Circular Limit

for amplified bass recorder and computer

Juan Sebastián Lach Lau
2008
Circular Limit

This piece stems from my research into algorithmic harmonic fields. Its building material is a microtonal pitch set derived from a psychoacoustic analysis of a low G tone of the bass recorder. This set provides the content to a stochastic field that is navigated amid its defining poles of consonance/dissonance (related to auditory roughness), harmonicity/inharmonicity (related to proportionality of intervallic ratios) and verticality/horizontality (relating densities in time and pitch). Articulation, duration and dynamics are also coupled to the field according to its key parameter, *strength*, which can be negative in order to mirror the field with a zone in which inharmonicness takes precedence. The probabilities of the pitches can either be related to a tonic and a mode, or each new pitch can be considered a new tonic on which to base the probabilities (called 'atonic' mode).

This algorithmic control allows for slow, almost imperceptible transitions between distinct harmonic configurations, as in the second half of the piece, running in atonic mode from a state of high strength(tonal) to one of no strength (atonal), finally towards negative strength (antitonal). The first half of the piece presents the material with a 'tonic' logic, taking excursions through the fields for each of the possible modes constituted by the pitch set. These journeys are interspersed with interludes based on timbral properties of the pitch set and the sound of the instrument. It was composed by improvising with the computer generator and transcribing the results.

The computer part accompanies the recorder by generating in realtime the same kind of harmonic journeys, providing a wider ambitus of notes, timbres and vertical/horizontal combinations. In the timbral interludes it extends and intensifies the sound of the recorder.

Juan S. Lach

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The recorder part was made in collaboration with Tomma Wessel, who premiered it with the author on April 15th and 16th 2008 at Logos, Ghent and 't Stuk, Leuven in Belgium.

Durata: ca 13 min 30 sec
Performance notes

The amplification involves the recorder and the computer, which outputs a stereo signal. The microphone signal from the recorder is also fed into the computer.

Recorder

Two microtonal pitch sets are used which correspond to the parts labelled dsp1 through 8 and cues 1 through 8 respectively. After cue 9, the playing should be with normal equal tempered fingerings. In the dsp parts, each note has its deviation in cents from equal temperament written below it.

The material for cues 1 through 8 is based on the following microtonal pitch set, written with the fingerings for a Yamaha bass recorder (number B61). The interval regarded as a tonic is indicated at the beginning of each section (in purple). Fingerings can be different on other instruments. In the score only the microtonal accidentals are indicated, not the deviations in cents for each note. The pitch set should be learned to be played directly as a scale:

<table>
<thead>
<tr>
<th>fingering</th>
<th>0123456</th>
<th>012356</th>
<th>0123</th>
<th>012456</th>
<th>01356</th>
<th>02456</th>
<th>04</th>
<th>012345</th>
</tr>
</thead>
<tbody>
<tr>
<td>ratio</td>
<td>1/1</td>
<td>81/64</td>
<td>21/16</td>
<td>7/5</td>
<td>14/9</td>
<td>12/7</td>
<td>11/6</td>
<td>9/4</td>
</tr>
<tr>
<td>cents</td>
<td>0</td>
<td>(+8)</td>
<td>-29</td>
<td>-17</td>
<td>-35</td>
<td>+33</td>
<td>+49</td>
<td>(+4)</td>
</tr>
</tbody>
</table>

Playing techniques:

Multiphonics are indicated by a note with \( \hat{\} \) together with their fingering.

Ord: Ordinario, use no special technique for playing a note

Fltz: Flatterzunge

Air: Air tone, leaking air

Noise: Noise tone, add a sharp "f" or "sss" to the sound

t, tk: Attack of note with a sharp 't' or alternation of t and k sounds

slap: Slap tongue

Vibrato types:

vib ord: breath vibrato

chevrotier: very fast and round throat vibrato

flattement = finger vibrato: movement of a finger or fingers on or at the edge of a keyhole

shadow effect: a tremolo/vibrato made by moving the hand over the labium

tounge vibrato: very fast '[l]'

flatt + breath: a combination of finger and breath vibrato in opposite directions

Computer:

The computer part is played live and consists of either cues or dsp sections. Cues are triggered manually by following the score. The computer will play synthetic material generated in real-time. The dsp parts will process the live input of the recorder and the computer performer should improvise on the four parameters of the dsp process:

- bandwidth of vocoder,
- mix level of vocoder / phase-vocoder
- transposition of the spectrum
- overall amplitude

The computer program can be obtained from the composer at lachjs@gmail.com. It is a standalone application with graphic interface running SuperCollider on Mac OS X. It includes documentation on how to use it. A 2-in, 2-out audio interface is needed.