

DLA DOCTORAL DISSERTATION THESIS

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MULTIDIMENSIONAL TIMBRE SPACE

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Budapest

2013

I. The Premises of the Research

In the 20th century, together with the rapid development of the material constituting music, a new music "lexicon" has been formed, where the significance of so called primary musical parameters ceased to exist, and timbre became an integral part of creating musical form. Timbre is nevertheless a substantially more complicated parameter, since it is multidimensional and has an indefinable – theoretically infinite – range. Its methods of organization cannot be described by the rules of the traditional music theory.

Since the beginning of the 20th century one can encounter new theories and pieces which attempt to structure and understand timbre dimensions. The most important and influential amongst the early theories dealing with the problem of creating form by means of timbres are the futurist manifestos by Balilla Pratella and Luigi Russolo, Arnold Schönberg's theory of "Klangfarbenmelodie" and Edgar Varèse's ideas published in *The Liberation of Sound*.

With the advent of electroacoustic music it became more and more possible to have access to musical data controlling timbre. The first important results of this domain are well documented: Pierre Schaeffer's and Karlheinz Stockhausen's works explore both the theoretical and practical

issues of these new possibilities.

The unfolding of individual timbre became possible through digitalization and processing of sounds by computers. Psychoacoustics has been included into the process of composition through the experiments and works of Max Matthews, Jean-Claude Risset and John Chowning.

II. Sources

The field possesses a broad bibliography. The publications can be divided into three types according to their main aspects: 1) music theory descriptions operating with new, sometimes metaphorical concepts but that do not discuss the methods of practical/technical realization (e.g. Schaeffer, Smalley); 2) technical descriptions with a detailed specification of sound synthesis and processing techniques, which lack the information about the percepts created with those techniques (e.g. Miranda, Roads), 3) documentations of results of psychoacoustic experiments attempting to connect technical parameters with sensory experiences (e.g. Wessel, McAdams).

My research was informed by all the three types of writings. From the point of view of new theory, it seems most promising to draw on publications dealing with psychoacoustics. Unfortunately those researches are still based

on a very limited set of sounds, mainly instrumental in their nature.

In addition to the above-mentioned types of publications, I found also very informative, writings which use methodologies from traditional music theory on ways of dealing with timbres (e.g. Lerdahl, McAdams-Saariaho), works exploring music semantics (e.g. Pedersen), texts summarizing composers' experiences (e.g. Wishart), realization scores of electronic music and performance scores of instrumental music.

III. Methods

In order to develop the subject, I discuss, initially, the first pioneering experiments influencing subsequent methods on structuring timbre spaces. Here I describe pieces and researches of composers and developers, who in the early period of timbre-based music were already trying to order sonorities in the form of compositions, acoustic or psychoacoustic theories and technological developments.

In the chapter on classification of timbre and timbre dimensions, after reviewing the results of research on music theory, acoustics and psychoacoustics exploring the problems of timbre classification and multidimensional timbre space, I

list timbre dimensions I found musically relevant, and attempt to describe and control timbre spaces created by myself.

I introduce and define the concept of reduced timbre space, which is a matrix containing limited amount of sensory dimensions having limited range. Whilst examining the conditions of the reduction, I define the criteria of the form-bearing capabilities of timbre dimensions, and I describe the requirements of a hypothetical reduced timbre space.

At the end I describe some practical possibilities of the application of the theory of reduced timbre spaces. With the help of the concept I analysed the piece "Turenas" by John Chowning, and present the process of the composition of my audiovisual piece CT, and its interactive software, creating a reduced timbre space.

IV. Conclusions

To create well-recognizable and ready-for-transformation timbre motifs, a change of multiple sound dimensions is necessary. Correlating pattern-variations within timbre dimensions create complex, organically changing percepts. The changes in time of the interior structure of sonorities ensure that a complex mass of information will stimulate the hearing in the same way it happens when listening to natural acoustic sounds, meaning, sonorities never heard before will be perceived and sound naturally. To create musical forms using timbres one has to acquire the art of grouped movements of timbre dimensions.

The reduced timbre space is a matrix containing a limited amount of sensory dimensions with limited range. In the matrix, only those dimensions which influence the variations of sonorities defining musical form, are changing dynamically,. The reduction concerns the number of dimensions, their range, the function of mapping, and the number of discrete steps within the dimensions.

The conceptual apparatus of the reduced timbre space is well applicable in practice to analyze pieces based on sonorities. By separating, identifying and scaling timbre dimensions, sounding materials created in an intuitive,

experimental way can be opened up (can be made accessible) for analysis. With the help of structuring and visualizing the data it is possible to compare systematically, timbres constituting musical pieces, so one can explore in detail the role of timbre-transformations in the development of musical forms.

Sound-synthesizing and processing engines capable of creating intelligently controllable timbre dimensions can renew and advance the methodologies of electroacoustic music composition and realization to a higher level. The reduced timbre space is a good starting point for forming arbitrarily combined, perception-based modular musical structures. Through its application, complex interactive music systems can be created which will merge and unite the complexity and precision of the methods offered by non real-time electronic music studios with "organic" music-making gestures and the experience of immediate audible feedback.

V. Documentation of activities related to the topic of the dissertation:

Pieces:

Swinging Door - for dancer and live electronics

Premiere: 2007 September, Budapest, Music Forum EXPO, Kunsthalle

Aliquots and Aliquants - for dancer and laser-MIDI interface

Premiere: Székesfehérvár, Nights of Museum, 2009

CT - for interactive video and music (video: Zsolt Gyenes)

Premiere: Cologne, 2010 June 10.

Send Me a Sound - for 2 dancers, 2 remote locations, internet connection and live electronics

Premiere.: 2010 November 6., Hamburg - Vienna

My Everyday Silencies CD

Publisher: dióbél kiadó

Date: 2013 January

Publications:

Andrea Szigetvári: Controlling Reduced Timbre Spaces - a tool for real time electroacousticperformance Proceeding of Music in the Global Village Conference 2007

Georg Hajdu, Kai Niggemann, Ádám Siska-Andrea

Szigetvaári: Notation in the Context of Past, Current and Future

Quintet.net Projects, Contemporary Music Review Vol. 29

Issue 1, pp. 39-53., 2010