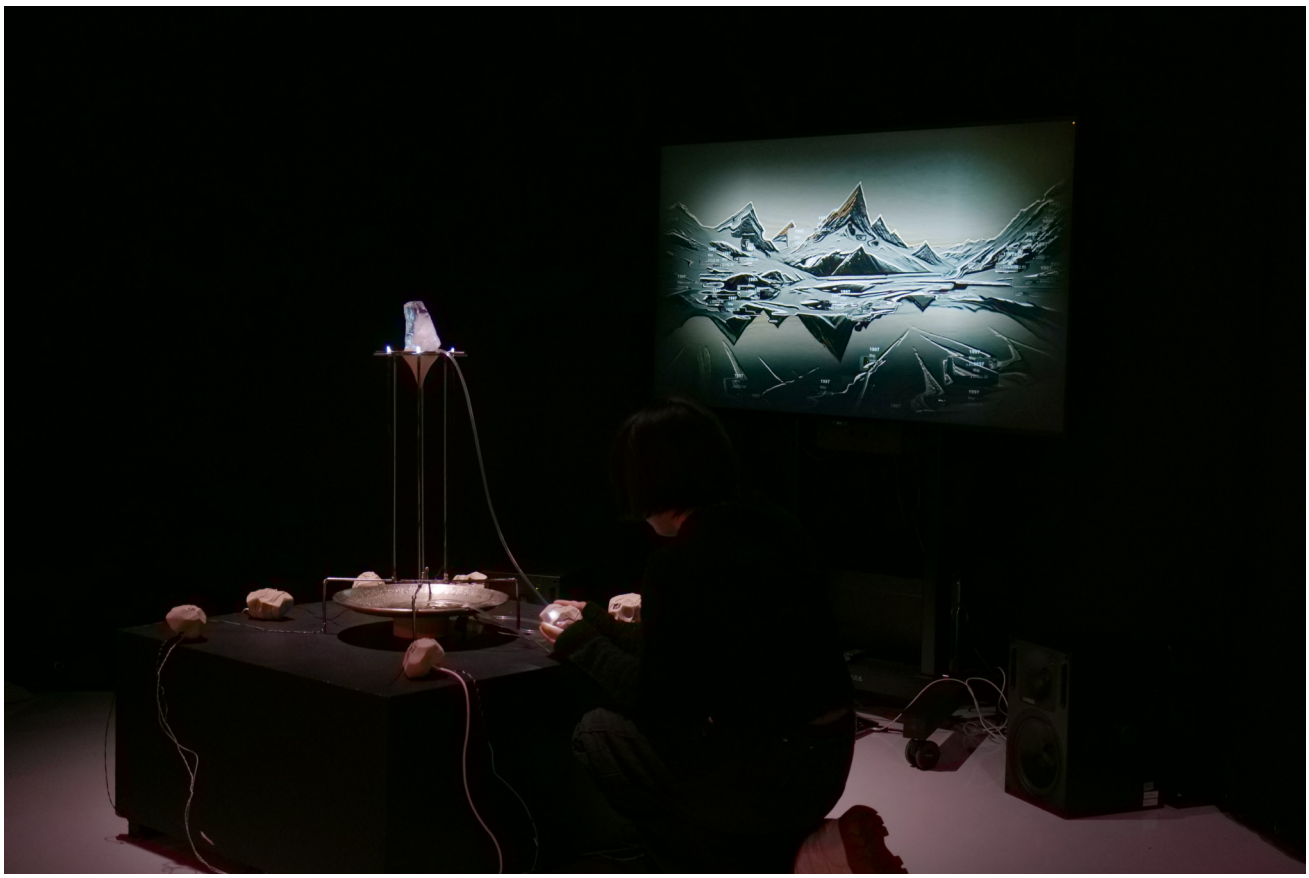

Fig. 1. Overview of *Traceless*

Authors' Contact Information: Xuedan Gao, Aalto University, Espoo, Finland, xuedan.gao@aalto.fi; Xinchen Liu, Aalto University, Espoo, Finland, xinchen.liu@aalto.fi.

NIME '25, June 24–27, 2025, Canberra, Australia

2 Project Description

The Anthropocene, a time defined by human impact since the 1950s, has led to significant environmental changes, often tied to the Earth's declining health [2]. Glacial ice, formed over centuries through the compression of snow into dense, airless layers, symbolizes the vast, slow forces of nature. However, this balance has been disrupted in the past two centuries. Human activities such as fossil fuel combustion, deforestation, urbanization, and industrialization have accelerated glacier melting, contributing to global warming and altering Earth's ecosystems. The contrast between glaciers' slow formation and rapid retreat shows the profound impact of human activities on natural processes.

Traceless is an interactive sound installation with visual projections that invites participants to use handheld controllers for audio and tactile interaction. Ice, a symbol of power in deep time and fragility in the Anthropocene [1], serves as both medium and collaborator in this work. *Traceless* includes the installation's core structure, an interactive audio system, and visual projections. It captures the sounds of ice melting and dripping using contact microphones. The visual projections compare two timescales: the slow, natural progression of glacial formation and the rapid, human-accelerated retreat occurring today. We created animations of various forms of snowflakes combined with the rhythmic sound of dripping water to metaphorically represent the time spectrum of the various stages of glacier formation. To illustrate the impact of human activity on glacier melting, we utilized AI-driven videos generated through Stable Diffusion, along with the Greenland Surface Melt Extent dataset from the NSIDC (National Snow and Ice Data Center) [4]. The two visual effects were switched through tactile interactions, bringing different times into the same space.

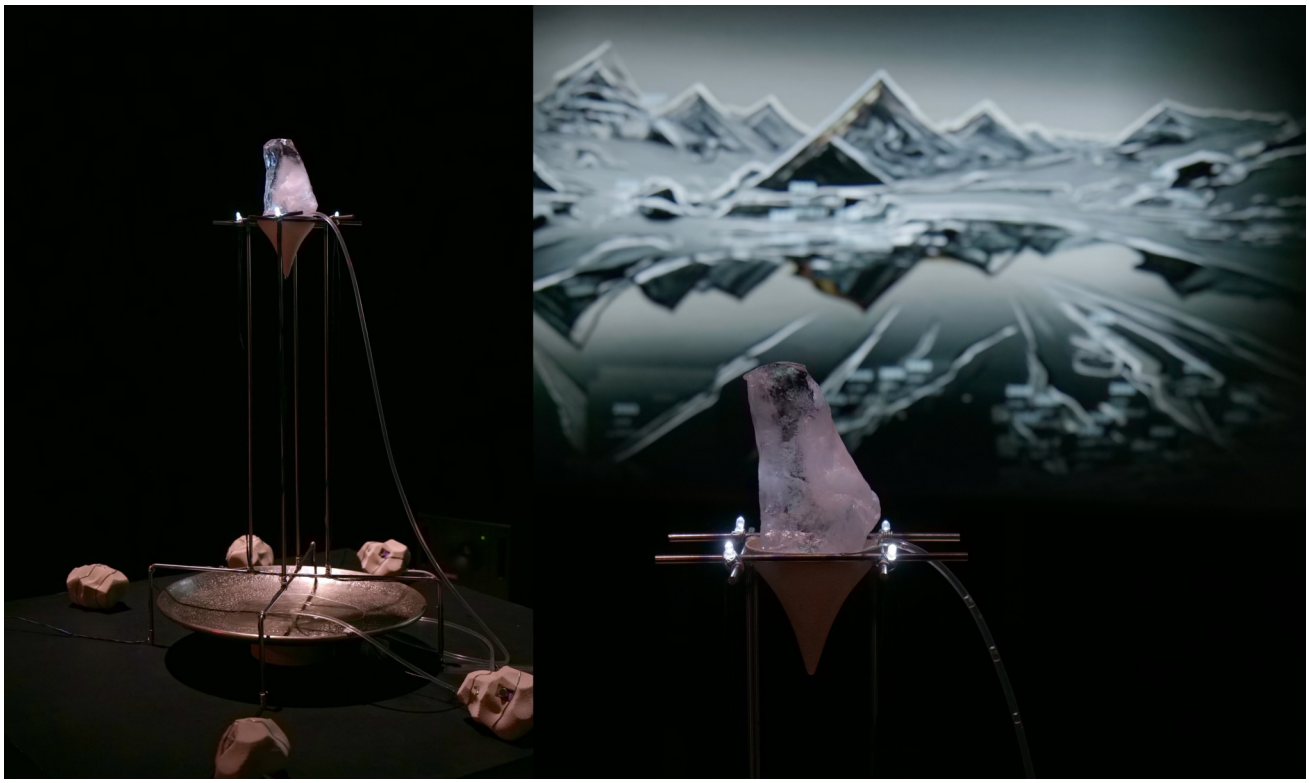

Fig. 2. Installation(left), ice(right)

The interaction emphasizes the harmony between human actions and natural processes. When participants hold the controller, the corresponding musical note will play. When participants speak to the installation, their voices blend with the natural sounds of melting ice, which forms an echo that embraces change as part of the natural system. Human language is not parsed semantically and becomes increasingly blurred in the echo. This is a call-and-response process, where the ice and the system actively respond to the participants in their own rhythm that is not influenced by the participants, forming a mutual dialogue. The sounds metaphorically embed the vibrational frequencies of carbon-based life into the ancient resonance systems of geological formations. The sounds across material dimensions constitute dialogues between geological time and the Anthropocene.

Traceless allows participants to experience and reflect on the agency of nature within a restricted dialogic framework. The asymmetric interaction exposes the boundaries of human intervention and guides participants to realize, through

attempted 'collaboration' with the installation, that symbiosis resides not in technological domination, but in what Donna Haraway calls 'becoming with' [3], an ongoing process of co-creation rather than control. By immersing participants in the multisensory experience, *Traceless* encourages them to think about the active role of nonhuman entities and to imagine a de-anthropocentric future.

3 Technical Notes

The installation consists of a steel structure holding a melting ice block, with water dripping onto a metal plate. Seven 3D-printed controllers with conductive materials and embedded microphones allow participants to interact. When touched, the controllers trigger LED lights, MIDI notes, and sound effects. Contact microphones capture the sound of dripping ice, processed through effects in Max/MSP. The visuals are processed in TouchDesigner and react to sound and touch, shifting between snowflakes and melting glaciers. The visuals are driven by AI-driven videos generated through Stable Diffusion, and the Greenland Surface Melt Extent dataset from the NSIDC (National Snow and Ice Data Center) [4]. An Arduino system manages sensor data from a capacitive touch sensor, controls the LEDs and water flow of the pump, and transmits data to Max/MSP via serial communication. Max/MSP handles audio processing and sends data to TouchDesigner via OSC for real-time visual projection.

4 Media Links

- Video: https://youtu.be/lR1OMePhHwM?si=gpOlbw7HuWiLFxd4

5 Ethical Standards

This work does not involve human subject research or experiments with animals. The installation is an interactive artwork where participants engage voluntarily without data collection, personal identification, or behavioral tracking.

Acknowledgments

The authors would like to thank Matti Niinimäki for all his help throughout the process, Xiaoqi Wang for assistance with video shooting and exhibition setup, Ron from the Aalto metal workshop for his support during the installation construction, and Krisjanis Rijnieks from Aalto Fablab for his guidance and support on 3D printing and mold making.

References

[1] Mark Carey. 2007. The history of ice: how glaciers became an endangered species. *Environmental History* 12, 3 (2007), 497–527.
[2] Paul J Crutzen. 2006. The "anthropocene". In *Earth system science in the anthropocene*. Springer, 13–18.
[3] Donna J Haraway. 2016. Staying with the trouble: Making kin in the Chthulucene. In *Staying with the Trouble*. Duke University Press.
[4] National Snow and Ice Data Center. 2025. Melt Data Tools. https://nsidc.org/ice-sheets-today/melt-data-tools Accessed: 2025-02-04.