J. HARRY WHALLEY

CLASP TOGETHER (BETA)

Mixed Quartet, NGS and EEG

2012
Architecture:

The diagrams on these pages demonstrate the architecture of the technology for Clasp Together (beta).

- **NGS** - Neurogranular Sampler (Audio Unit Plugin)
- **EEG** - Electroencephalography Headset (Emotiv EPOC)

### Background:

EEG, or Electroencephalography, is the capacity to detect brain activity and is all but new, dating back to 1929 and the efforts of Hans Berger. The electric discharge produced by millions of firing synapses produces a faint electrical current that can be detected by electrodes positioned on the scalp. While primarily used to study brain functions or anomalies, during the last decades EEG has been at the centre of scientific research on Brain Computer Interfaces (BCI) and the scope and use of them has expanded; the 'Emotiv EPOC' headset used in this piece was developed for use in computer games, for example.

Using a Bluetooth connection to a computer running the 'Emotiv SDK Affectiv suite', the signals are converted into a percentage value in one of the categories; ‘engagement’, ‘instantaneous excitement’, ‘long term excitement’ or ‘mediation.’ These in turn drive the amount of activity in the NGS by continuously changing its parameters.

Facial expressions and head movements (Gyroscope) trigger pre-recorded samples of the ensemble.

The piece also fits in the wider context of artificial intelligence and creativity as explored by Douglas Hofstadter.
Technical Requirements:

Laptop running 'Max/MSP' with 'NGS Audio Unit' (au) installed.
Audio interface with two analogue I/O and fast stable drivers (e.g., RME)
Small Mixer (2 in, 1 aux)
Laptop running Emotiv EPOC 'Affective suite' and 'Mind your OSCs'
Emotiv EPOC bluetooth headset
Front of House (FOH) Mixer (8 in, stereo 2 aux send/return, one pre-fade (to NGS) one post-fade(to FX))
Appropriate microphone(s) for each instrument.

Three Technician/Engineers.
  1 - Fit EEG, connect to 'Affective Suite'
  2 - Activate / Deactivate NGS, Activate 'Gesture samples'.
  3 - Front of House sound engineer.

The Max/MSP Patch, Samples and NGS au can be found on the data DVD.
The Emotiv EPOC software comes with the EPOC headset.

My thanks to Panos Mavros for his help and his coding of the Max/MSP Patch used in this piece, to John Matthias et. al., for allowing me to use their Neurogranular Sampler and to Lauren Hayes, for organising this project. Performance elements were developed with Pete Furniss and Panos Mavros.

Instrumentation:

- Bb Bass Clarinet
- Tenor Trombone
- Violin
- Contrabass

* All instruments should have microphones for sound reinforcement / NGS input.

TRANSPOSED SCORE

Bb Bass Clarinet sounds a major ninth lower than notated.

Performance Notes:

Bass Clarinet

The EPOC EEG headset will detect your overall affective state and facial and head movements. Your affective state controls the amount of activity in the 'Neurogranular Sampler' and as a result the amount extras sound in the form of 'grains' coming from the instrument. The quick changing of tasks (improvise - sight read - graphic notion) is designed to insure that the NGS receives a high level of activation. The facial and head movements will trigger pre-recorded samples of the ensemble.

Technique instructions in Italic indicate either mental performance instructions or dramaturgical / triggering movements. The timing is marked by downward arrows above the staff. Interpret ‘movement’ instructions to be any type of head movement from the list below, unless specified exactly.

<table>
<thead>
<tr>
<th>Movement</th>
<th>Sample Triggered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head Left / Right</td>
<td>- Double Bass</td>
</tr>
<tr>
<td>Head Up / Down</td>
<td>- Trombone</td>
</tr>
<tr>
<td>Eyebrows Up</td>
<td>- Violin</td>
</tr>
<tr>
<td>Furrow</td>
<td>- Clarinet</td>
</tr>
</tbody>
</table>

Interpret 'graphic notation' freely.

Do not learn measures 114-115, and play as accurately a possible.

Notation:

- Highest possible note

‘Doodle Tongue’ - Use the mouthed sounds "da-dle, dee-dle", but otherwise the same technique as double-tonguing should be used.

[] - Box above a note: Create multiphonic based on the given pitch.

Boxed Text - Instructions to technician regarding Max/MSP Patch.
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Rubato (c. \( \frac{3}{4} = 112 \))

Assisted donning of headset

Fierce free Improvisation

Allegro non troppo (c. \( \frac{3}{4} = 120 \))

1. Think about something unrelated and play from memory until b32 (G.P.)

Con sordino, 'doodle tongue'

Start NGs

Repeat until headset is on and working

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33 (A Tempo)

Lungu G.P
Demonstrate all movements

3 All: move away from instruments

4 (A Tempo)

58

head movement

head movement