Romp in Chaos

Program Notes

The sound of chaos can be joyous! This electroacoustic miniature is an exercise that explores the edge of chaos, which is realized by two digital waveguides resonating against the Peter de Jong chaotic map.

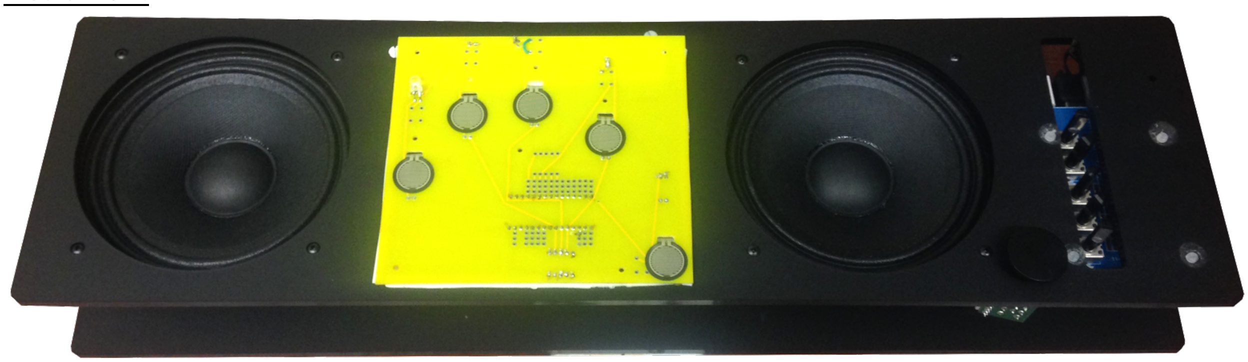
For this work, an embedded acoustic instrument was created with five pressure sensors and five potentiometers. As the performer changes the parameters to and fro, the sound romps back and forth between chaotic regimes and more tonal sounds. Long live chaos!

Description

The Peter de Jong chaotic map is an exotic kind of oscillator that can exhibit both ordered (e.g. repeating) and deterministically chaotic (e.g. noise-like) behavior. One convenient property of the Peter de Jong chaotic map is that it will always remain stable even if it is sounding strange.

This musical work explores a web of sounds created through the Peter de Jong chaotic map, as its parameters are gradually varied at run-time through force-sensing resistors (see below, center) and potentiometers (see below, right).

Instrument



The Peter de Jong chaotic map is defined by the equations $x_n = \sin(ay_{n-1}) - \cos(bx_{n-1})$ and $y_n = \sin(cx_{n-1}) - \cos(dy_{n-1})$. By controlling the *a*, *b*, *c*, and *d* parameters in real-time with force-sensing resistors (see above), sound can be synthesized. Depending on the particular values, the sound will either be more regular, or it may tend to sound more or less like noise. In between and on the "edge of chaos," the sound tends to be peculiar.

What is interesting for computer music is the ability to explore the edge of chaos. The Peter de Jong chaotic map was enhanced for this instrument, to try to widen the edge of chaos. To achieve this, the Peter de Jong chaotic map was connected to digital waveguides with delay times L_1 and L_2, in order to enable the straightforward synthesis of harmonic tones as well. The equations governing the final version of the sound synthesizer are $x_n = \sin(ay_{n-L_2}) - \cos(bx_{n-L_1})$ and $y_n = \sin(cx_{n-L_1}) - \cos(dy_{n-L_2})$.

As can be observed in the audio file, significant DC offsets are present in the x_n and y_n signals. These offsets make the instrument more challenging to operate, so that the performance becomes a combination of give and take between the performer and the instrument, and this is part of what makes the instrument sound even more chaotic.

Technical requirements

This work is realized using an embedded acoustic instrument that is placed on a table.

The technical requirements are therefore as follows:

- Half of a utility-sized table's worth of table space
- Chair
- Music stand
- One power connector to 120VAC
- A direct box with 1/8" stereo audio input to use for streaming audio out of the instrument.

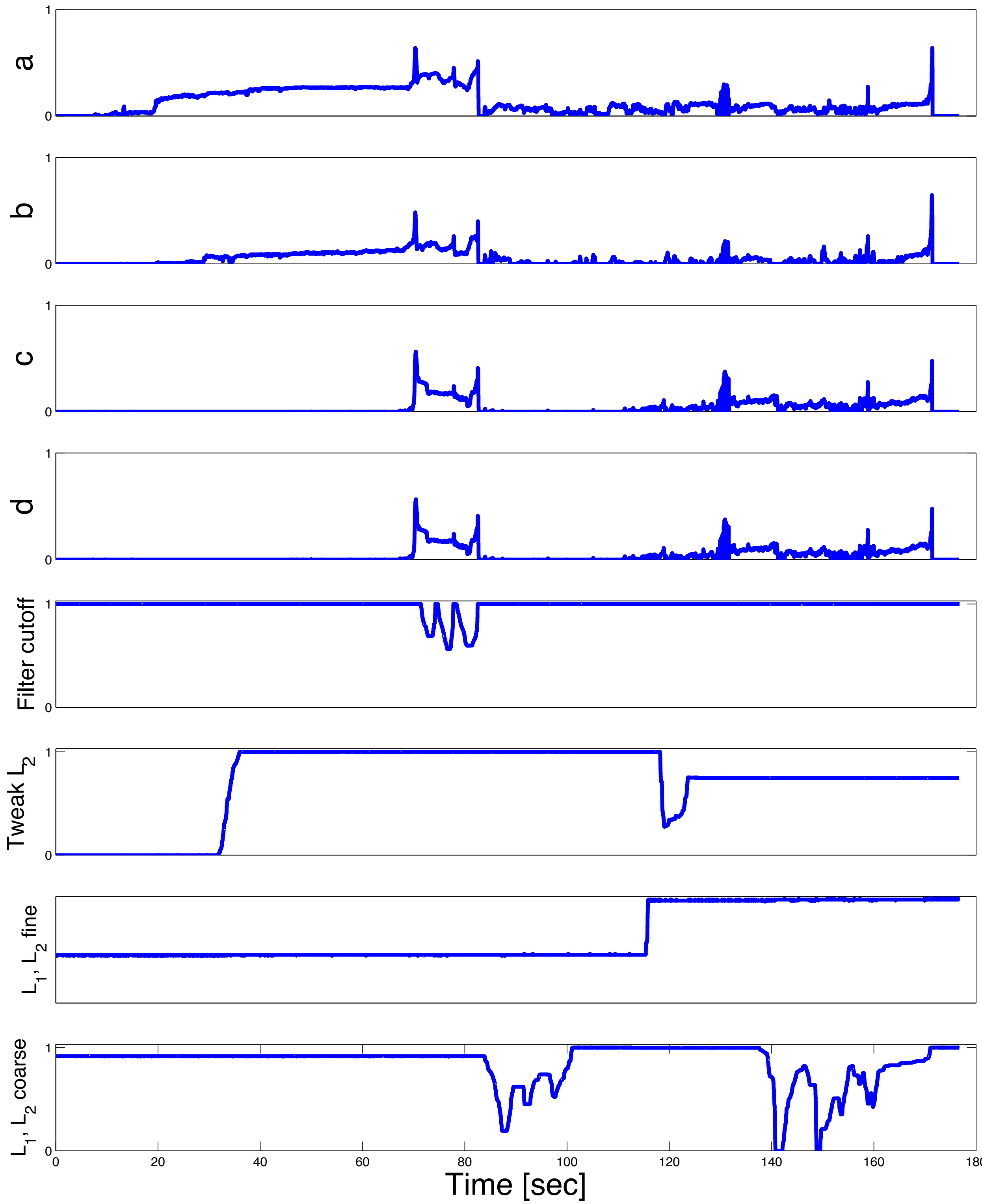
The venue should connect the direct box to a mixer to broadcast the sound.

Link to audio

https://goo.gl/hGkt9F

Score

The score is presented on the following pages. Parameters not listed are left at 0 for the duration of *Romp in Chaos*.



a
b
c
d
Filter cutoff
Tweak L_2
L_1, L_2 fine
L_1, L_2 coarse
0
1
0
20
40
60
80
100
120
140
160
180
Time [sec]