A Few More Words on Jim Tenney (Part I): The Dissonant Counterpoint Algorithm

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Handout Examples

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Statistical Feedback
“Carl Ruggles has developed a process for himself in writing melodies for polyphonic purposes which embodies a new principle and is more purely contrapuntal than a consideration of harmonic intervals. He finds that if the same note is repeated in a melody before enough notes have intervened to remove the impression of the original note, there is a sense of tautology, because the melody should have proceeded to a fresh note instead of to a note already in the consciousness of the listener. Therefore Ruggles writes at least seven or eight different notes in a melody before allowing himself to repeat the same note, even in the octave.”

Henry Cowell, New Musical Resources, 1930. Part 1, Section 4: “Dissonant Counterpoint” (pp. 41-42)

“Along with backtracking, statistical feedback is probably the most pervasive technique used by my composing programs. As contrasted with random procedures which seek to create unpredictability or lack of pattern, statistical feedback actively seeks to bring a population of elements into conformity with a prescribed distribution. The basic trick is to maintain statistics describing how much each option has been used in the past and to bias the decisions in favor of those options which currently fall farthest short of their ideal representation”


Statistical and Probabilistic Techniques (Selected Writings of Charles Ames)


Randomly picking kisses and hugs, 10 times

\[ X \times X \times X \times O \times O \times O \times X \]

A generalized finite state machine

\[ x_n = f(x_{n-1}, x_{n-2}, x_{n-3}, x_{n-4}, \ldots, x_0) \]

REALLY simple "history" function
(two sample averaging low pass filter)

\[ x_n = x_n + x_{n-1} \]

NOT a "history" function

\[ f(x) = x^2 \]

Back to Xs and Os (statistical history)

\[ x_{n-1}, x_{n-2}, x_{n-3}, x_{n-4}, x_{n-5} \]

Random Pick of Five Values

XXXOX (4 Xs, 1 O)

Half-Cosine Interpolator

\[ v_t = \frac{v_1 + v_2}{2} + \frac{v_1 - v_2}{2} \cos \left( \pi \frac{t - t_1}{t_2 - t_1} \right) \]

Simple Experiment: "All my trials"
Standard deviations: 100 (.0016), 1,000 (.003), 10,000 (.001), 100,000 (.00001), 1,000,000 (.000001)

Hundred trials

Thousand trials
Ten thousand trials

Hundred thousand trials
Million trials
Million Trials
Half cosine interpolator

Multistage Half-Cosine Interpolator

Dissonant Counterpoint Algorithm and Examples
Dissonant Counterpoint Algorithm Recipe (simplified)

1. Take $N$ elements and associated probabilities $p_n$.
2. Using a pseudo-random number generator, pick one.
3. Set the selected element's probability to zero (or some very low value).
4. Increment all the others by some uniform or weighted amount.
5. Pick again.

This example is written in Jazza, using Nick Drokoush's JMSL, and my probabilistic mode library.

A "Tenney mode" in this case is a time-var welt statistical distribution of pitch classes. When a pitch class is selected (stochastically), its probabilility drops to zero and increments gradually over subsequent notes.

"Tenney: Dissonant Counterpoint Algorithm" (pitch classes in one octave)
Tenney dissonant counterpoint: uniform weights

Elements

C  C#  D  D#  E  F  F#  G  G#  A  Bb  B

Iterations

10  20  30  40  50  60  70  80  90  100
Tenney dissonant counterpoint: uniform weights
Tenney dissonant counterpoint: weighted

elements

iterations
Tenney dissonant counterpoint: weighted
Tenney dissonant counterpoint (10000 trials): uniform weights
Tenney dissonant counterpoint (10000 trials): weighted
interlodd
tenneytood
(no rhythms)

any tempo, dynamics, articulations

Piano 1

Piano 2
interlude
Tenneytoidii
polanski

Piano 1

Piano 2

(any dynamics, articulations, tempi)
interllood
uiituiiiiiiiiiiiii
(tooaytood #15a)

loud, duration = 2 seconds

polansky

lp
hanover, 8/23/07
rev. 8/23/07
interlude
viiiioiiiioioii(ii)iugp
(tooaytood #15b)

quiet, small, reflective, powerful; duration = 2 seconds (and one note)

for grace paley:
"That is, to tell their stories as simply as possible,
in order, you might say, to save a few lives."

polansky

Hanover, 8/23/07
Rev. 8/23/07
interlude

viiiviiiviiiviiiiii

("moving out")

(tooaytood #15c)

polansky

(duration = 2 seconds)
interllood
CuiciiF#vicinii(ii)
(tooaytood #16a.2)

duration = 2 seconds

Piano 1

Piano 2

lp, hanover, 9/10/07
rev. 9/11/07
interllood
'Tootood
(tooattood #16b.2)

polansky

all legato, gently
duration = 2 seconds

Piano 1

Piano 2

(any note, at any time, any octave)

lp
hanover, 9/9/07
9/12/07
interlude
longtood

\( \text{polansky} \)

\( \text{Piano 1} \)

\( \text{Piano 2} \)

(freely: any articulations, dynamic variation)

lp, hanover, 8/30/07
rev. 8/31/07
To Weave (a meditation)

James Tenney
Jan. 2003