

Voice type and speech sound type: Two analytical categories proposed for characterisation of acousmatic pieces that include vocal materials

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Abstract

This paper presents two analytical categories which were applied to works included in my portfolio of compositions as part of my PhD dissertation presented at the University of Sheffield in December 2018. Each piece was analysed using five taxonomies. Three of them are classifications provided by well-established systems: sound object theory (Schaffer 1966), spectromorphology (Smalley 1997), and space function levels (Vande Gorne 2010). Every category within each type of analysis, is represented graphically by means of the *EAnalysis* software (Couprie 2014), showing their distribution across five corresponding timelines, allowing a visual comparison between them. An explanation of these well-established systems is presented to understand the way they are used in the analysis of the portfolio, providing in this way a context for the original two categories proposed.

Likewise, the remaining two taxonomies can be read comparatively with the others and were proposed by me and focus on vocal and linguistic materials which are present in the works. They are *voice type* and *speech sound type*, making reference respectively to the inclusion or absence of semantic content and to a categorization of phonetic elements within each piece. In order to test them beyond the analysis of my own compositions, they have begun to be applied to some compositions from the repertoire, one of which is shown as an example in this article.

1. Introduction

The portfolio of compositions analysed is part of the thesis entitled *Voice and poetry as inspiration and material in acousmatic composition* (Albornoz 2018), and addressed a group of pieces, both in eight channels and stereo. The compositional rationale, inspired by creative and aesthetic theories by Chilean poet Vicente Huidobro (Albornoz 2020), expected to generate original pieces mainly distinctive by heterogeneity in terms of their constitutive elements, whether structural, inner sound materials or conceptual aspects. In order to demonstrate the diversity of those components, an exhaustive analysis was carried out. The well-known tripartite model proposed by Jean-Jacques Nattiez in his book *Music and Discourse: Toward a Semiology of Music* (Nattiez 1990) was used as a basis to address the analysis and description of the pieces contained in the portfolio, linking this to the various terms and ideas developed by Stéphane Roy (2004). This model establishes three dimensions in which a symbolic and an artistic phenomenon can be analysed: poietic, esthetic and trace (also known as neutral) levels.

The description and analysis of the pieces included in the portfolio was achieved through the poetic and neutral levels. The esthetic¹ dimension involves the reception of the symbolic phenomenon; this implies all the perceptual and interpretative processes by the receivers, the audience (in a private listening session or in a concert). Since the poetic process does not necessarily correspond to the esthetic one (Nattiez 1990, p. 17), this kind of analysis escaped the scope of this investigation, because it would have involved the implementation of a study focused on the audience, diverting attention from the initial motivations of the compositional practice proposed in the thesis.

2. The analytical categories applied

In accordance with the guidelines set above, each piece included in the portfolio was analysed using five taxonomies or analyses plus a general segmentation to indicate the main sections detected. The portfolio included a total of eight acousmatic pieces², five of them grouped in an octophonic cycle and three in stereo format grouped due to be the three tributes to artists passed away. Three of these taxonomies are classifications provided by well-established systems: *sound object* distribution (Schaffer 1966), *spectromorphology* distribution (Smalley 1997), and *space function levels* distribution (Vande Gorne 2010). These analyses were carried out through detailed listening and organised in vertically stacked rows, which are read from left to right over time. The deployment of every category or class, within each type of analysis, is represented graphically by means of the *EAnalysis* software (Couprie 2014), achieving in this manner a way to show their distribution across five corresponding timelines.

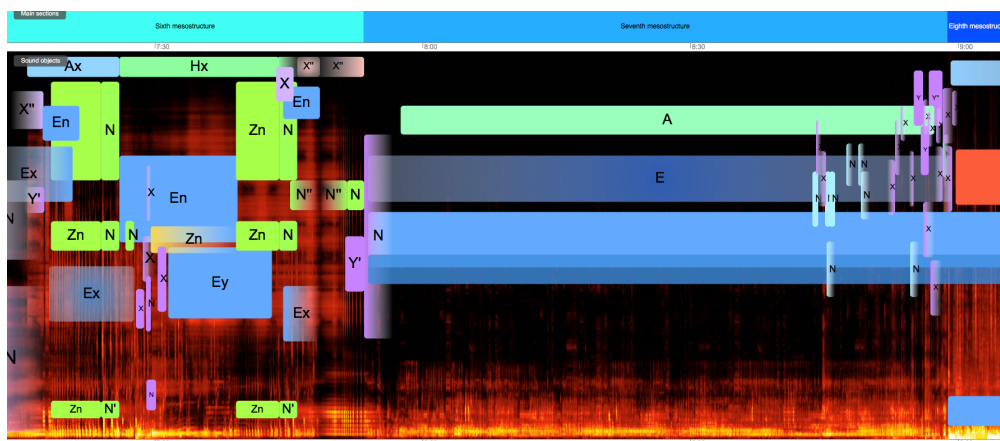
2.1. Schaefferian analysis: sound object distribution

Every analysis is presented graphically with figures representing units or sections, for instance, within the Schaefferian analysis, coloured rectangles with letters for balanced sound objects in a scale ranging from fractions of a second to seconds or, in the case of macro-objects, few seconds to minutes. For this specific taxonomy, the *sound object* description contained in the *Traité des objets musicaux* (Schaeffer 1966) was considered as thoroughly as possible. This includes the basic classification criteria of *sound objects* and the basic typology. Along with the original text of the *Traité*, further explanations by Michel Chion, an authorised voice in this topic, were considered. According to Schaeffer, the *sound object* (*objet sonore*) could be analysed and described through a typology, which in turn is based on morphologic criteria. The criteria used mainly in the thesis text were *masse* (*mass*, the occupation of the pitch field by the sound) and *entretien* (*sustainment*, the way sound persists within the duration, which defines

¹ Here it is important to state that the original French term *esthétique* used by Nattiez and Roy, and translated as *esthetic* by Abbate, should be understood within the specific frame of the semiological theories applied to music by the three authors mentioned; this applies to the way it is defined in this text, leaving aside the possible translation to English as *aesthetic* or *esthetic*, which would involve the philosophical meaning of the word, related to philosophy of art, including different aspects such as ontology of art, perceptual studies on artistic phenomenon or art as communication among others (Shelley 2017). *Esthétique* was a neologism coined by Paul Valéry in 1945 precisely to avoid confusion with *aesthetic* and it was used by Jean Molino, from who is taken by Nattiez (1990, p.12). In fact, is Molino who proposes the tripartite theory of semiology (Nattiez 1990, p.10).

² The octophonic cycle includes the pieces *Overture*, *La Lumière*, *La Luz*, *The Light* and *Hundreds of milliseconds* (*Finale*). The three stereo acousmatic tributes are *Un regalito misterioso*, *Tom... Far... Orion... Blue...* and *Sheffield 17*.

its *facture*) (Schaeffer 1966, pp. 401, 402). The crossing of these two main criteria gives a group of sounds displayed in the *Tableau récapitulatif de la typologie* (Schaeffer 1966, p. 459), a chart where sounds are classified using letters as symbols for different types of *mass* and *sustainment* and with some words to detail specific cases. These nomenclatures are used to describe the sound materials of the pieces in the *neutral (trace)* level of analysis and in the *poietic* level when is needed. Conveniently, *EAnalysis* software provides a thorough graphic library with these letters and symbols for each class in the *Tableau*. All of this was complemented using as sound reference the examples provided by the website *Prise de son creative* (2013).



Screen capture of a *sound object distribution* analysis section in one piece of the thesis portfolio, *Hundreds of milliseconds*. It is possible to see the general segmentation on the top.

2.2. Spectromorphology distribution

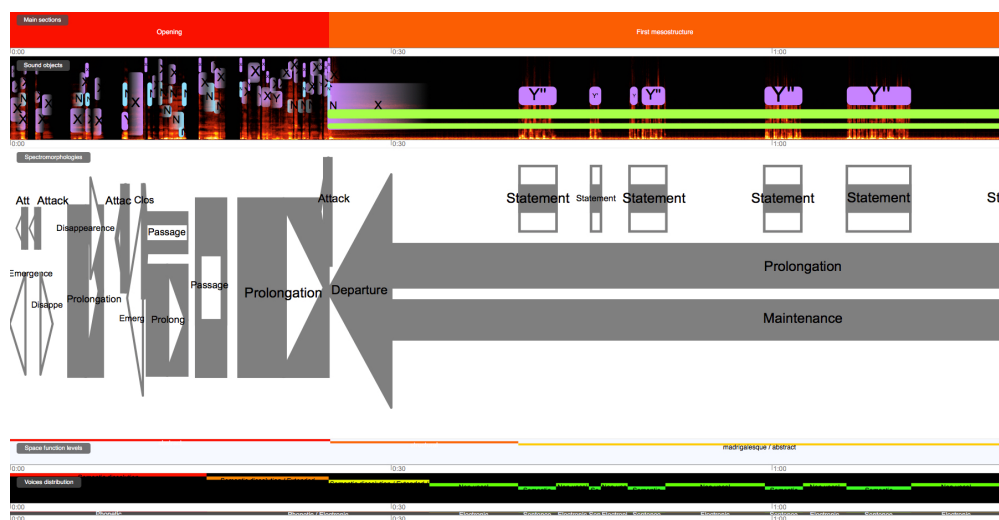
The structural functions defined by Denis Smalley in his paper *Spectromorphology: explaining sound-shapes* (Smalley 1997) were used as analytical tools as well. *Spectromorphology* is a concept inspired by Schaeffer's theories and it is a group of analytical tools based on aural appreciation.

This notion is a set of defined shapes and morphological functions which operate in the scale of the *mesostructures* (Roads 2015, p. 306). If the *sound object* is assumed as the minimum unit with a sonic value (the smaller meaningful formal unit), then, following Roads (2015, pp. 286-289), the organisation of a piece in several levels of interrelated materials can be understood as scales of more or less segmentation, ranging from sound object to the macroform (the whole piece form) going through phrases, subsections and sections, being these last three what it is defined as *mesostructures*³ (Roads 2015, p.305). Here it is very important to clarify that the analytical tools used, the structural functions defined by Denis Smalley as descriptive instruments, do not necessarily have a constant hierarchical configuration, a notion which applies to electroacoustic music in general and even to specific pieces (Smalley 1997, p. 114),

³ According to the online Oxford dictionary (Oxford University Press 2018), *meso* means "middle" or "intermediate", and *structure* means "The arrangement of and relations between the parts or elements of something complex". Combined, these two words imply consequently a *structure* of intermediate range within a whole or *macroform (macrostructure)*. The spelling used by Roads has been adopted through out in the thesis, which does not use the hyphen between the two components of the word (Roads 2015).

and corresponds to the *heterarchical* nature of acousmatic music; the heterarchy concept it can be understood as “a complex of simultaneous hierarchies” (Roads 2015, p. 288); in other words, since acousmatic music is created through complex sound structures, they cannot be reduced to only detached elements, neither cannot be divided in clear structural terms.

Since Smalley’s functions operate in any levels of a given piece (Smalley 1997, p.115), these figures cover few seconds to half a minute or even more. In this way, these two taxonomies, *sound objects* and *spectromorphologies*, complement each other, detailing the type of discrete units in the first case, and setting up a structural evolving profile in the second. However, the visual analysis representations only include Smalley’s *structural functions*, meanwhile his list of *motion* and *growth* processes, applied to each work, were described only in the thesis text (Albornoz 2018). The visual representation is provided by the figures for each structural function, as well included within the analytical graphic libraries of *EAnalysis*.



Screen capture showing the *spectromorphology distribution* analysis section in the piece *Hundreds of milliseconds*. It is possible to see, sorted from top to bottom: the general segmentation, *sound object distribution*, *spectromorphology distribution* and two more taxonomies compressed.

2.3. Space function levels distribution

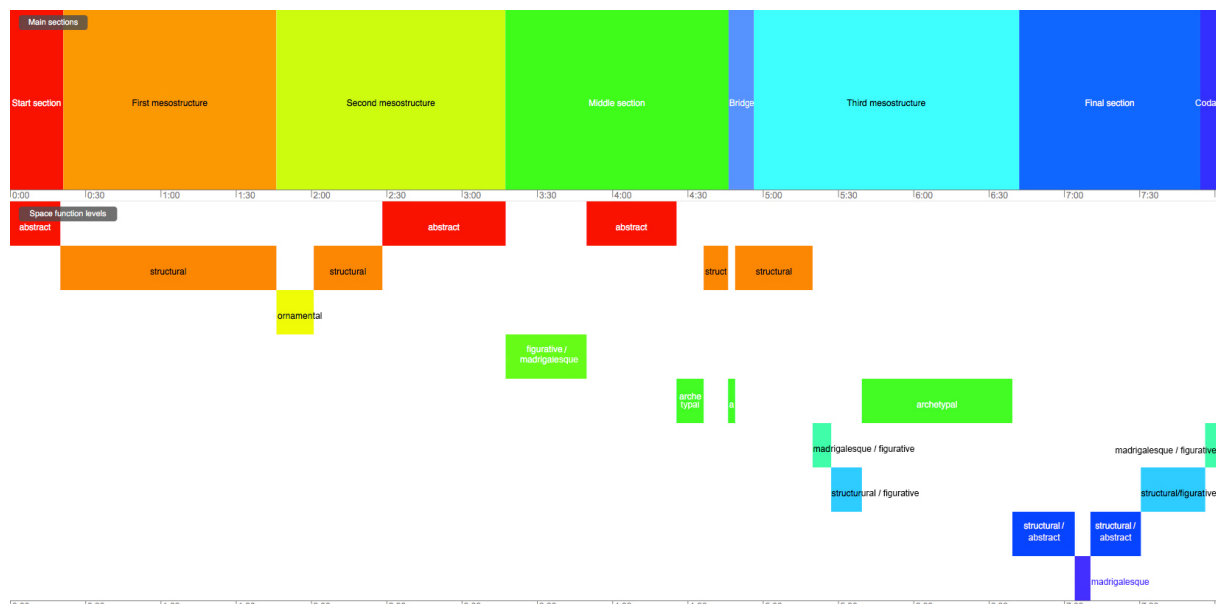
Annette Vande Gorne, among her thorough practice and investigation on space as musical element, has defined different levels of functionality which can be conferred to the space by a composer (Vande Gorne 2010, p. 165)⁴:

- *Abstract level*: “the space conceived as plans, volumes, movements or geometrical figures”. A given material can be exposed through variations allowed by spatial differentiations, always from a perspective focused on spatial sound shapes as pure forms.
- *Structural level*: “space used as valorisation of sections, transition or remembrance”. Spatial dispositions and motion help to highlight moments or articulations and to clarify specific shapes or mesostructures.

⁴ Translation by A. Albornoz from the original in French (Vande Gorne 2010, p. 165).

- *Ornamental level*: “the space, often in motion, added to an event to reinforce its interest or momentary function”. The given spatial configuration operates as an accent which could be not strongly related to the other spatial structures, being rather a decorative element to call attention in a particular moment.
- *Figurative level*: “Figurative level of a relation of space to the imaginary, to a characteristic feature, to the metaphor”. Space as bearer of images, evoking and recreating real or imaginary spaces, locations and motions.
- *Archetypal level*: “spatial figures obvious for all, like the wave (rocking), the circle (isolement), the explosion”. Specific ideas and contexts are communicated by movements which recall evident archetypes founded in different situations in real life.
- *Madrigalesque level*: “Renforcement of expressive elements which are external to the music in itself (text, image...) by figures, movements, appropriate spatial situations”. Here, Vande Gorne refers to a specific feature of the Italian Sixteenth Century musical genre, the ‘madrigal’, which has an expressive and direct way of using texts to reach the listener, often in a naive way. The Belgian composer claims to have been developed the same procedure regarding motion and spatial illusions to generate a direct connection with the audience.

In the case of these *space function levels*, each category is represented by coloured rectangles with durations from few seconds to half a minute or more as well. This particular analysis provides information about global characteristics and sectional aspects through their spatial behaviour in different levels. Complementing this, the spatial lexicon by Smalley (2007) is used only in the thesis text. The graphic presentation of these levels through time allows to visualise how spatial composition shapes the pieces structure and in fact, it can be verified the way this *spatial function levels* match or not with the sections indicated in the row of the main segmentation and with the other elements within the graphs of the other taxonomies. By comparing the way in which the different analyses interact over time, it is revealed which aspect is relevant or when several act synergistically to shape the compositional structure.



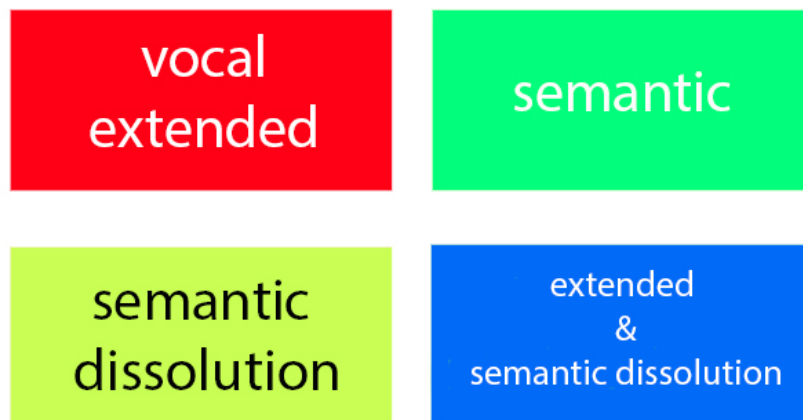
Screen capture showing the *space function levels distribution* section below the general segmentation in the piece *Overture*.

2.4. The proposed analytical categories

In a similar way, the remaining two taxonomies present information that can be read comparatively with the others. These were proposed by me and focus on vocal and linguistic materials which are present in the works. These taxonomies are *voice type* and *speech sound type*, making reference respectively to the inclusion or absence of semantic content and to a detailed categorisation of phonetic elements within each piece. Graphically, they are also coloured rectangles labelled with the names of each proposed category.

Voice type

Voice type make reference to the inclusion or absence of semantic content. The categories proposed for this analysis are *semantic*, *semantic dissolution* and *vocal extended* or *extended*. The first two are self-explanatory, they allude to the presence or absence of linguistic meaning, that is to say any piece of meaning contained in the vocal sounds by means of any element of a recognisable language. *Vocal extended* is a term proposed in this thesis to point out a type of material which, although it has a vocal nature, it has been so profusely processed by electroacoustic music techniques, that it can be approached as either *semantic* or *semantic dissolution*. In some cases, hybrid cases such as *extended & semantic dissolution*, for instance, are presented, in order to acknowledge a compound distribution with an accent in one aspect.



The three basic categories for *voice type* analysis and a hybrid category (in blue).
For each piece, each category is configured with a colour which is used in the correspondent analysis timeline within the specific *EAnalysis* project.

Speech sound type

On the other hand, the *speech sound type* make reference to a detailed categorisation of phonetic elements within the pieces. The categories used are:

- *Phonetic*: a general category for complex elements with speech origin. This allows to classify specific discreet units or elements clustered with more or less clarity as one or a combination of the categories listed below. In combination with other categories, that is to say through hybrid ones, enables to express when the material is hard to define, either due to its mixed nature or due to its fluctuation over time.

- *Phonemes*: “The smallest contrastive unit in the sound system of a language” (Crystal 1995, p. 427). Or, according to Aitchison (1992, p. 39) “[...] phoneme is the smallest segment of sound which can distinguish two words”. For instance, in English the sound of *p* and *b* are substantial units which can allow differentiation between the meaning of *pig* and *big* (Crystal 1995, p. 160). Or in the case of Spanish, the sound of *m* and *p* allowing the differentiation of *mar* (sea) and *par* (pair). As is easy to notice, the importance of such sounds, in terms of meaning, is given by the context, since they are not considered relevant as mere sounds in a *phonetic* perspective. Returning briefly to the *musique concrète* theories, in his study of language, Schaeffer points out (1966, p. 285) that the context is given by the understanding of a certain language. If somebody does not know the specific language, in the moment of hearing these sounds, he or she will not hear *phonemes* but *sound objects*, or, at least, his or her attention it would be driven towards the sonic shapes rather to linguistic aspect, which it is kept hidden due to the ignorance of the given language. Following this idea, it is possible to affirm that, if a *phoneme* is isolated in a way the context for its functionality as such is lost, then it becomes a *phonetic* unit that can be analysed as *sound object* in an acousmatic perspective.
- *Allophones*: “[...] variants of a phoneme [...], in the form of a linguistic unit that does not alter its basic identity [...].” (Crystal 1995, p. 415). In other words, there are sounds which can vary, more or less in certain amounts, without changing the meaning involved in them. These *allophones* are defined as well by the context. For example, in Spanish the word *zapato* (shoe) can be uttered in a sloppy pronunciation with the less dental sound of *s* (*sapato*), without altering its meaning. Just as the *phoneme* becomes a *sound object* by losing its functionality due to the change of its context, the recontextualization of an *allophone* could give rise to new *words*, which were not included initially during the collection of sound speech materials in a given case of compositional process.
- *Word*: The smallest syntactic unit in a language “[...] that can stand alone as a complete utterance, separated by spaces in written language and potentially by pauses in speech” (Crystal 1995, p. 433). It can carry complex meanings or have a functional nature within a syntax system.
- *Sentence*: An assembly of words which is the “[...] largest structural unit that displays stateable grammatical relationships, not dependent on any other structure” (Crystal 1995, p. 430). It carries meanings and messages.
- *Extended*: different to the previous one in *Voice type*, since it points out a phonetic aspect ‘extended’ by performance or electroacoustic treatments.
- *Non-vocal* or *electronic*: absence of speech or recognisable speech due to the only presence of electronic sounds or recognisable sounds but which are not voices.
- Hybrid cases combining two or more categories.

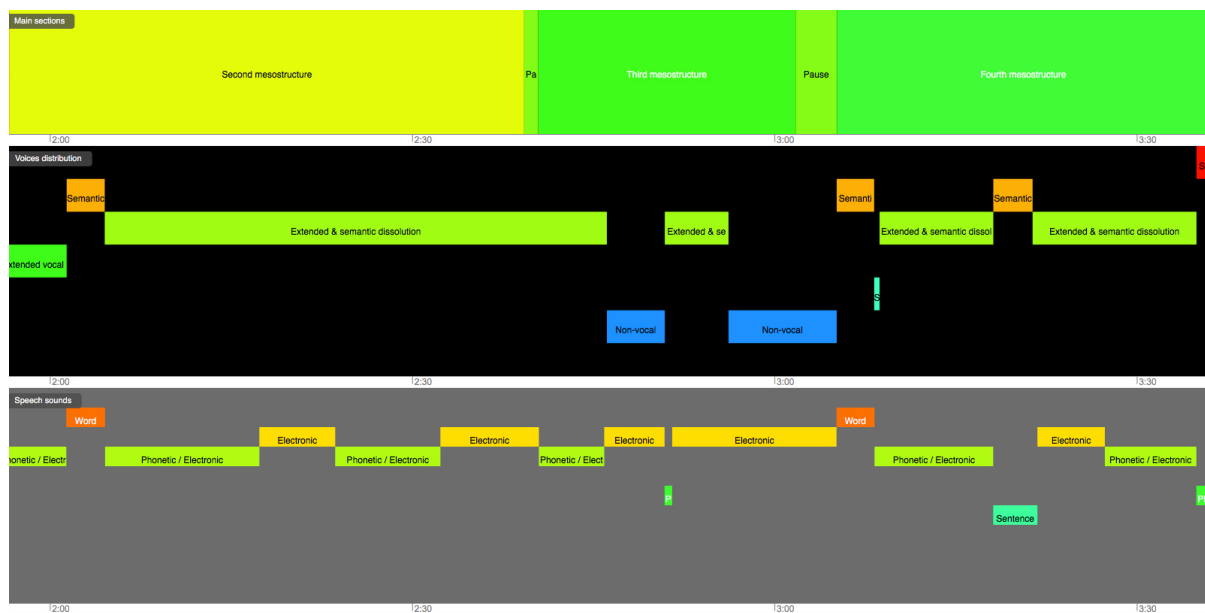
It is important to state that for both analyses, the predominance of an aspect (*semantic*, *word*, *extended*, *electronic*, etc.) is the rule to classify the particular section or part of a piece. This is important to understand since, in spite of hybrid cases, there are moments or sections where a multitude of materials cohabit, nevertheless one category has been identified as the predominant. All these categories are based on definitions provided by the *Cambridge encyclopedia of language* (1995) and some complementary literature, including the books

Phonetics by Reetz and Jongman (2009), *On Sonic Art* by Wishart (1996) and *Teach yourself linguistics* by Aitchison (1992).

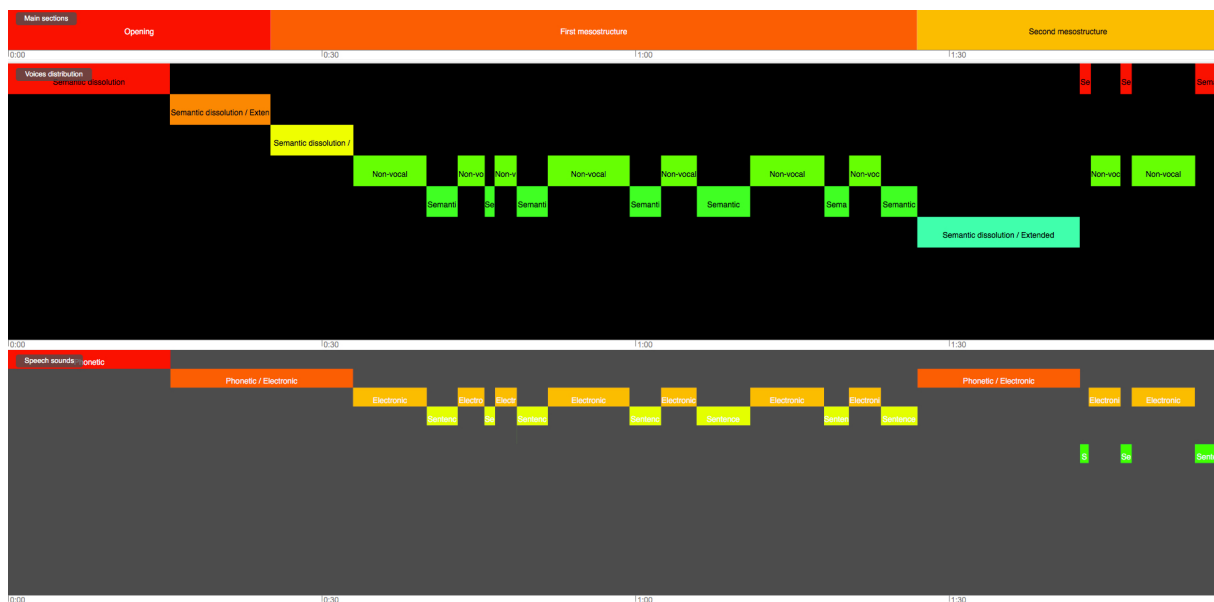


Categories for *speech sound type* analysis and two hybrid categories (in blue and violet). As in the previous *voice type* analysis, within each piece, each category is configured with a colour which is used in the correspondent analysis timeline within the specific *EAnalysis* project.

Alongside these categories, two words, *silence* and *non-vocal*, are located freely to clarify the distributions as needed within the thesis analyses. Finally, aside of the evident use of these taxonomies to identify sound materials in a piece as an exhaustive classification with its own valuable analytical possibilities, the two proposed here for vocal and text materials, are understood as easy handy tools to facilitate description, comparison and aesthetic analysis of any acousmatic piece or eventually other types of music or sonic art compositions, all of which by means of verbal expression through texts, lectures, discussions, et cetera, could allow to determinate global aspects regarding the nature of a given work. For instance, considering the following figures, images produced with *EAnalysis*, the first one shows part of the first half of the work *La Lumière*, where the hybrid categories, the intercalation of various of them, and the disclosure of different *speech sound types* within *voice type* sections, reveal a complex, fluctuating and interwoven (or amalgamated) general nature, where the junction of semantic and non-semantic materials manifests the transiting from meaning to sound texture in both ways. In contrast, the second figure shows the initial section of the piece *Hundreds of milliseconds*, evidencing a more stable distribution, with clear presence of semantic content contrasting with processed materials. In fact, the way the *semantic* material is deployed, placed, contrasted and merged with the other sounds constitutes the form and nature of the composition, with a strong presence of a style close to sound poetry, as is extensively described in the original thesis (Albornoz 2018).



Voice type and *speech sound type* analyses in some sections of the first half of the piece *La Lumière*. Note that *voice type* blocks (over black background) are constituted by two different categories in the *speech sound type* row (over grey background).



Voice type and *speech sound type* analyses in some sections of the first half of the piece *Hundreds of milliseconds*. It is possible to note a certain degree of consistence of the category blocks which is highlighted by the intercalation and the coherence between them in both rows.

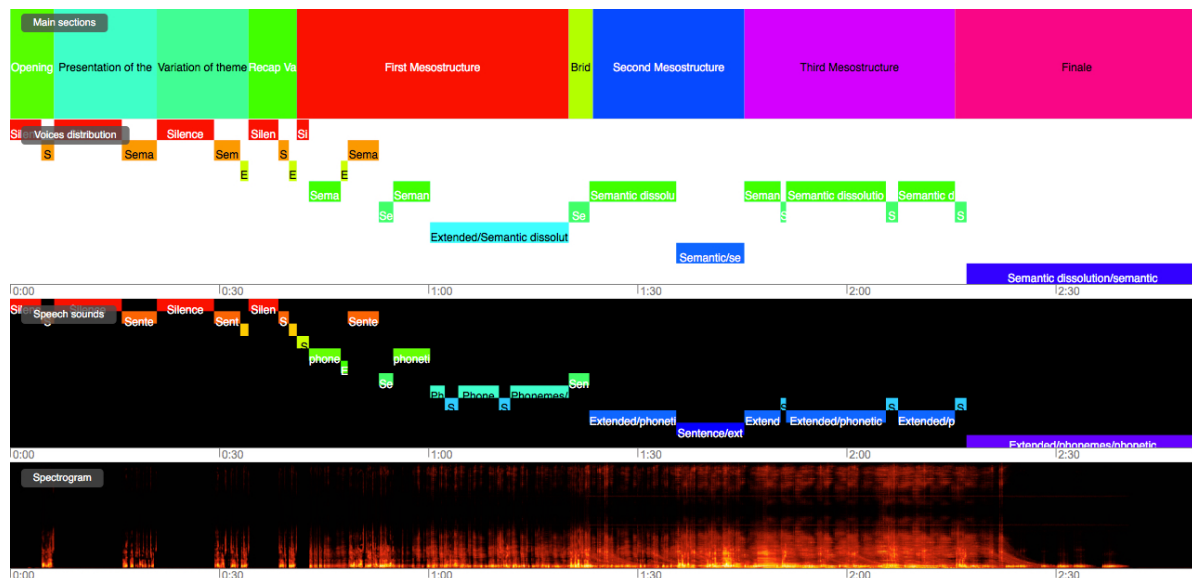
3. Conclusions and eventual expansion of the scope

The five taxonomies include various categories which allow to characterise the pieces simply but clearly in terms of predominance of the sounds deployed. This is explained in detail in the

thesis for each piece of the portfolio and linking this heterogeneity in terms of aesthetic results with the compositional rationale proposed (Albornoz 2018, pp. 3-11). Obviously, all of this is too extensive to address in this article and constitutes the artistic path of the doctoral research carried out.

In regards of the last two mentioned taxonomies, *voice type* and *speech sound type*, they allow to express the character of each piece according to its vocal and semantic components, evidencing in each case its aesthetic nature by tracing its connections to the electroacoustic repertoire and other related artistic forms such as sound poetry and text-sound composition. Similarly, in order to test them beyond their use in the analysis of my own compositions, these two taxonomies have begun to be applied to a selection of electroacoustic compositions from the repertoire. Just as an example, I am mentioning the analysis, with these two taxonomies, of *Blue Tulips* by Trevor Wishart (1999). Thanks to the rendering of these categories with *EAnalysis*, it is possible to appreciate how vocal materials evolve from a naturalistic presentation of speech to materials extensively processed by electroacoustic means, transiting from linguistic meaning to acousmatic texture and involving the presence of hybrid cases, all of which is deployed by exposition, recapitulation and variation of themes in an idiosyncratic way.

The following figure shows these analyses, including the general segmentation on top and a spectrogram at the bottom as reference. Note that in the first sections, silence (red rectangles) and semantic content (orange rectangles) are alternated in the *voice type* (white background) and coherently they are represented as silence and sentences in the *speech sound type* row (black background in this case). It is possible to see as well, the progressive appearance of categories representing transformation and hybrid cases, demonstrating the evolution mentioned above and the progression to a complexity of the sound materials.



Voice type and speech sound type analyses in the piece Blue tulips by Trevor Wishart. This is the representation of the whole piece.

Finally, rests to state some prospective ideas and questions. One important aspect is to analyse pieces of the repertoire and evaluate the effectiveness of this procedure, for instance comparing aural descriptions by a focus group, using or not these taxonomies and the *EAnalysis* software.

Some questions raised are:

- Can these taxonomies be useful for the defined purpose in a wider scope?
- Can be applied to other types of music pieces and even to other kind of sonic works, such as sound art and sonic art works?
- And, beyond the possible utility in terms of aesthetics and expand the field of electroacoustic music studies, namely electroacoustic musicology, can these taxonomies become tools to enlighten and help compositional practice?
- Can *machine learning* techniques applied to facilitate the analysis of a piece or group or pieces?

What has been detected as a possible improvement to carry out, both as conceptual terminology and as a visual tool to use, it would be to develop a better way to render the transitional nature of certain sound materials and sections, which could lead to increase the quantity and the details of the categories and find a coherent graphic representation for them. Let's see what we can do in further eventual research projects.

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