

Shadowing Lemma: $r \in [3.9, 3.905706]$ near to period 5 with $X_0 = 0.7435897435897437$

"Shadowing Lemma:..." embraces nonlinear dynamics (chaos theory) as a temporary partner to undertake the compositional task of *semiotic practice* within sound computation. Semiotic practice is a discipline suggested by Julia Kristeva to use semiotics to generate discourse concerning the constraints of familiarity upon language. Issues of familiarity are a concern for composers; the computer, in many ways a linguistic tool, provides an information space where composers can investigate alternatives to existing musical languages.

"Shadowing Lemma..." explores computation as a form of semiotic practice, by uncovering both familiar and unfamiliar aspects of evolving chaotic patterns. A unifying "lemma," or style, remains in the shadows. Patterns are not reconciled into unified gestures, instead, friction between pattern iterations conveys information about the structure of chaos.

The composition was generated using auditory representations of the dynamical behavior of a complex system. A chaotic system generates a range of patterns from fixed points and periodic cycles to intermittent and highly unpredictable sequences. This variety can be controlled by making small changes to the initial conditions of the system. For the composition of Shadowing Lemma, the system was defined by an initial state for the variable X and a control parameter r which was varied between the two values indicated in the title. These conditions produce patterns that are very near to a periodic pattern of 5 numerical positions, a state which the system can fix on without escape.

Timbre and rhythm were generated by evaluating statistically significant change in the chaotic system. A histogram of the system was used to control auditory spectra, and note events were initiated at timepoints when the statistical balance of the system shifted beyond a minimum specified by the composer.