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Transformation analysis of the relations between acoustic instruments and electronics in mixed concert music, and creative application of this analysis

ABSTRACT

Background

In the growing repertoire of score-based concert works that combine acoustic instruments with electronics ('mixed' works), how can we gain a systematic view of patterns of practice in composers' shaping of the relations between acoustic instruments and electronics? I adapt David Lewin's (2011) Transformation Analysis as a pivotal tool in an approach to answering this question. This provides an alternative to other approaches, such as the taxonomy from Robert Rowe (1993), which polarised what he called the 'instrumental paradigm' and the 'player paradigm' in electronic music 'interactivity'. I bypass the issues of 'interactivity' and instead point at the *morphology of relations* between acoustic and electronic elements. I formalise descriptions of this morphology to arrive at types, which I organise in a typology of transformation paths. I argue that the typology indicates patterns of practice.

Aims and repertoire studied

I present a preliminary typology of composers' uses of relations between acoustic instruments and electronics in mixed works from Kaija Saariaho (*NoaNoa*, 1992), Luciano Berio (*Altra voce*, 1999) and Jonathan Harvey (*Ricercare una melodia*, 1984). The patterns of practice in these mixed works are described as transformation path types and higher-order relations between these path types. The focus on morphology, rather than on system states or characteristics, enables second-order descriptions and detailed understanding of the relations between human performers and electronic technology. This provides a richer analytical output than first-order descriptions such as Rowe's taxonomy.

I outline the analytical approach with examples, as well as argue for the validity and usefulness of the typological organisation of the analysis outputs. I show the analytical work to be a productive tool for shaping original compositional work, illustrated with excerpts of an *autoethnographic narrative* (in the sense of Adams 2015) from an intertextual and *parodic* approach (in the sense of Hutcheon 2000) to music creation. I argue that my analyses of mixed works repertoire can also indicate *intertextual* links (Klein 2005) between these works and new compositions which 'mix' acoustic instruments and electronics.
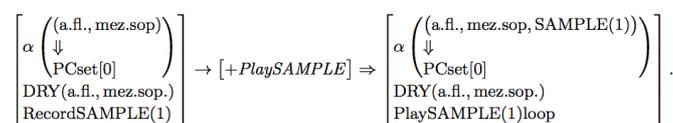
Methods

David Lewin's published analyses are for the most part focused on formalising analytical spaces describing pitch-class transformations. A key example of Lewin's work is the book *Generalized Musical Intervals and Transformations* (Lewin

2011). However, in Chapter Four of this book he presents analyses of works that generalise the intervallic concept to models of time and timbre.

Tolga Tüzün has followed Lewin's lead and also gone further, by exploring contextual transformation analysis of timbral spaces in his analysis of Tristan Murail's work *Winter Fragments*. Tüzün's focus is on `how to organize theoretical constructs based on timbral objects and their transformations in a musical composition', and he aims `to uncover/discover contextual group operations in a timbral space'. (Tüzün 2009, 11) However, he does not address what Rowe would call 'interactivity'.

In my adaptation of transformation analysis I segment works into *Timbre-Pitch Classes* (TPC) which form points in transformation spaces. Figure 1 shows an example of my formal transformation path descriptions in Berio's *Altra voce*: TPC(bar 2) to the transformation +*PlaySAMPLE* to TPC(bar 3). Formal descriptions of transformation paths between the points in the theoretical transformation spaces allow me to analytically access what Rowe would call 'interactivity' in mixed works.

Types and super-types of transformation paths found in several compositions indicate patterns of practice. My organisation of these types and super-types into a hierarchical typology further indicates patterns of practice. Figure 2 shows a typology excerpt where arrows indicate directions of inheritance relationships between some super-types and types. Transformation types are indicated within ovals. Example work titles and segmentation points (bar numbers) applicable to the transformation types are indicated below each oval.

$$\begin{bmatrix} \alpha \begin{pmatrix} \text{(a.fl., mez.sop)} \\ \Downarrow \\ \text{PCset}[0] \end{pmatrix} \\ \text{DRY(a.fl., mez.sop.)} \\ \text{RecordSAMPLE(1)} \end{bmatrix} \rightarrow \begin{bmatrix} +PlaySAMPLE \end{bmatrix} \Rightarrow \begin{bmatrix} \alpha \begin{pmatrix} \text{(a.fl., mez.sop, SAMPLE(1))} \\ \Downarrow \\ \text{PCset}[0] \end{pmatrix} \\ \text{DRY(a.fl., mez.sop.)} \\ \text{PlaySAMPLE(1)loop} \end{bmatrix}.$$

Fig. 1. Example of transformation path description in *Altra voce*: TPC(bar 2) with transformation to TPC(bar 3).

I align my transformation spaces with other analytical techniques such as pc set analysis; and in the creative context, I argue that the types, generated through my adaptation of transformation analysis, enable a rich compositional control of musical ideas combining instruments and electronics. This work intertwines research-led practice with practice-led research and makes partners of analysis and composition in music.
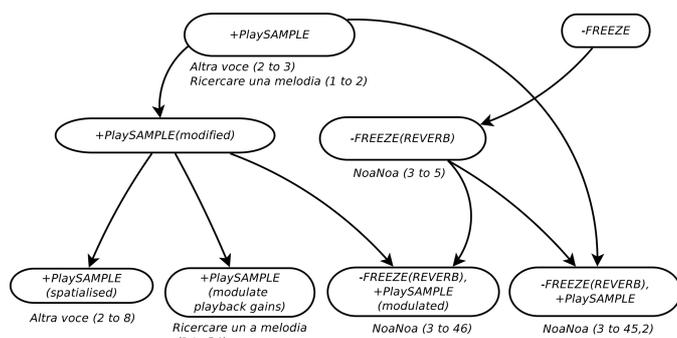
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   +PlaySAMPLE                          -FREEZE

   Altra voce (2 to 3)
   Ricercare una melodia (1 to 2)

+PlaySAMPLE(modified)          -FREEZE(REVERB)

                                NoaNoa (3 to 5)

 +PlaySAMPLE    +PlaySAMPLE    -FREEZE(REVERB),   -FREEZE(REVERB),
 (spatialised)  (modulate      +PlaySAMPLE        +PlaySAMPLE
                playback gains) (modulated)

 Altra voce (2 to 8)
                Ricercare un a melodia   NoaNoa (3 to 46)   NoaNoa (3 to 45,2)
                (1 to 34)
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Fig. 2. Typology excerpt in diagram form, showing inherit-ances between transformation types.

Implications

I demonstrate the analytical approach with excerpts of the three repertoire works by Saariaho, Berio, and Harvey, and discuss the applications of some of the resulting analytical ideas in the compositional decision-making for my work *Chasing the voices of windmills* (2014). Exchanges between the analytical and compositional processes have provided fur-ther development of the analytical typology. I describe some highlights of these exchanges from an autoethnographic stance.

The iterative exchange between creative and analytical work can be seen as a kind of `dialogue' between the acts of analysis and composition. Such a `dialogue' fits well with an `intertextual' interpretation of the music works and provides a highly self-conscious submission by the composer to the `Text' of the Western music tradition. This kind of submission to tra-dition should perhaps be labelled `high-postmodernism': in-novation is found through interaction with, and by reworking of, the established canon. Perhaps a codification of practice through analysis, such as the present typology, can provide a stepping-stone for innovation in future creative and analytical work.

Analytical activity is by its nature interpretative, at least to some extent, and so the typology artefact resulting from the re-search is shaped by the decisions taken by the analyst. The ty-pology results are also context-dependent according to reper-toire and the analytical approaches employed: in the present analyses of works by Saariaho, Berio, Harvey, and myself, I cannot claim any strong objectivity regarding the typology ele-ments that I have arrived at. However, I argue that the research approach conforms adequately to canons of reproducibility and generalisability for qualitative research. (Strauss 1998)

Given the intimate exchange between analytical listening and composition described above, it may appear that in this context Jean-Jacques Nattiez's (1990) semiotic tripartition is imploding: if the esthesic act of listening also *is* the poietic act of creating, then the distinction between these two semiotic concepts begins to look arbitrary. Of course, with this state-ment I am intermingling the poietic and esthesic parts of an older piece with the poietic part of a new composition. But from the stance of an *aleatoric intertextuality*, (Klein 2005, 12) where chronology of works can be disregarded, this kind of semiotic implosion would seem unproblematic. A Barthian intertextual view (Barthes 1977, 142–148) that the old and

new works are both part of a bigger cultural *Text* gives a con-text for suggesting that the compositional act involved in the new piece is equivalent to an analytical-listening act applied to the older piece. In other words, the analytical-listening action is a compositional action: the new work produced would then be a trace of this analytical-listening action and the `composi-tional process' then becomes `merely' an exercise necessary to transfer the analytical-listening action into a physical manifest-ation that can be shared with other listeners.

Perhaps we might reconsider the title `composer' as having the meaning: the analytical-listener who provides a trace of her or his listening act. To distinguish the composer from the critic we might have to specify that the trace is in a `musical' medium, in whatever way that might be defined. But the more interesting aspect of this semiotic implosion is the con-sequence that anyone who engages in an analytical-listening act potentially is also engaging in a compositional act and, as a result, analytical listening is necessarily a creative activity. This would seem to underline the potential importance, to every person, of the activity of creating the trace that allows sharing of analytical listening; in other words, this emphasises the importance of the creation of new compositions. The point of this conjecture is not to propose a thorough semiotic ana-lysis, nor to fully explore the issues of intertextuality; however a concept of the composer as being primarily an analyst and a listener is interesting in my opinion, and suggests questions deserving attention in future work.

Keywords

Mixed music, transformation analysis, formal analysis and composition tools.

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