

## Quadrumvibrate

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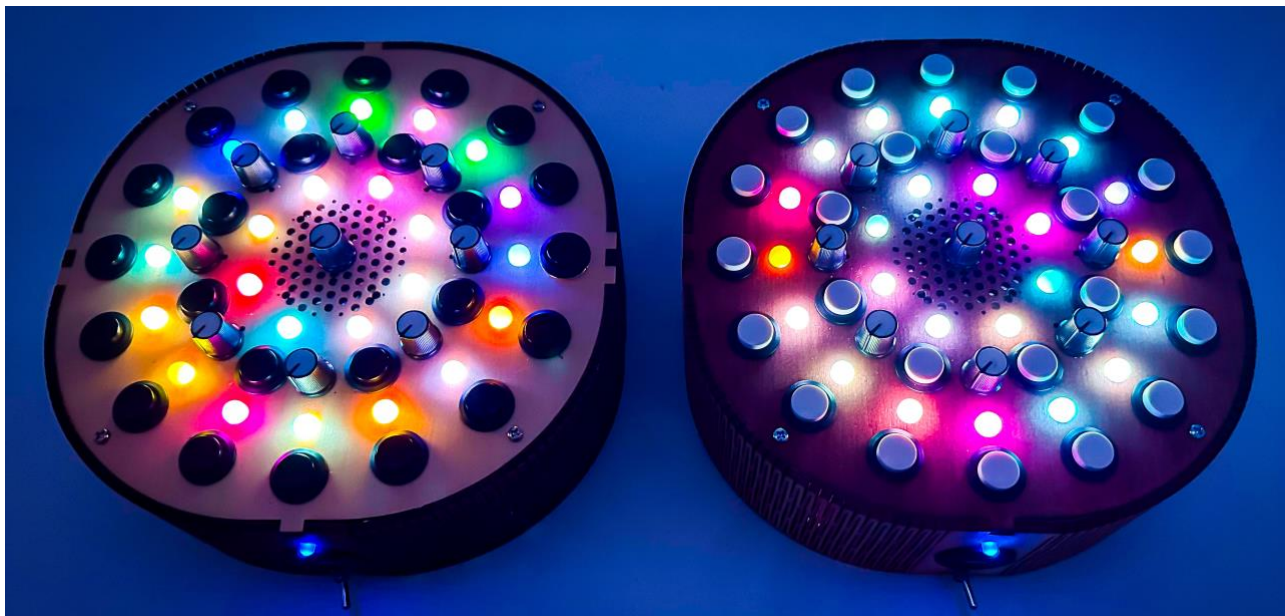


Fig. 1. Two Beat Machines.

### 1 Program Notes

This performance is a duet that unfolds as a dynamic interaction between two performers and the generative systems they activate, forming a quartet of human and machine actors. The work explores evolving sonic and rhythmic textures built from algorithmically generated and modulated rhythmic sequences, realised through layered, synthesised percussion. Each performer plays a Beat Machine, a custom electronic musical instrument they built themselves, housed in a bespoke wooden enclosure featuring a concentric, circular user interface layout. The instrument generates a deliberately lo-fi oriented sound pallet and offers a range of rhythm-generation algorithms, including Euclidean, polymetric, polyrhythmic, geometric, and probabilistic approaches. Rather than presenting fixed material, the performers actively shape the music in real-time through direct intervention, triggering, modifying, and regenerating patterns and sounds as the performance unfolds.

Structured as a sequence of contrasting sections, the performance moves between driving, pulse-oriented passages and more sparse, atmospheric sound worlds. Musical form emerges through the performers' ongoing interaction with generative systems, as they respond to rhythmic and timbral change. Visual and gestural interaction with the instruments supports clear performer agency, allowing experienced musicians to maintain expressive control while embracing unpredictability. The work

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foregrounds performative decision-making, interaction, and responsiveness as central musical elements, demonstrating a refined balance between human intention and algorithmic behaviour in live electronic performance.

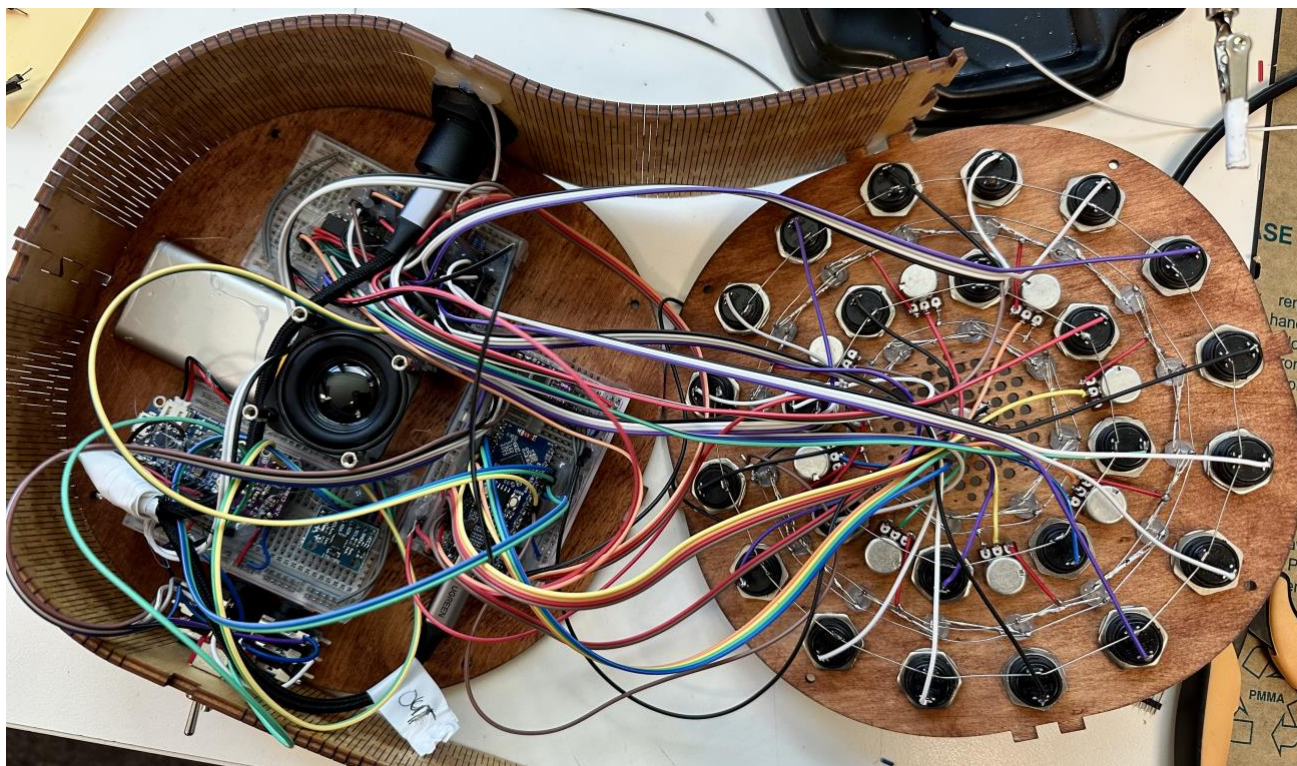


Fig. 2. Inside Beat Machine.

## 2 Project Description

This performance is a duet which may also be understood as a quartet of interacting human and machine actors. The work explores the sonic and rhythmic possibilities of generated and algorithmically modulated rhythmic sequences that trigger layered, synthesised percussive sounds. Performers shape these processes through direct manipulation and by initiating generative and regenerative processes.

The performers each play a NIME called the Beat Machine, which is a bespoke, handmade instrument they designed and built from affordable electronic components, including an ESP32 microcontroller, CD4051 multiplex chips, accelerometer, and digital to analogue converter. It incorporates a LiPo battery and charging circuitry, plus a small amplifier and speaker to support portable performance. The instrument is housed in an elegant, laser-cut wooden enclosure using a living hinge design with panel-mounted interface controls. A more compact, machine-assembled/printed-circuit-board version of the Beat Machine has also been developed for wider distribution.

The instrument offers a range of rhythm-generation algorithms, including Euclidean [1], polymetric, geometric [2], and probabilistic approaches enabling both organised and chaotic rhythmic organisation. Each Beat Machine can play up to eight parts, with each part independently generated and algorithmically modulated. Parts may vary in length and tempo. All sounds are produced using a shared synthesis architecture that combines established subtractive and frequency-modulation

techniques that lean into a lo-fi aesthetic. Generated patterns and timbres can be triggered at will and edited manually in performance.

The instrument's interface features a compact, circular arrangement of buttons, lights, and dials, visually reinforcing the cyclical nature of the looping sequences that underpin the machine's beats. Circular interfaces have long been popular for rhythm machines, with examples including the Buchla 252e [3], ndial [4], Pattering [5] and Orbita [6]. The interface has been refined through iterative experimentation to provide performers with access to the instrument's full range of features, while LED colour and animation provide clear, real-time feedback.

The performance is structured as a series of sections, each investigating different musical potentials of the Beat Machine, ranging from energetic, pulse-driven material to sparse and atmospheric textures. This performance demonstrates the instrument's performability in the hands of experienced performers, who also designed and created the instrument.

### 3 Technical Notes

The performance requirements:

- Small table for the instruments;
- Stereo DIs x 2;
- PA and foldback;
- Microphone stand;
- Venue with data projector and projection screen/wall;
- HDMI input to the projector for the overhead camera feed;
- Power.

We will provide:

- Beat Machine x 2;
- camera/phone and HDMI adapter to feed HDMI to the house projector;
- Adapter for mounting camera/phone on a standard microphone stand so we can send live video straight to the house projector.

### 4 Media Link(s)

- Video documentation: <https://vimeo.com/1162979051/e05494ccd4?fl=pl&fe=sh>

### Acknowledgments

This work was supported by the Australian Government through the Australian Research Council.

### Ethical Standards

This work is done in the context of research activities within and supported by University and Australian Government research grants. The development of the creative work was undertaken by the authors and external feedback on the instrument design was collected under ethics approvals granted by the authors' University.

### References

- [1] A. R. Jensenius and M. J. Lyons, *A NIME Reader*. Cham: Springer International Publishing, 2019.
- [1] Francisco Gómez-Martín, Perouz Taslakian, and Godfried Toussaint. 2009. Structural properties of Euclidean rhythms. *Journal of Mathematics and Music* 3, 1 (March 2009), 1–14.
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- [3] Don Buchla. c1977. *252e Buchla Polyphonic Rhythm Generator*. <https://buchla.com/product/252e/>
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- [5] Olympia Noise Co. 2025. *Patterning 3: Drum Machine*.
- [6] Playtronica. 2025. *Orbita*. <https://help.playtronica.com/orbita>