

Bucolic: Cultural Machines. Community-Based Human–AI–Robotic Musicianship with Traditional Instruments

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1 Program Notes

Bucolic: Cultural Machines is a live performance that brings together traditional instruments, robotics, artificial intelligence, and spatial sound to explore how musical communities—human and non-human—can coexist and co-create in contemporary performance.

The work emerges from an international collaboration between artists and researchers connected to musical traditions in Finland, Greece, and Japan. Instruments such as the Finnish kantele, Greek goat bells, and Japanese shakuhachi are not treated simply as sound sources, but as cultural agents shaped by relationships between people, animals, environments, and belief systems. These traditions share an understanding of music as something distributed across bodies, materials, and spaces rather than authored by a single performer.

In performance, robotic systems physically activate acoustic instruments, while live coding and AI-driven processes respond in real time to performers and surroundings. Machine learning models trained on instrumental sounds transform and extend timbral gestures, generating hybrid textures that move between recognizability and abstraction. Spatial audio techniques distribute sound throughout the performance space, encouraging listeners to experience music as an immersive, ecological event rather than a frontal presentation.

Improvisation plays a central role. Performers listen and adapt to the behaviors of AI systems and robotic instruments, negotiating moments of control, unpredictability, and mutual influence. Spatial perception and the audience's ability to move during the performance further shape the unfolding work, positioning listeners as active participants within a shared sonic environment.

Aligned with NIME 2026's theme "Communities", *Bucolic: Cultural Machines* reflects on how new musical interfaces can foster dialogue between traditions, technologies, and listening communities—inviting audiences to experience music as a network of relationships across cultures, species, and systems.

2 Project Description

Bucolic: Cultural Machines is a live performance exploring expanded musical agency through interactions among human performers, artificial intelligence (AI), robotic instruments, and spatial

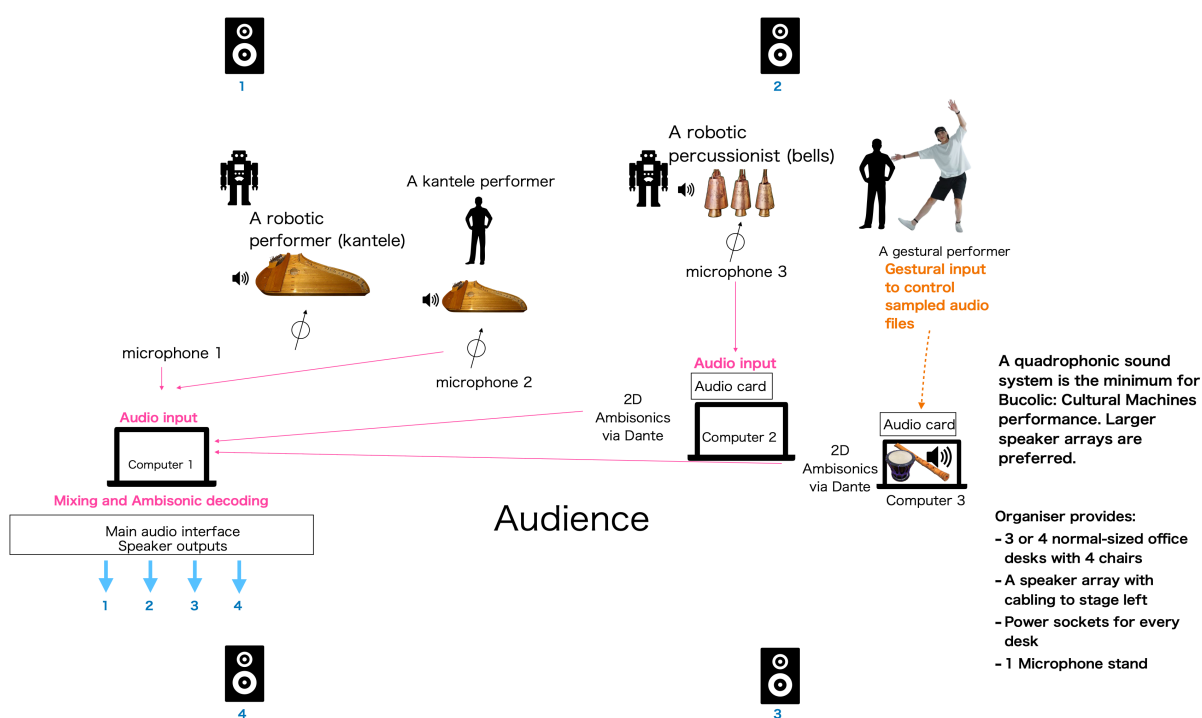
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Music Proceedings of the International Conference on New Interfaces for Musical Expression
NIME '26, June 23–26, 2026, London, UK

sound environments. The work emerges from an international collaboration among artists and researchers from Finland, Greece, and Japan and is developed in preparation for Oulu 2026, the European Capital of Culture.

The performance draws upon traditional instruments—the Finnish kantele, Greek goat bells, and Japanese shakuhachi—not merely as sound-producing objects, but as cultural devices embedded in animistic and ecological worldviews. In these traditions, musical sound mediates relationships among humans, animals, natural forces, and spiritual entities. These folk imaginaries form the conceptual foundation of the performance’s compositional and interactional design.

Rather than treating technology as a neutral tool, *Bucolic: Cultural Machines* positions AI, algorithms, and robotic systems as active participants in performance. Musical agency is distributed across performers, machines, instruments, and spatial environments, challenging conventional performer–instrument hierarchies and foregrounding relational, posthuman models of musicianship. Figure 1 shows the technical rider of Bucolic performance.



1. The Technical Rider of Bucolic Performance

Fig.

3 Performance Notes

The performance integrates custom-built and digitally augmented musical interfaces:

- **Robotic Goat Bells (Greece):**
A set of acoustically resonant goat bells actuated by servo motors and controlled through live coding. The bells articulate rhythmic and gestural patterns derived from algorithmic processes, evoking pastoral soundscapes where animals function as sonic agents.

- **Robotic Kantele (Finland):**
A servo-driven plucked kantele whose strings are actuated through algorithmic control and performer interaction. The instrument maintains its acoustic identity while extending its gestural and temporal possibilities.
- **Shakuhachi (Japan):**
Performed live by a human performer using gestures. Sensor-based interfaces may be used to translate bodily movement into control data for sound processes.
- **AI Sound Systems:**
Machine learning models (e.g., IRCAM's RAVE) trained on traditional instrument timbres generate hybrid acoustic–synthetic textures, responding in real time to performer actions.

The performance unfolds as a sequence of interconnected scenes rather than a fixed composition. Each scene foregrounds different relationships between human performers, robotic instruments, AI processes, and space.

Live coding plays a central role, allowing performers to modify musical logic in real time. Algorithmic processes generate both control data for robotic actuation and parameters for AI-based sound transformation using SuperCollider and Max. Human performers respond to these outputs through improvisation, listening, and embodied interaction, fostering a dialogic relationship between intention and machine behavior.

Indeterminacy is embraced as an aesthetic principle. AI systems introduce unpredictability, requiring performers to negotiate with semi-autonomous agents rather than exercising total control. Musical form emerges through interaction rather than pre-determined structure.

4 Media Link(s)

- Video: <https://youtu.be/2mWzXW7g5Zc>

Acknowledgments

The authors gratefully acknowledge Jan Julin for his significant contributions to the design and realization of the robotic kantele, and John Tyligadas for his essential role in the development of the robotic goat bells.

The development of the Bucolic: Cultural Machines project has been supported by funding from the EU–Japan Fest Foundation.

Ethical Standards

This project is grounded in long-term, dialogic collaboration with musicians, composers, and cultural practitioners connected to traditional music communities in Finland, Greece, and Japan. Rather than treating these traditions as raw material for technological experimentation, the work approaches instruments, performance practices, and associated cosmologies as situated forms of knowledge developed within specific social, ecological, and historical contexts.

The design and performance processes emphasize reciprocity and co-authorship. Artistic decisions—including instrument augmentation, algorithmic behavior, and performance structure—are developed collaboratively, with attention to the values, aesthetics, and meanings attributed to the instruments within their originating communities. Robotic and AI-based systems are framed not as replacements

for human or traditional practices, but as speculative extensions that invite reflection on continuity, transformation, and care in contemporary music-making.

Ethically, the project seeks to avoid extractive or representational approaches to cultural heritage. The use of traditional instruments and sound materials is accompanied by explicit contextualization in performance and documentation, acknowledging their cultural origins and living communities. AI models trained on instrumental sounds are used as interpretive and responsive systems rather than as tools for stylistic replication or appropriation, and care is taken to avoid claims of authenticity or cultural substitution.

The performance further engages audiences as participants within a shared sonic environment, encouraging situated listening and awareness of relational agency among humans, machines, and environments. By fostering encounters between NIME communities and musicians rooted in non-academic traditions, the project aims to broaden access to technological performance practices and promote inclusive forms of knowledge exchange.

Overall, this work contributes to NIME 2026's focus on "Communities" by proposing an ethical framework for new musical interfaces that values collaboration, cultural specificity, and shared responsibility in the design and performance of technologically mediated music.