

Displaced Light: A Composition for Six Instruments and Electronics Mediated Through the Application of Microsound

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ABSTRACT

Displaced Light, for six instruments and live electronics is an exercise in the use of microsound in a live context, realised through an environment for real time granulation built in Max. The electroacoustic part and the acoustic part have been integrated from the beginning of the composition process through structural frameworks informed by the application of microsound. The electroacoustic part has been notated and related to the acoustic part through the application of a system of graphical notation created specifically for the composition. The sound of the acoustic instruments is always to some degree perceivable, however remotely, in the electroacoustic material.

1. INTRODUCTION

One of the principal aims of the composition is to create a work in which gestural archetypes are used to create an environment where texture and harmony are treated as separate but integrated structural elements. That is to say, the composition should treat texture and harmony as separate parameters but with frequent points of contact mediated through the application of a hierarchy of gestural archetypes in both the electroacoustic and the acoustic parts. cf (Saariaho, 1987, p. 124) [1]. Also, the electroacoustic elements of the composition should be integrated with the acoustic elements from the beginning of the compositional process. Microsound is therefore used in a number of ways. Namely:

- To complement the gestural archetypes used by the acoustic instruments by moving through a similar structural framework
- To expand the spectral content of the acoustic instruments
- As a technique for mediating the integration of harmony and texture
- To extend existing spectromorphological relationships and to contribute new spectromorphological relationships, including

gesture/texture relationships, foreground/background relationships, and framing relationships

- To engage in a dialogue of tension and resolution both with the acoustic part and with elements in the electroacoustic part

The electroacoustic part is notated in a way that is meaningful in the sense that the notation functions both as a graphical representation of the sound and as a set of instructions which would allow the sounds to be recreated. The notation of the electroacoustic part is also designed to be intuitive to read.

Microsound has been used in conjunction with instrumental techniques to create a coherent structure based on a pure-sound/noise axis. However, the gestural archetypes used in the composition do not unfold in a strictly linear hierarchy. That is to say, gestures reappear out of sequence both in their original forms and in hybridised variations in order to add tension and compositional interest to the work. The harmonic content used by the acoustic instruments is derived from repeated transformations of a single chord. This process is described in the next section.

2. HARMONIC STRUCTURE

Central to the acoustic elements of the composition is the chord shown in Figure 1. This chord consists of a root note, a minor second above the root and an augmented triad a fifth above the root.



Figure 1: Root plus minor 2nd with augmented triad 5th above root

The chord is inverted chromatically around the root and then transposed up one octave as shown in Figure 2



Figure 2: The same chord inverted around F4 and transposed up one octave

A second chord is then created from the first chord. The highest note of the chord remains the same while the second highest note is transposed downwards by one semitone, the third by two semitones, the fourth by three semitones and so on. The result of this is shown in Figure 3



Figure 3: Transposing each degree of the chord (except the top note) downwards by an increasing number of semitones to create a new chord

As the resulting chord contains an octave (e flat), this note is transposed up a semitone. The result is shown in Figure 4



Figure 4: the chord from fig 3, together with the original chord, adjusted to avoid octaves

The process is then repeated to produce a series of five chords. These five chords are then inverted and transposed in order to produce another series of five chords. The notes of the chords then become the pitches used by the acoustic instruments in the composition. The series is shown in Figure 5.

The pitches shown in Figure 5 form the basis of the harmonic structure of the composition. The central sections, labelled E1 and E2 in Figure 5, are combined, making nine sections in total. Each section is approximately one minute and thirty seconds long, although timings are not intended to be absolute and will vary in different performances. Extended instrumental techniques are used to create a continuum between pure sound and noise. That is to say, the instrumental techniques have been used in conjunction with microsound to create the hierarchies of timbres that exist

along a continuum between consonance and dissonance (in the context of this discussion the terms consonance and dissonance are not used in their strict, tonal sense, but rather as terms which suggest states of stability and instability). Each section represents an arc beginning and ending with pure sound and moving towards noise at the centre. As the composition progresses, the continuum shifts progressively towards noise and away from pure sound until the centre point of the composition is reached and the process is reversed. Natural tensions between pure sound and noise, between texture and gesture, and between the acoustic and the acousmatic are deliberately exploited for compositional effect. Gestural archetypes appear out of sequence in both the electroacoustic and the acoustic parts in order to interrupt the linearity of the structure and create compositional interest. A broad schematic of the process is shown in Figure 6

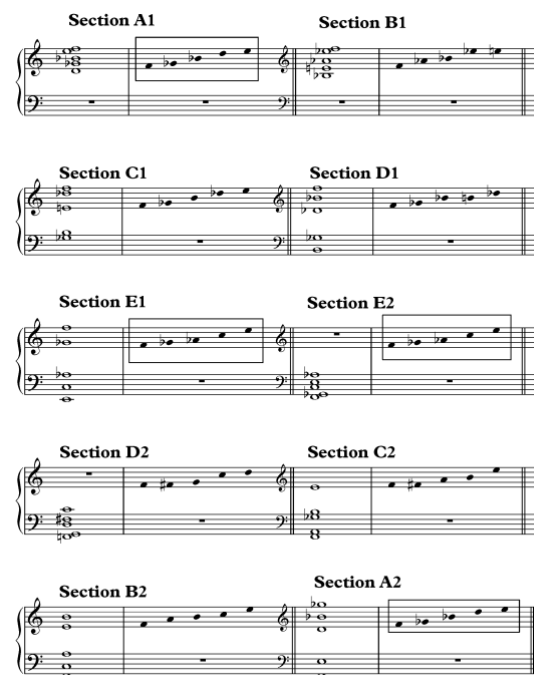


Figure 5: Harmonic structure of the composition

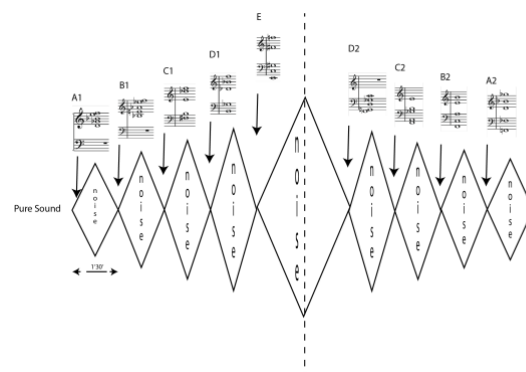


Figure 6: Overall structure of the composition showing relationship between noise and pure sound and the harmonic basis

3. INSTRUMENTATION AND THE RELATIONSHIP TO THE ELECTRONIC PART

The following acoustic instruments are used in the composition:

- Flute
- Clarinet or Bass clarinet
- Vibraphone
- Piano
- ‘Cello
- Double Bass

As the composition progresses, each instrument moves through a series of gestural archetypes, progressing broadly along arcs from pure sound to noise and back. The linearity of the progression is, however, frequently interrupted by restatements of earlier archetypes and by hybridised variations on individual phrases. A broad overview of the archetypes used is shown in

Flute	Mid range Slow attack and continuation No vibrato	Mid range Slow attack and continuation Ordinary vibrato	Rapid burst and continuation
Clarinet	Mid range Slow attack and continuation No vibrato	Rapid burst and decay	Rapid burst and continuation
Vibraphone	Bowed harmonic Slow attack and continuation	Rapid burst and tremolo with continuation	Tremolo Slow attack and continuation
Piano	Sustained chord Slow attack and continuation	Rapid burst and continuation	Rapid burst Repeated pitch Progressively mute string
‘Cello	Slow attack and continuation Norm to sul tasto. Gradually increase bow pressure	Ord. to harmonic	Tremolo stopped note and stopped harmonic with glissando
D.Bass	Natural harmonic Slow attack and continuation	Tremolo Slow attack and continuation	Stopped harmonic

Flute	High register harmonic Slow attack and continuation	High register whistle tone with appoggiatura Rapid attack and continuation	Tongue ram Short attack and decay Strike gesture
Clarinet	Slow attack and continuation with trill	Rapid burst and tremolo Iteration	Tremolo and continuation Iteration
Vibraphone	Rapid burst and decay	Rapid burst repeated pitch Iteration and rapid decay	Polyphonic tremolo Iteration and continuation
Piano	Silent chord with single glissando across strings	Harmonic	Scratch string while holding silent chord Low register
‘Cello	Rapid burst and decay with and without glissando	Rapid burst pizzicato	Ord. to tremolo
D.Bass	Rapid burst and decay with and without glissando	Stopped harmonic glissandi and tremolo norm to molto s.p.	Ord. to harmonic to tremolo. Norm to molto s.p.
Flute	Rapid burst and rapid decay Strike gesture	Tremolo with appoggiatura Iteration	Ord. to flutter-tongue Pure sound to noise Slow attack iteration/push
Clarinet	Slap tongue Short attack and decay Strike gesture	Ord. to flutter-tongue Pure sound to noise	Multiphonic Slow attack and continuation
Vibraphone	Tremolo to ord. slow attack and continuation	Bowed note with pedal Slow attack and continuation	
Piano	Hit strings with palm and let ring	Very rapid glissandi over strings high register	
‘Cello	Natural harmonic with tremolo and trill to open string With glissando	High register raris glissandi with tremolo	Col legno tratto Col legno battuto
D.Bass	Col legno tratto Col legno battuto	Low register Very gradual gliss with tremolo	

Flute	Air notes to ord. Noise to pure sound		
*Cello	Low register Very gradual gliss with tremolo		

Table 1: Gestural archetypes used in the composition listed by instrument and in the order in which they appear

Figure 7 to **Error! Reference source not found.** show the moments at which the principal gestural archetypes appear in the first half of the composition. After Section E the structure is reversed and repeated with material moving from Section D to Section A.

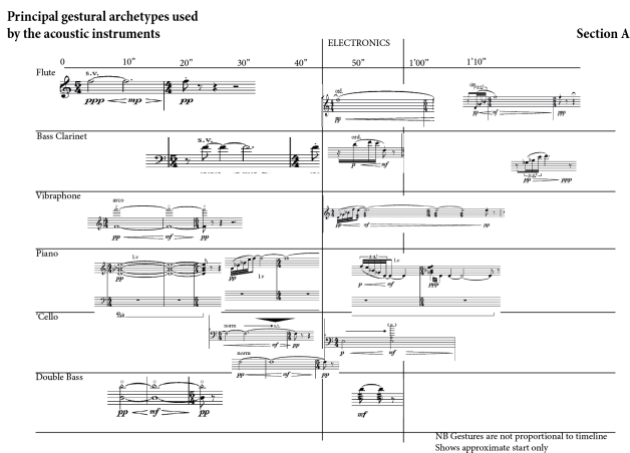


Figure 7: Principal gestural archetypes used in section A

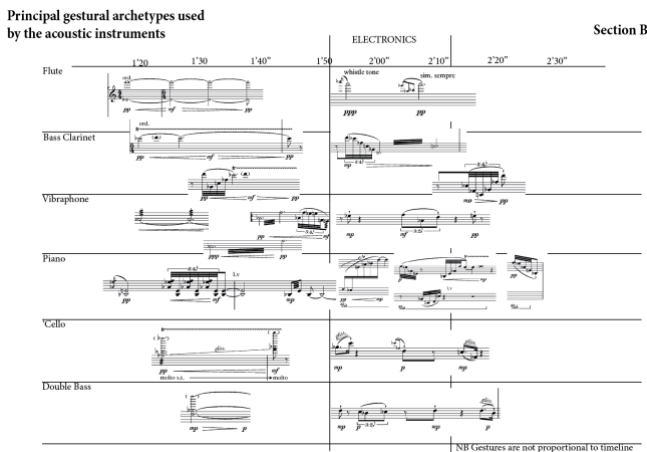


Figure 8: Principal gestural archetypes used in section B

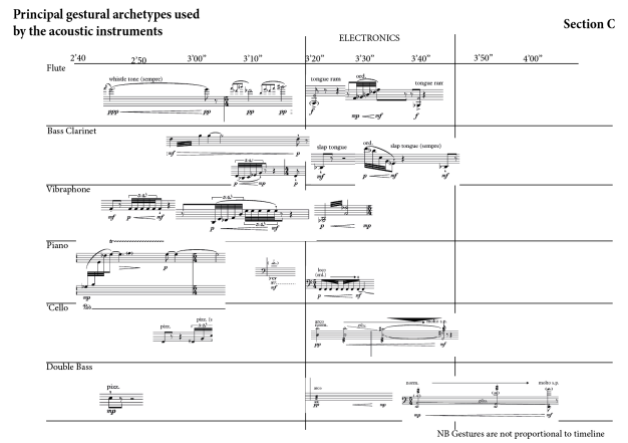


Figure 9: Principal gestural archetypes used in section C

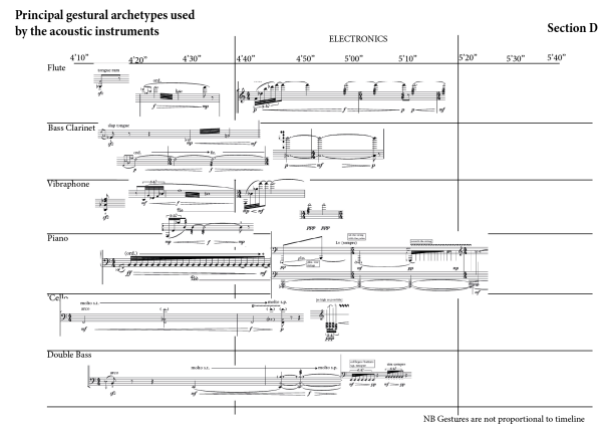


Figure 10: Principal gestural archetypes used in section D

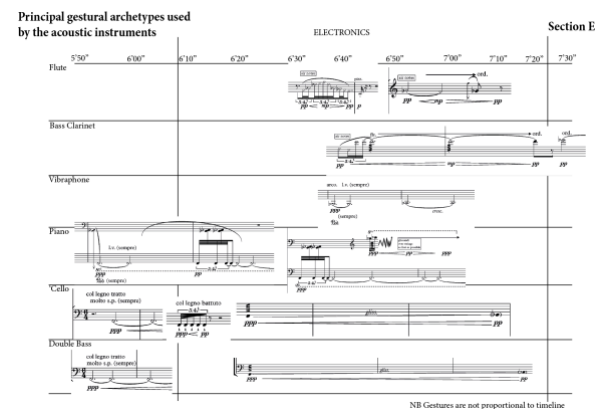


Figure 11: Principal gestural archetypes used in section E

4. CLASSIFICATION OF GESTURES USED

Table 2 shows the principal categories used to describe the gestural archetypes. The categories are again adapted from the typology suggested by Lewis and Pestova [2]. Many of the archetypes used in the composition fall between categories and it is often these ambiguities that contribute to the compositional interest of the work.

Slow attack and continuation
Slow attack and abrupt decay
Iteration/push
Rapid burst and slow decay
Rapid burst and abrupt decay
Strike
Strike/push and continuation

Table 2: Principal categories used for gestural archetypes

In order to illustrate the way in which this terminology has been applied in the composition, examples of archetypes from the vibraphone part are shown in to below. Many of these examples are taken from the pre-compositional process but similar gestures can be found in the final work:



Figure 12: Vibraphone gestural archetype 1. Slow attack and continuation: bowed note with harmonic

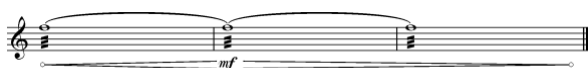


Figure 13: Vibraphone gestural archetype 2. Iteration: rapidly repeated note



Figure 14: Vibraphone gestural archetype 3. Short attack and decay - strike gesture



Figure 15: Vibraphone gestural archetype 4. Iteration 2 - push gesture



Figure 16: Vibraphone gestural archetype 5. Rapid burst and decay. Strike/push gesture



Figure 17: Vibraphone gestural archetype 6. Rapid burst and continuation. Strike/push and continuation



Figure 18: Vibraphone gestural archetype 7. Longer phrases with a mixture of regular and irregular rhythms. Mixture of slow decal and abrupt decay

The other instruments used in the composition move through similar taxonomies of gestures.

5. ELECTROACOUSTIC STRUCTURE

The electroacoustic part engages in a dialogue with the acoustic instruments by moving through a similar structural framework. The electronic part is structured in such a way as to spread outward from the centre of each section of the composition. The extent of the electronics gradually increases with each section as the composition progresses so that, by the centre of the piece, the electronics are playing through the majority of the section. A broad outline of this process is shown in Figure 19:

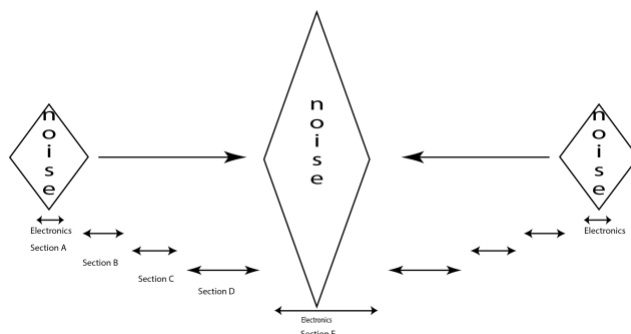


Figure 19: Broad schematic demonstrating how the extent of the electronic part gradually increases from the centre of each section until, by the centre of the composition, the electronics play throughout the majority of the section. The process is then reversed

A schematic for the performance environment used for the electronic part is shown in Figure 20

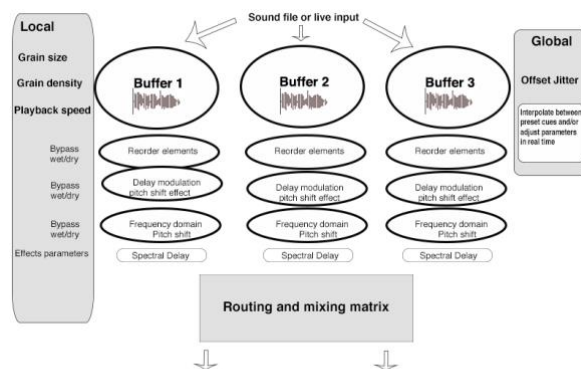


Figure 20: Overview of the Electronic Performance Environment

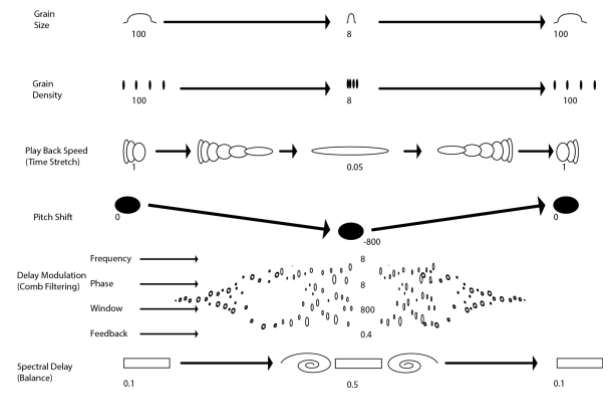
Table 3 shows which parameters from the environment have been mapped for the composition together with the abbreviation used in the score and the schematics. A system of graphical notation has been devised to represent the electronic processes. These are outlined in the preface to the score.

Parameter	Abbreviation
Grain Size	GS
Grain Density	GD
Play Back Speed (Time Stretch)	PBS
Pitch Shift	Pitch
Delay Modulation Effect (Comb Filter)	DMod
Individual parameters for Delay Modulation Effect	
• Frequency	Fq
• Phase components	P
• Delay Window Size	Win
• Feedback	Fb
• Balance	Bl
Spectral Delay Balance	SD

Table 3: Parameters used for the control of the electronic part together with abbreviation

For each section of the composition, each of the three channels of the electronic performance environment processes a sound file of a gestural archetype played by an acoustic instrument in the same section. Figure 21 shows the overall schematic for channel 1. Figure 22 shows a more detailed schematic for the first section of the composition with the three individual channels grouped together. It is these schematics which have been mapped onto the score. After the fifth section, the structure is reversed.

As with the acoustic part of the composition, the material in the electroacoustic part moves broadly along an axis from pure sound at the beginning of the composition to noise at the center of the composition before returning to pure sound at the conclusion of the work. The process is not linear, however, and, as with the acoustic part, this non-linearity is exploited in order to build tension and add compositional interest.



Electronics Channel 1

Figure 21: Electronics Channel 1 Schematic

Section A1

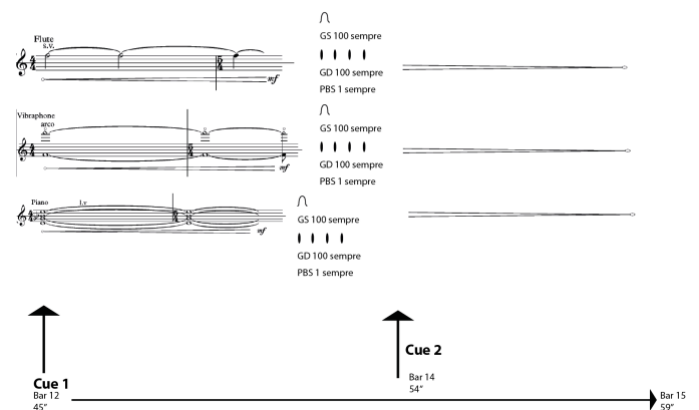


Figure 22: Electronics section A1 schematic

6. CREATING A UNIFIED WORK

Owing to the multiple structural frameworks underpinning the composition, the disparate but interrelated elements of the work unfold separately but also as an integrated, cohesive whole. The harmonic structure, the hierarchy of gestural archetypes and the pure sound/noise axis all function together, in both the acoustic and the electronic elements, to create a unified composition. The broad macrostructures described in the schematics are reflected in the microstructures of the piece on different timescales. Progressions from pure sound to noise and back can be observed not only in the overall structure of the composition but also in individual sections, gestures, and microsound events.

As different parts of the work unfold, tensions, as well as resolutions to those tensions, appear not only between the electroacoustic parts and the acoustic parts but also within those parts themselves. In this respect, the electroacoustic material does not merely function as a way of extending or framing the acoustic part. Rather, both parts evolve simultaneously and both are

interdependent and integral to the unfolding of the musical argument.

7. THE IMPLICATIONS OF USING A SIMPLE SYMBOLIC GRAPHIC NOTATION SYSTEM

The notation for the electroacoustic elements is both descriptive, in that it provides a useful representation of the processes, and prescriptive, in that it contains enough detail to allow the work to be reproduced with the appropriate software environment. The graphics used are intuitive to understand and easy to incorporate into commercial music processing packages. The use of graphics in this way, especially when they are intended to be used in works which incorporate acoustic instruments, encourages an approach to electroacoustic composition where broad structural outlines, as well as more detailed gestures and phrases, can be imagined before any processing takes place. In this respect, they function as an extremely useful compositional tool.

8. CONCLUSION

The composition provides examples of ways in which acoustic instruments can be combined with electroacoustic material through the application of microsound. The use of acoustic instruments as source material, the adoption of a system of hierarchical gestural archetypes, and carefully considered structural frameworks all serve to give the piece a cohesion in which the electroacoustic and the acoustic interrelate in an aesthetically satisfying manner. Integrating cues from the software performance environment into the score is an effective model for control of the electronic part. The system of graphical notation which is both prescriptive and descriptive is a useful tool for both composition and analysis. The composition demonstrates well the use of microsound to mediate relationships between the acoustic and the electroacoustic.

9. REFERENCES

- [1] Saariaho, K. (1987). Timbre and harmony: Interpolations of timbral structure. *Contemporary Music Review*, 2 (1), 93-133.
- [2] Lewis, A., & Pestova, X. (2012). The Audible and the Physical; a Gestural Typology for "Mixed" Electronic Music. *Proceedings of the Electroacoustic Music Studies Network Conference; Meaning and Meaningfulness in Electroacoustic Music*. Stockholm: www.ems-network.org.