

# Title: Modular Mechanical Systems

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## 1. PROGRAM NOTES

Modular Mechanical Systems (MMS) is a study of DIY handmade electronic music systems utilising light sensors and kinetic movement as audio and control sources. It explores tactile feedback systems where performance gestures and light control and reception enable cyclical sonic motifs. The modular design allows an infinite array of potential performance outcomes. MMS considers how each element—hardware and software, tangible and virtual—of the system can both enact and respond to generative processes through gestural control and light manipulation. The authors explore the role and affordances of each element and how it contributes towards the temporal sonic and visual space. This question arises during both the design and interactive performance. During performance, the authors explore shifting timbres, rhythms, and recurring sonic motifs by manipulating the boxes' configuration and their relationship to one another as well as light positions and filters. The interplay of emerging textures with the performers' responsiveness and interaction highlights the affordances of handmade bespoke systems toward musical structures in non-linear systems. While improvisation and experimentation are at the heart of the composition process, the system allows for curated and repeatable performance outcomes.

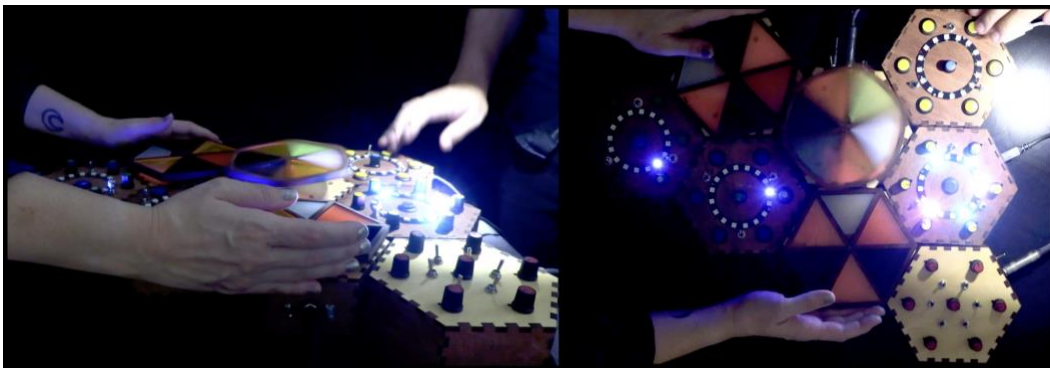


Fig. 1. Modular Mechanical Systems

## 2. PROJECT DESCRIPTION

Background and context: The authors are makers and musicians who are deliberately adopting a low cost and DIY approach that foregrounds the use of accessible tools.

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Underlying concepts and technologies: Rotating frames are mounted on bearings/motors that support panels of coloured acrylic that function as light filters. Below this, embedded into the surface, are photocells routed to bespoke circuitry based on the 40106 CMOS IC and 6N138 optocoupler. Thus, the initial sound world is generated via standalone synthesisers that are tangible (performed via rotation by hand and motor) and highly responsive/performable via light. A range of complimentary controllers with computer-controlled LEDs and accelerometers are used to process and augment the other boxes, these controllers are based on Arduino-compatible microcontrollers and utilise Control Surface [1] and Fast LED [2] libraries, code and instructional videos are available here [3].

Why this is relevant to the NIME community? Gestural expression and control are both inherent in music making and developing new performance systems. Kinetic movement and systems make use of the theatrics of gestural performance, where the instrument's movements and performer's interactions with the instruments are more easily observed by the audience, thus illuminating the relationships between instrument, gesture, and sound output. Incorporating light as both a control source and performance gesture further augments the performative aspect aiming to increase audience engagement. Additionally, we hope to foreground the usefulness of modular and embedded systems and foreground a visual presentation that involves no laptop being visible on stage.

### 3. PERFORMANCE NOTES

This is currently envisaged as a live performance with both performers physically present in Utrecht (funding is tentatively in place and performers have other reasons to be in Europe at this time).

Preferred Performance Venue: Theater performance, Tivoli Vredenburg. While we think this work is best suited to a theatre performance, the folder linked below also contains a version that is appropriate for a club environment, and we are happy to be situated in either context.

Performer's will supply:

- Self-built /bespoke modular instruments [note, all are low-voltage]
- 2 laptops running Max/MSP, Ableton.
- 2 Audio interfaces with ¼" outputs (we currently anticipate that each performer will output stereo).
- Black table covering
- AU multiway powerboard
- Converter for local to AU power supply

Needs from house:

- Table (ideally at standing height), we need 2000 x 700mm of space

- 1 power outlet
- Adjustable lighting (instruments are light-controlled)
- Wall projection area or projection screen
- Camera for live feed projection of tabletop instruments and hands
- Tripod to situate camera above table
- We will output on 4 x TRS jacks so will need adapters for 1/4" to XLR if that's necessary for house system.
- All of performers' gear is on-stage.

Ideal placement:

- Performers offset from direct overhead light source—sidelight is preferable due to light-sensitive instruments.

#### 4. MEDIA LINK(S)

The folder below contains:

- 8'00" demonstration for a theatre setting;
- 15'00" demonstration that targets a club setting.
- <https://drive.google.com/drive/folders/12h2Nsmw86d1yNWOZRZBaeaYnLQ7iLhRy?usp=sharing>
- See also <https://www.nhojelocin.com/>.

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#### ETHICAL STANDARDS

This artistic research was undertaken as part of the author's respective roles as Australian academics working in university contexts and was thus supported by their employment at Griffith University and Queensland University of Technology. We are not aware of any conflicts of interest and no human or animal participants were harmed in the making of this work.

#### REFERENCES

- [1] <https://github.com/tttapa/Control-Surface>
- [2] <https://fastled.io/>
- [3] <https://vimeo.com/825720530>