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SIG~: Schaefferian Improvisation Group
    of Iowa City

Counterweight

Schaefferian Sound-Object
Improvisation

for horn, alto saxophone, bass, percussion and
multiple electronics

2015
Program Notes

Pierre Schaeffer’s theory of sound objects is a milestone in the historical development of electronic music. The TARTYP (*Tableau Récapitulatif de la Typologie*), i.e., Summary Table of the Typology of Sound Objects, plays a central role in this theory. It is a schematic representation of a taxonomy of sound objects that demonstrates the premises of the Schaefferian theory. While Schaeffer’s ideas set the path for major trends in electronic music, the TARTYP itself was not widely accepted as a practical tool for musical analysis and composition. Its impracticality is in part attributed to a large number of confusing and vague terms introduced by this theory. In contrast, Schaeffer, devoted a great deal of attention to the construction of sound examples that demonstrate his ideas. The TARTYP sound objects are exemplified *Solfége de l’objet sonore* (P. Schaeffer and G. Reibel 1966).

**SIG~** is a Schaefferian improvisation group based in Iowa City, Iowa, founded for the purpose of exploring the practical applications of Schaeffer’s TARTYP to real-time composition and computer improvisation. The premise of this exploration is the idea that the TARTYP taxonomy can be put into practical use through improvisation and the aural learning of Schaeffer’s sound examples. However, the ensemble’s focus is not on exact reproduction of Schaeffer’s sound examples. Instead, members of the ensemble use these examples to imitate the behavior of sounds and to create their individual interpretation of the TARTYP sound objects, i.e., sounds that have the same defining characteristics. The mastery of the TARTYP musical language in SIG~ is supported by software designed specifically for this ensemble using the Pd-extended and Processing environments. A core element of the SIG~ performance system are generative grammars derived from the classification of sounds in the TARTYP.

The SIG~ performance system is described in details in the paper:

The TARTYP generative grammars are described in details in the paper:

**Counterweight** is a Schaefferian sound-object improvisation recorded live by SIG~ on April 11, 2015 at the University of Iowa Electronic Music Concert. In this performance the ensemble uses animated scores which were generated in real time by the SIG~ performance system based on the TARTYP generative grammars. The following score documents the supporting material introduced to the ensemble as preparation for this performance including performance notes, notation key and technical notes. The score also describes the orchestration and structural design used in this improvisation.
Background

The TARTYP is a classification sounds based on their characteristics in the time and frequency domains. It introduces an alphanumeric notation for sound objects. Its structure suggests inter-relationships between sub-collections of sound objects. Sound-object characteristics are specified in the TARTYP at the margins of the table, with time domain characteristics along the upper row of the table and the frequency domain characteristics along the leftmost column (see Figure 1). Combinations of characteristics at the horizontal and vertical planes of the table describe the sound-object classes notated in the body of the table. The table is divided into sub-collections of sounds. Figure 2 displays this division of the TARTYP into six sub-collections.

The TARTYP generative grammars are derived from the TARTYP classifications of sound objects and its defining elements as well as from the structure of the table and its sub-collections. The rewrite rules of these grammars use the time and frequency terms specified at the margins of the table as terminal symbols. For each of the sub-collections of the table, a grammar is defined in which a terminal equals a subset of the notated sound objects. A set of rewrite rules in a sub-collection grammar defines a space consisting of a large but finite number of paths where each of these paths can be composed out as a sequence of sound objects. In addition, a Table grammar references each of the sub-collection grammars and establishes a unified hierarchical space of sound object sequences.

![Table diagram](image)

**Figure 1.** Highlighted in gray are time-domain terms along the upper row of the table and the frequency-domain terms along the leftmost column in Pierre Schaeffer’s TARTYP.
Figure 2. The division of the body of the TARTYP into sub-collections of sounds.
Performance Notes

Along with this score performers are provided with a folder including sound recordings created by Pierre Schaeffer in the 1960s. These recordings exemplify the sounds described in the TARTYP classification. The names of sound files included in the folder match the alphanumeric notation specified in the TARTYP. The performer should use these sound recordings as a tool for creating his or her personal interpretation of TARTYP sounds, i.e., to create sounds with similar characteristics in regard to elements such as amplitude envelope, frequency content (pitch vs. noise), duration and variability (changes in frequency content throughout the sound’s duration). The performer should not attempt to reproduce or duplicate Schaeffer’s sound examples.

Each performer should use an Individual Performer Interface (IPI). This interface is a combination of applications developed in the Pd-extended and Processing environments that support performer-computer interaction based on the TARTYP taxonomy. The performer should use the IPI to record his or her personal interpretation of the TARTYP sounds. Following the recording of these sounds, the performer switches the IPI to playing mode. In this mode, the IPI constructs sequences of sounds. It also displays specialized graphic notation of these sequences in an animated score. The performer can interact with these sequences in different ways. For example, using a USB foot pedal the performer may command the grammar engine to construct a new sequence at any time. In addition, the performer may choose between looping a sound-object sequence and playing it a single time by changing IPI parameters. The performer may also choose to musically relate to the sequence in different ways including following the notated sequence, using it as an accompaniment (looping), or creating a counterpoint line. For details on the operating of the IPI see the technical notes.

The notation used in the SIG~ animated score is graphic notation that replaces Schaeffer’s original alphanumeric notation. Figure 3 presents this graphic notation. The figure is a table diagram displaying 29 graphic symbols. Each cell of the table includes one of Schaeffer’s original alphanumeric symbol, and the graphic symbol that replaces it in the animated score. It maintains the following basic principles of symbolic representation of TARTYP sounds: a circle represents pitch-based sound (definite pitch) while a square represents a noise-base sound (complex pitch); a solid line represents sustainment whereas a dashed line represents iteration; a dot represents short duration (impulse) where as longer line represents longer duration (measured duration); an angled line (dashed or solid) represents glissando (variable). For a description of each symbol see notation key.
**Figure 3.** Overview of the SIG~ animated score notation. Graphic symbols based on [1] (reproduced by permission of the author).
<table>
<thead>
<tr>
<th>Alpha-Numeric</th>
<th>Graphic Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>![symbol]</td>
<td>Pitch-sustained, medium duration (3 sec)</td>
</tr>
<tr>
<td>X</td>
<td>![symbol]</td>
<td>Noise-sustained, medium duration (3 sec)</td>
</tr>
<tr>
<td>Y</td>
<td>![symbol]</td>
<td>Glissando-Pitch-sustained, medium duration (3 sec)</td>
</tr>
<tr>
<td>N'</td>
<td>![symbol]</td>
<td>Pitch-pulse, short duration (0.5 sec)</td>
</tr>
<tr>
<td>X'</td>
<td>![symbol]</td>
<td>Noise-pulse, short duration (0.5 sec)</td>
</tr>
<tr>
<td>Y'</td>
<td>![symbol]</td>
<td>Glissando-Pitch-pulse, short duration (0.5 sec)</td>
</tr>
<tr>
<td>N''</td>
<td>![symbol]</td>
<td>Pitch-iterative, medium duration (3 sec)</td>
</tr>
<tr>
<td>X''</td>
<td>![symbol]</td>
<td>Noise-iterative, medium duration (3 sec)</td>
</tr>
<tr>
<td>Y''</td>
<td>![symbol]</td>
<td>Glissando-Pitch-iterative, medium duration (3 sec)</td>
</tr>
<tr>
<td>Hn</td>
<td>![symbol]</td>
<td>Pitch-homogenous (sustained), long duration (10 sec)</td>
</tr>
</tbody>
</table>
\(H_x\) Noise-homogenous (sustained), long duration (10 sec)

\(T_n\) Glissando-MorePitch-homogenous (sustained), long duration (10 sec)

\(T_x\) Glissando-MoreNoise-homogenous (sustained), long duration (10 sec)

\(Z_n\) Pitch-Redundant (iterative), long duration (10 sec)

\(Z_x\) Noise-Redundant (iterative), long duration (10 sec)

\(Z_y\) Glissando-Pitch-Redundant (iterative), long duration (10 sec)

\(E_n\) Pitch-unpredictable (sustained), very long duration (20 sec)

\(E_x\) Noise- unpredictable (sustained), very long duration (20 sec)

\(E_y\) Glissando-Pitch-unpredictable (sustained), very long duration (20 sec)

\(E\) Glissando-Noise-unpredictable (sustained), very long duration (20 sec)
T: Glissando-Noise-homogenous (sustained), long duration (10 sec)

W: Glissando-Noise-sustained, medium duration (3 sec)

Φ: Glissando-Noise-pulse, short duration (0.5 sec)

K: Glissando-Noise-iterative, medium duration (3 sec)

P: Glissando-Noise-Redundant (iterative), long duration (10 sec)

A\textsubscript{n}: Pitch-unpredictable (sustained), very long duration (20 sec)

A\textsubscript{x}: Noise-unpredictable (iterative), very long duration (20 sec)

A\textsubscript{y}: Glissando-Pitch-unpredictable (iterative), very long duration (20 sec)

A: Glissando-Noise-unpredictable (iterative), very long duration (20 sec)
Technical Notes

The SIG~ performance system includes four major components: individual performer interfaces (IPIs); an independent improvising processor (IIP); a group network supported by a server; and a sound amplification system (see Figure 4). The IPI is a combination of applications developed in the Pd-extended and Processing environments that support performer-computer interaction based on the TARTYP taxonomy. The IIP runs an application similar to the IPI yet without interaction with a live performer. The group network supported by the server is used to enable communication between the IPIs and the IIP. The software used in the SIG~ performance system is available from the composer.

![System diagram of the SIG~ performance system](image)

**Figure 4.** A system diagram of the SIG~ performance system
To use the IPI (Figure 5) follow these instructions:

**Required Software**
The IPI requires Pd-extended 0.43.4 (or later version). It also requires the libraries pdj and tID which are included in this folder. Load these libraries to Pd-extended by adding their file path to the preferences of Pd-extended. The attached copy of the pdj library includes the TARTYP grammar Java codes.

**Required Hardware**
The hardware supporting the IPI may vary in regard to different instruments yet should include at the least:
1. A laptop running Pd-extended
2. Audio interface with one input channel (mic or line) and two output channels
3. A USB foot pedal

**To get started**
1. Select the Processing application MinRep5.4 (animated score) that is compatible with your operating system and double click to start it.
2. Launch Pd-extended
3. To check audio interface:
   a. Go to “Media” menu
   b. Select “Audio settings…”
   c. Select your interface
      i. Input device 1:
      ii. Output device 1:
   d. Click “Apply”
   e. Click “OK”
4. In the folder “IPI_balanced” open the file “AA_IPI_bln.pd”
5. At the upper part of the patch change the number below “Foot_Pedal” to match the keyboard number of your foot pedal. It is currently set to 98 (the key B)
6. Raise (slide to the right) “volume slider” at the bottom right corner
7. To record sounds (sound objects):
   a. In the radio button “Record/Play” click “Record”
   b. Activate recording with foot pedal. Recording will automatically stop after 3 seconds.
   c. Adjust the gain slider at the top of the interface
8. To start improvising:
   a. In the radio button “Record/Play” click “Play”
   b. In the radio button “Con/Discon” click “Con”
   c. In the radio button “Speed” click on the second from the left
   d. Click on the red button title “RuleSet”
   e. Use the foot pedal to play sound sequences
      (At this point you should start seeing changing notation in the animated score).
Controlling parameters
1. Type “s” to fade out and in
2. Mixing
   a. The blue fader (vertical slider) titled “seq” controls the loudness of the recorded sound sequences.
   b. The white faders (vertical slider) titled “Cep” and “Mel” control the loudness of the processed live sound.
   c. Use these to create the desirable mix

Connecting to the server
To connect to the server and disconnect from the server click the right/left button in the radio button at the upper part of the interface above the sub-patch “pd client”

Figure 5. The IPI’s Pd-extended application with a TARTYP grammar engine

The IPIs and the IIP are each in a specific TARTYP sub-collection grammar. They are unified in the group performance system by a Table grammar engine which is running on the supporting server. The Table grammar engine ensures a structural organization that reflects the structure of the TARTYP. The group network supported by the server is used to enable communication between the Table
grammar engine, the IPIs and the IIP. Following the extraction of a path in the Table grammar engine messages are sent through the network to the IPIs and IIP that invoke the generation of new rule-sets and the extraction of new paths. At the same time, performers may chose in any time to extract a new path in their own IPIs as well as to invoke the generation of a new rule set and the extraction of new paths in the Table grammar engine. Figure 6 is a diagram of the ensemble’s communication network.

Figure 6. A diagram of the communication network incorporated in the SIG~ performance system
<table>
<thead>
<tr>
<th>Table</th>
<th>Orchestration</th>
</tr>
</thead>
<tbody>
<tr>
<td>BALANCED</td>
<td>Musical Structure</td>
</tr>
</tbody>
</table>

**Orchestration**

**Musical Structure**

- **Balanced**
- **R.H. Held**
- **R.H. Iter**
- **Sub-Table**

**Instruments**

- Alto Saxophone
- Horn
- Bass
- Percussion

**Sub-Table**

- Samples
- Excentric
- Accumulations