



# CONTINUA: A RESONATOR-FEEDBACK-CELLO DUET FOR LIVE CODER AND CELLIST

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*Continua* is a duet for cellist and live coder, each playing a hybrid instrument based on the Halldorophone, an electroacoustic instrument in which electromagnetically-controlled feedback can be induced independently on each string. The physical interface ostensibly affords a traditional gestural performance practice, but one that is substantially altered by the nonlinear, generative feedback processes; the electronic interface enables remote digital intervention and live-coding, but in a form considerably augmented by the physical interface.

The evolution of new musical instruments—acoustic, electronic, digital, augmented, hybrid or robotic—can be profitably framed in number of ways: the characteristics of their constituting materials; the particular qualities of performance praxes they afford; the varying roles of and relationships evoked between performer and instrument; and the loci of musical agency (Schnell and Battier, 2000; Livingston, 2000; Collins et al, 2003; Magnusson, 2009, Bown et al, 2009). Improvising with an acoustic instrument can be seen as a physical dance with a softened critical mind around a fixed resonant form; Live Coding might be seen as a staging of the performer’s mind as instrument, situated in a principally static body, unleashing generative sound-producing processes on the world. We are interested in the continua between these practices and how emerging hybrid instruments may afford new modes of ensemble performance.

*Continua* is a collaboration between a live coder who works with physical, gestural controllers (and also plays acoustic instruments), and a cellist who works with generative and adaptive systems (and also codes). We share an interest in the trade-offs between expressivity of bodily gesture afforded by physical interfaces and the musical possibilities of generative and adaptive processes when instantiated in code (Kiefer, 2015), (Eldridge, 2005).

Our instruments are two retro-fitted acoustic cellos following the design of Halldór Úlfarsson’s Halldorophone. At the end of the finger-board, under each string, sit four CycFi electromagnetic coil pick ups, the gains of which can be individually controlled. These signals are processed externally and fed back to a speaker built-in to the back of the instrument. This feedback pathway can be made more complex with the addition of a second transducer fitted on the front surface of the instrument (pictured). The nonlinearities of the signal pathway create richer dynamics than a simple feedback circuit and provide opportunities for musical-meaningful intervention. The cello strings are a significant parts of the feedback circuit, and provide a rich interface for interaction.

In this performance we investigate two different set ups. The cellist controls gains with analogue pedals and a mixer, exploring the balance of bowed, plucked and electrically-induced string oscillations. The sustained oscillations created by the feedback also enable new percussive preparations: bolts, sticks or other objects stuck between the strings can be set in continuous motion, and drift along strings toward nodes of vibration. The signal pathway for the live-coder runs from pick-ups through an audio interface into SuperCollider before being sent to the in-built speaker and transducer. In SuperCollider we can monitor incoming signals and explore mechanisms for exciting and damping the strings. In this performance, a watt-governor like process is used to control a frequency-shifter, which acts to damp the strings when the feedback reaches a threshold. In another patch, synthesized sound is injected into the system via a ducking compressor, creating interactions between the digital sound and acoustic feedback. By virtue of the rich nonlinearities in the physical feedback system through the cello, these relatively simple patches produce a range output from serene drones to brutal screams and yelps. The two instruments, played in close proximity during the performance, also influence each other, allowing the two performers to explore the two instruments as one coupled feedback system.

As a duet we are interested in exploring the continua between gestural control of fixed physical interfaces and remote live coding of adaptive software instruments. How do the expressive potentials of gestural control and the alluring uncontrol of generative, adaptive processes play out in hybrid instruments? How does our experience of time differ when we perform using both in-the-now gestures and temporally-extended generative processes? what are the musical and performative implications? Our initial explorations of this new electro-acoustic-digital feedback instrument suggest it is positioned at the intersection of contemporary gestural and generative improvised performance practices, inspiring exploration of the rich uncharted continua.

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