

Voltage Mediation

Research & Development of Hybrid Digital–Analogue Sound Systems

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Project Overview

Voltage Mediation is a four-month research and development project exploring how early domestic computing systems can meaningfully interact with contemporary analogue modular synthesis.

The project investigates bidirectional translation between 1982 Sinclair ZX Spectrum 1-bit computational audio and Eurorack voltage-controlled synthesis, asking:

What forms of musical coherence and instability emerge when discrete digital timing systems are mediated through continuous analogue voltage environments?

Rather than treating digital-to-analogue conversion as a technical problem to be solved, this project treats translation as an artistic site of instability, negotiation and compositional discovery.

Context

The ZX Spectrum's 1-bit audio represents an extreme form of digital austerity: rhythm and pitch generated through strict processor timing loops and binary switching.

Modular synthesis descends from mid-20th-century voltage-controlled traditions, where sound emerges from continuous electrical variation, drift and feedback.

Voltage Mediation stages a structured dialogue between these two technological lineages:

- Binary timing vs electrical fluctuation
- Determinism vs drift
- Clock stability vs entropy

Intended Outcome

A tested prototype hybrid instrument and lecture-performance framework, assessed for future touring and installation viability.

Outputs include:

- Custom ZX Spectrum compositional software
- A digital-to-voltage translation interface
- A responsive modular synthesis architecture
- Two public development sharings
- Professional documentation and written reflection

Research Structure

Phase 1 — System Prototyping

Development of a digital-to-analogue translation interface.

Testing clock stability, drift thresholds and bidirectional control structures.

Phase 2 — Spatial & Compositional Development

Exploration of multichannel diffusion strategies.

Development of a structured 30–45 minute lecture-performance integrating technical explanation and live mediation.

Phase 3 — Public Development Sharings

Two informal development sharings with Midlands-based arts partners.

Audience discussion and peer feedback inform refinement.

Phase 4 — Refinement & Documentation

Consolidation into a portable prototype format.

Production of video documentation and reflective writing outlining findings and limitations.

Artistic Method

The work begins deliberately from instability:

- Misaligned digital timing structures
- Rhythmically unresolved loops
- Structural tension within binary systems

Through analogue mediation - filtering, scaling voltages, tuning relationships - coherence gradually emerges.

Later phases reintroduce entropy through analogue fluctuation and repatching, destabilising computational order and potentially feeding back into digital timing behaviour.

The system becomes both instrument and research tool.

How This Develops My Practice

My previous work has explored legacy computing systems in installation and performance contexts. Voltage Mediation shifts this practice toward structured, research-led hybrid architecture.

The project formalises a methodology for translating binary computational structures into analogue voltage systems and back again.

It expands my work into:

- Hybrid digital–analogue system design
 - Multichannel spatial presentation
 - Lecture–performance as transparent artistic method
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Public Benefit

Voltage Mediation contributes at both audience and sector levels.

Access & Transparency

The lecture–performance format makes complex electronic processes visible and intelligible.

By revealing internal system behaviours in clear spoken language and live demonstration, the work reduces barriers often associated with experimental electronic music.

Regional Contribution

Development activity and sharings take place in the Midlands, contributing to research-led sound practice outside major metropolitan centres.

Sector Knowledge

The hybrid system functions as a research tool.

Documentation will outline:

- Instability thresholds
- Translation behaviours
- Compositional implications

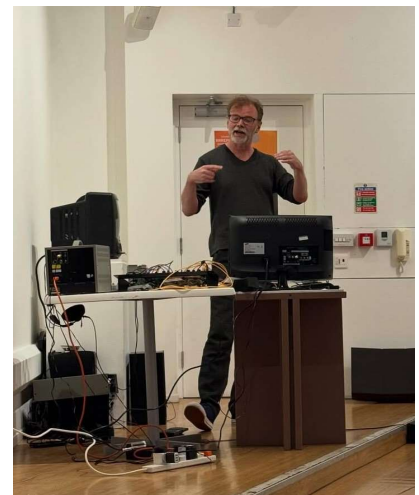
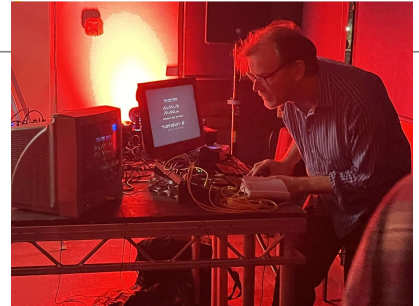
Written reflection and video documentation will be shared publicly to support peer learning.

Technological Dialogue

By placing 1982 domestic computing hardware in structured dialogue with analogue synthesis traditions, the project encourages reflection on technological lineage, constraint and obsolescence.

Previous Related Work

- ZX Spectrum installation exhibited at LCB Gallery (Leicester)
- ZX Spectrum performance at Machina Bristronica
- Teletext installations and broadcast-based visual art
- Featured in *BreakSpace* (ZX Spectrum magazine), highlighting artistic work bridging legacy hardware and contemporary sound practice



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