ON TREVOR WISHART'S MUSICAL TRADE-OFFS: COMPOSITIONAL GOALS, MATERIAL'S SELECTION AND SUITABLE SOUND PROCESSES SUPPORTING THE LISTENER PERCEPTION.

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ABSTRACT

Based on Wishart's literature, this paper investigates the most frequent and significant recorded voice transformation processes, and its correlation with the composer's compositional goals, presented on four Trevor Wishart's acousmatic pieces: Vox-5, Tongues of Fire, Globalalia and Encounters in the Republic of Heaven. Although Wishart developed new sound transformations using the phase-vocoder, the selection of the materials takes a key role in determining which sound metamorphosis would fit his aesthetic goal: retain the source credibility from the listener perspective. This articles shows how his compositional goals in each piece demands both specific recorded materials and precise transformation processes in order to achieve his intention with respect to the listener. Hence, one of the main relevant aspects of Wishart's work for electroacoustic composers is to reveal – from the audience point of hearing – subtleties between natural and artificial transformations of voice samples.

1. INTRODUCTION

1.1 Background

Trevor Wishart is a freelance composer/performer based in York, UK, who made an extensive theoretical and compositional work on human voice and sound metamorphosis. He is the main designer of Sound Loom and Composers Desktop Project: softwares focused on transformations of sound recordings.

The Composers Desktop Project (CDP) is an open source and collaborative software that dates back from 1986, when Wishart started an artist residency at Institut de Recherche et Coordination Acoustique/Musique (IRCAM). During this period he devised his firsts computer tools based on the phase vocoder: spectral stretching and sound morphing. This collaboration gave birth to CDP and to the piece Vox-5.

1.2 Literature Review

Wishart main theoretical works are On Sonic Art, Audible Design and Sound Composition [1, 2, 3]. Though he claims that the contents are rather speculative and non-scientific, his deep and vast discussions of electroacoustic music are prestigious and largely cited in the academic world.

Topics like psychoacoustics; voice production and extended vocal techniques; sound morphology; lattice music and sound continuum; real time and non real time composition; relations between sound and image, and its theoretical concepts, occupy a central position in his work.

The deep exploration and usage of human voice is a backbone of the composer's whole work. From the exploration of extended vocal techniques for live improvisation to the computational transformations of vocal sounds into sounds from the nature, Wishart unveiled the limitless creative possibilities offered by this multi-purpose human apparatus.

Wishart is strongly interested in the sounds of the natural world, in opposition of synthesized sounds. Therefore the CDP is strongly oriented towards processes that transform samples of audio recordings – instead of being a platform for audio synthesis, algorithmic composition or live coding.

As a natural consequence of the composer interest in vocal sounds, a large set of the CDP functions is somehow devised for working with voice. Pitch-trackers, formant extractors and imposer, FOF[1] extractor and imposer, spectra combination, vowel imposition, vocoder, independent time-stretcher and pitch-shifter (phase-vocoder) and many others assist the composer's aim: transform the human voice.

[1] Fonction d'Onde Formantique (FOF) or Formant Wave Function Synthesis is a spectral synthesis method developed in 1984 at IRCAM by Xavier Rodet as part of CHANT project.

2. COMPOSER'S PERSPECTIVE: SOUND METAMORPHOSIS AND SOUND CONTINUUM

2.1 Criticism on notation and super-conceptual thinking.

Throughout his literature, Wishart makes strong criticisms on the oppression that notation and philosophical thinking had imposed to music. Firstly, he claims that notation imposes and creates certain musical priorities, and not the way around. Secondly, it imposes that many musical parameters – pitch, rhythm and loudness – a strictly obeyer to lattice logic. As a consequence, numerous possibilities of musical expression have been mowed by this system.

The author states that this notation tradition withdrawn music for its basic purpose: being heard. He attacks late Twentieth Century composers arguing that their music suffers of "obsession with complicatedness" because they lay out so many complex mathematical and relational ideias for the listener without careful testing if the results are truly audible [1]. In his own words:

> For me, on the other hand, a musical experience which appears aleatoric is aleatoric. The experience that the listener has is the music and the composer's methodology, no matter how rational it may be, is a heuristic device realising the source of that experience in sound. (Wishart, 1986, pg. 43)

Wishart also claims that this notation priorities and lattice logic in tradicional music also imposed a secondary role to timbre. One of the consequences is that music instrument design and their relative performance techniques have been imprisoned in the dogma of being sound sources of stable timbre and variable pitch. Thus, the piano is the ultimate outcome of this lattice conception due to its severe submission of timbre to discrete pitches and to its absence of possibilities regarding continuous sounds.

Summarising, this lattice structure attempt to negate the importance of recognition of the source and focus the listener attention upon the discretized parameters [1]. Consequently, this leds late Twentieth Century Western Music to become super-conceptual, abstract and distant from the appreciation of the audience.

2.2 Sound Continuum

On Sonic Art (1986) proclaims the full liberty of usage and exploration of sound parameters, allowing them to express the continuity that is typical of natural sounds in the natural world. It urges composers to free themselves from tradicional lattice based music, which restricts the infinite possibilities of music to series of discrete steps events.

Hence, the composer proposes a characterization of the sonic continuum as well as a methodology for working with it. Wishart does not intend to make a exhaustive description of sound objects – in a way that the Groupe de Recherches Musicales (GRM) did – nor he wants to postulate meticulously a morphology of sounds in the continuum. Despite of that he discusses non-standard metrics for the continuum, points some conceptual approaches to the material and list some of the perceptible and diferentiables archetypes [1].

He also adds that the importance of the sound continuum is related to our experience of the real world. He claims that the lattice concept and traditional notation are only rough approximations of what reality is:

> Music, however, cannot be divorced from the medium of sound and enters into our experience as part of an immediate concrete reality; it impinges on us and in so doing it affects our state. Furthermore, as Susanne Langer remarks in Feeling and Form, in its articulation of the time-continuum of concrete experience, it corresponds directly with the continuum of our experiencing, the continuous flux of our response-state. (Wishart, 1986, pg. 16)

2.3 Sound Metamorphosis

Wishart has debated extensively in his theoretical work about sound metamorphosis and its difficult to point out a piece of him in which this idea it is not presented. As often mentioned, his main goal in doing so is to retain source credibility, keeping the listener aware of what is being transformed and metamorphosed.

> We can proceed seamlessly from one point to another (a continuous transformation) or by discrete steps (a sequence of discrete metamorphoses, more akin to traditional motivic variation, perhaps). I use the term metamorphosis to refer to the sonic manipulation of a sound to produce related sounds, while the term transformation refers to a process of sonic development through time; that is, the use of sonics relationships between events to build musical structures in time. This is also referred to as sonic modulation by analogy with motion between keys in the tonal system. (Wishart, 2000, pg. 22)

Wishart also makes criticisms on the attempts of tradicional lattice based music to represent natural sounds. He claims that figurative music, especially by some canonical orchestral composers like Tchaikovsky, Respighi and Beethoven, never presents truly audible results, even when it attempts to mimicry sounds related to orchestral instruments (e.g. birds). In the author point of view, this is once again an example of overvaluation of notation and theoretical thoughts in spite of audible phenomena [1].

As he has worked both on analog studio and with modern computer techniques, the ideia was pushed to its limits. Facing many problems in the analog studio and reaching its limits, Wishart proposed collaboration with IRCAM and developed a large set of computational procedures to aid or execute sound metamorphoses. As this

topic transversely touches most matters concerning the composer's work, it will be discussed throughout the paper.

2.4 Red Bird: early experiments and results

Red Bird (1978) is an acousmatic piece made entirely on the analog studio. Here Wishart has achieved notorious results, both technically and aesthetically, concerning sound metamorphosis. In this piece, the composer begins his long journey to attempt to make sound metamorphoses using the human voice.

Despite of the well known problematic points of working with recorded sounds on a strictly analog studio, one important aural issue emerged from his technical difficulties: some sounds do not resemble a specific aural image, e.g. a book being slammed into a table can sound like an uncountable situations and objects. Thus, contextual cues often need to be presented in order to induce the audience (e.g. sound of pages being flipped).

Wishart also encountered many problems concerning the metamorphoses of vocal samples into both clearly defined and doubtable aural images, specialy due to the lack of possibility concerning the analog studio. For instance, two sounds that he declares that were problematic were flies and machines. The first one, when mimicked by the human voice only sounded natural when isolated, when in context with other sounds it did not sound natural. The second one, due to formant characteristics and continuity of vocal stream, when tried to be mimicked only sounded like human voice. It was difficult to achieve the mechanical and straightly repetitive behavior of machines.

3. LISTENING: THE MAIN GOAL AND PURPOSE

> The computer, having no ear or human musical judgement, can manipulate order sequences of any length and of any unit-size in an entirely equivalent manner. As composers, however, we must be clear about the relationships of such operations to our time experience. Equivalence in the numerical domain of the computer (of for that matter on the spatial surface of a musical score) is not the same as experiential equivalence. Audible design requires musical judgement and cannot be "justified" on the basis of the computer-logic of a generating process" (Wishart, 1994, pg. 64)

3.1 Aural Criterion

Considering the criticisms mentioned above, Wishart is naturally a composer strongly oriented towards aural and perceivable aspects of music, despite of the metaphoric and philosophical meanings. Thus, his main goal is to achieve processes that sound for the audience exactly as he wanted them to sound like.

He asserts that, technically, almost anything can be a metamorphosis and any technical metamorphosis can be proposed. However, perceptually, the listener perception is the only reliable criterion that can state what is a successfull metamorphosis [4].

A second point is how each metamorphosis is related to each other and how they are organized across a piece. He claims that he is not merely interested in creating soundscapes with dimensions of recognition or lack of it. Otherwise, he is interested in constructing compositions with interplay of recognisable aural images which is quite different from the use of degrees of recognisability in an otherwise formalised musical landscape [1]. This approach motivated some authors to classify Wishart's style as storytelling or narrative [5].

3.2 Source Credibility

Regarding the importance of listener perception for his viewpoint of music, the first issue that arises is importance of the source credibility in order to make a truthful metamorphose.

His point of departure can be any sound, since it establishes a connection with the audience. Usually this is done by sequenced repetition of the material – when it has a short duration – or by utilizing materials that have long continuations (e.g long vowels). This can be shown by the fact that Wishart hardly or never presents the transformed material and then goes step-by-step revealing the original source. His transformation route is mainly the way around: showing the raw material and then transforming it step-by-step.

The importance of the source credibility is also attested by the frequent usage of the human voice: surely the most easily recognisable sound for humans. This topiv will be more deeply analysed below. When the sound source does not resemble a strictly specific aural image, Wishart also gives contextual cues to help the listener, as mentioned in Red Bird example.

3.3 Intrinsic acousmatic problem

As mentioned before, Wishart basically works in two main areas: acousmatic music and live acoustical performance of extended vocal techniques. Concerning the listener importance in his viewpoint, one crucial intrinsic problem of acousmatic music for Wishart's goals is that it is acousmatic: the absence of visual, (realistically) spatial and tactile stimulus fools and confuses the audience recognition of the sound source and its physicality.

On Sonic Art (1986) debates what would be a physical parallel of the sound transformations that he makes, suggesting some mathematical, physical and biological theories that would support the idea. The composer also asserts that sound metamorphoses often exhibit a dreamy and supernatural characteristic due to the exclusive focusing on the sense of hearing.

3.4 What the audience can perceive?

Wishart has debated extensively in his literature what the audience can perceive. While on On Sonic Art (1986) he shows a more philosophical approach, on Audible Design (1994) and Sound Composition (2012) he discussed and exemplifies which CDP transformations is more suitable for attending both compositional goals and fit audience perspective.

He often quotes and discusses achievements of psychoacoustics in his literature, however in his writings his is more concerned with testing and exploring the boundaries of these achievements, always providing sonic examples.

Once again, he claims that he is not interested in presenting ideas, sctrictly philosophical thoughts, notation procedures, etc for the listener. He is interested in presenting sounds, organized materials and structures:

> In composing, I differentiate between the procedures I use to generate compositional materials and the structures I lay out for the listener. It's not important for the listener to know anything about my compositional procedures, but I hope they inform the formal and dramatic structure that I do hope the listener will perceive and appreciate, though not necessarily consciously (Wishart, 2000, pg. 22).

> (...) if the organization of our music is to be based on the audible reality of the listening experience, the music must be organised according to *perceived* relationships of materials or *perceived* processes of derivation of materials.(Wishart, 1986, pg. 66)

4. SELECTION OF MATERIALS

> (...) Achieving a convincing transformation between two sounds is a practical problem of sonic art. The transformations between the sounds of different instruments playing the same note (e.g. oboe-flute) are very convincing as sonic transformations but unfortunately totally uninteresting as metaphors. The transformation voice -> bird-sounds is metaphorically quite interesting but much more difficult to generate.(Wishart, 1986, pg. 166)

4.1 Voice

As investigated above, On Sonic Art (1986) makes strong criticisms on the tradicional instruments and their absence of timbral possibilities. Wishart opposes the keyboard – which represents the ultimate point of this lattice conception – against the human voice, which is can be viewed essentially as a continuous timbral articulator:

> "The human larynx and vocal tract as well as the birds' syrinx, however, are altogether more malleable systems, allowing control through the pitch continuum (as with unfretted string), the continuum adjustment of formant spectrum and transformations in the direction of noise, grain, grit or of harmonic and multiplexed textures. Subtle muscular control of the physical apparatuses which govern the emission of sounds ensures that intentional gestural input may be exceedingly subtle and multi-dimensional. Hence the voice lies at the farthest extreme from the typical musical instrument developed in the West" (Wishart, 1986, pg. 103)

Wishart elects the voice as his prime material because of malleability and instrinsically natural human recognition. Clearly, it is the best choice to fits his viewpoints of sound continuum and sound metamorphoses and also his necessity regarding the listener perception.

All through his work he explored the numerous possibilities offered by the voice: vocal extended techniques; mimicry; sound of the text and relations with its meaning; phonetics and exploration of syllables across the world languages; age, gender, nationality and other intrinsic parameter of individual's voices, to list a few. In each of these compositional goals, he searched for specific transformation processes to best fit the audience perspective.

4.2 Departure and arrival materials

Wishart's metamorphoses do not strictly goes from one strongly specific aural image to another strongly specific one. His aim though is to make the departure from a sound as clearly audible as possible and to make the transition to the arrival sound as convincing as possible.

He firmly states that he is interested in *source-focused transformation* (where the nature of the resulting sound is strongly related to the input sound, (e.g time-stretching of a signal with a stable spectrum, retaining the onset unstretched) in spite of *process-focused transformations* (where the nature of the resulting sound is more strongly determined by the transformation process itself, e.g. using very short time digital delay of a signal, superimposed on the non-delayed signal to produce delay-time related pitched ringing) [2].

He claims that transformations focused in the source retain the same infinite potential that the infinity of natural sound sources offers. On the contrary, process-focused transformations soon easily become overused because they tend to be used inadvertently with any source [2].

This interest is also show in many of Wishart compositions where he allows himself to "run with the result" [4]. For him, the main point is listening to the whole process and perceptually evaluate if the source and goal sound are related, despite of which process was done [2]. Moreover, the composer also claims that the sounds in the middle of the process are extremely important, but the process itself might be transparent to the audience.

5. TECHNICAL AND AESTHETIC GOALS

Wishart declares that each of his pieces proposes both a new poetic/aesthetic goal and a new technical challenge [6].

> I usually have a poetic idea in the background when I make a piece but I also need a technical challenge because I get bored easily. (Wishart, 2013, pg. 513).

Regarding this, his compositional method follow three basics steps in order to develops these goals. His main compositional stages are:

1. Idea itself. Why start on a piece at all?
2. Transform the sounds
3. Determine the structure of the piece. (choosing the piece's form) [7]

Each piece technical and aesthetic goal will be analysed in the next section, relating the to the suitables sources and processes to achieve this goals.

6. PIECES AND PROCESSES

Wishart has made a extensive description of his processes and sources throughout his literature [1, 2, 3]. Thus, here we will point out some key processes and sources on the chosen pieces as well as his technical and aesthetic goals. He carefully selects each computational process regarding a sound source and a compositional goal:

> In particular the sound examples in this book are the result of applying particular musical tools *to particular sound sources*. Both must be selected with care to achieve some desired musical goal. One cannot simply apply a process, "turn the handle", and expect to get a perceptually similar transformation with whatever sound source one puts into the process. Sonic art is not like arranging (Wishart, 1994, pg. 9)

The four pieces analysed in this article were chosen both by their relevance in the author work and because of the idiosyncratic results and approaches that each of them present.

6.1 Problems of transforming voices

The effortless and natural identification of the human voice by human beings is a double edged-sword: the human hearing detects precisely when a voice is transformed. This means that extra caution must be taken when choosing the vocal samples, the transformation and the goal material or aural image.

One classic problem is the preservation of formants in the transformation processes. Wishart has debated it extensively in his literature [1, 2, 3] and proposed some solutions and techniques. As he is constantly using time-stretching methods, and they tend to distort formant structure, this is a constant concern.

Issues concerning vocal attack are also a central topic in his literature and pieces. In his literature, he states that the attack is directly linked with the physicality and causality of the sound, thus it is intrinsic related to the source recognition. Wishart frequently merges vocal attacks with the tail of other sounds in order to achieve a vocal-like sonority; in order to blend materials that might be recapitulated or to reach unique transformations but retaining some source credibility. Alternatively, when he wants to destroy these instrinsic characteristics he often alters the attack of the sound.

The author is well known for his unique voice spectral tools devised using the phase-vocoder. This is a extremely extensive topic and can not be entirely covered in this article. Nevertheless, the analysis and resynthesis stages of the phase vocoder worth consideration. Wishart carefully selects the analysis parameters depending on the source and the spectral process to be applied. The same is true for the resynthesis stage. A negligent selection of these parameters can introduce many problematic artifacts.

Generally, all these problems appears together when working with recorded samples of voices and trying to transform them:

> Compositionally, we tend to demand different things of discontinuous sounds, than of continuous ones. In particular, if we *time-stretch* a continuous sounds, we may be disturbed by the onset distortion but the remainder of the sound may appear spectrally satisfactory. If we time-stretch a discontinuous sound, however, we will be disconcerted everywhere by onset distortion as the sound is a sequence of onsets. Often we want the sound (e.g. in the real environment, a drum roll, a speech-stream) to be delivered more slowly to us without the individual attacks (the drum strike, the timbral structure of consonants) being smeared out and hence transformed. We wish to be selective about what we time-stretch! (Wishart, 1994, pg.55)

Wishart also underlines a decisive point. Once a good transformation is done, and the listener is convinced, the composer can proceed more freely and alter the material more radically:

> (…) but nicest thing is, once you have reached this plausibility you can do implausible things. So once I've convinced you that this is happening for real I can, for example, make that rrrr sound go on forever or I can make it change in tempo, become very regular, i can make it more pitched (…) (Wishart, 2018, 19'00")

6.2 Vox-5

The Vox Cycle is a series of 6 compositions for amplified voices and 4 loudspeakers, except for Vox-5 which is an acousmatic piece based on voice recordings. The whole cycle is based on the possibilities of making sound metamorphosis between vocal sounds and non-human sounds through the use of vocal extended techniques.

Vox-5, commissioned by IRCAM in 1981 and released in 1986, is mainly focused on the computer realization of sound metamorphoses between human voices and commonly recognizable sonic images like crowds, bees, bells

and horses. During this period Wishart devised his first computational functions for transforming vocal samples, which led to the development of the Composer Desktop Project (CDP).

Two main transformations where devised: spectral manipulation and spectral and spectral interpolation, both using the phase vocoder [9]. The spectral manipulation techniques consisted of a method of dividing the spectrum into two parts and shifting one of them called spectral shifting; it also consisted of a spectral stretching technique in which the the amount of shift was not constant for each spectral data, but dependent on the frequency position, thus changing the harmonicity of the spectrum. The spectral interpolation consisted of a function for interpolation spectral data from two diferent sound samples through a given time [10].

The piece tries to achieve consistent sound metamorphosis between vocal samples and sounds of bees, horses, crowds and bells. The bell transformation is a strongly important one because of the inharmonic content of bell sounds, which make them impossible to mimicry using only the natural voice. To achieve this goal, he selected a vocal of the syllable “ko-u”, which is somehow simliar to a bell atack and continuation. Then he spectrally stretched it, in order to achieve the inharmonic spectral content of a bell sound.

Wishart enumerates the factors which guarantees the source credibility:

> It is important to understand that this transformation "works" due to a number of factors apart from the harmonic\inharmonic transition. As the process proceeds, the tail of the sound is gradually *time-stretched* to give it the longer decay time we would expect from an acoustic bell. More importantly, the morphology (changing shape) of the spectrum is already bell-like. The syllable "ko->u" begins with a very short broad band spectrum with lots of high-frequency information ("k") corresponding to the initial clang of a bell. This leads immediately into a steady pitch, but the vowel formant is varied from "o" to "u", a process which gradually fades out the higher partials leaving the lower to continue. Bell sounds have this similar property, the lower partials, and hence the lower heard pitches, persisting longer than the higher components. A different initial morphology would have produced a less bell-like result.
>
> This example (used in the composition of Vox-5) illustrates the importance of the time-varying structure of the spectrum (not simply its loudness trajectory) (Wishart, 1994, pg. 35)

6.3 Tongues of Fire

Tongues of Fire was the first piece realized entirely with the CDP, released in 1994. At this period, the CDP has evolved to full suite of processes for temporal and spectral transformations. In this piece, new transformations techniques like waveset distortion, granular synthesis, brassage, spectral freezing, spectral averaging, and many others were used and develop during [3]. It worth noting that in this piece Wishart beggins a long exploration of time-stretching transformation and possibilities, which will play a central role throughout his whole work.

> The "theme" of *Tongues of Fire* is a rapid solo vocal utterance less than 2 sec in length. This theme was chosen both for expressive reasons (it is recognizably human, but slightly grotesque, slightly comical, and without any linguistic content in any existing human language) and for sonic structural reasons (it is a sequence of several spectrally complex and different sounds, thus making excellent raw material for many kinds of sonic metamorphoses). (Wishart, 2000, pg. 22)

The main aesthetic goal here is to transform a utterance in many complex sounds, which must be audible related to original material, but do not necessarily need to achieve a specific aural image. This is achieved through a form of theme and variations, similar to instrumental music tradition.

The main technical goal is develop the four nodes of variantions: rhythmic variations, *voismetal*, *gablcrowd* and *pichstak* and a climax sound of *fireworks*. All the names are composer’s references and cues to similar sounds. *Voismetal* has a percussive attack, it is gradually time-stretched and waveset distorted in order to generate a metallic sound; *gablcrowd* is a texture of gabbling voices, extending the solo voice theme material into a disgruntled-crowd-like event by superimposing several different variants through time; *fireworks* is a texture of stretched vocal glissandos and portamentos that sounds like fireworks.

The *pitchstak* metamorphosis is a series of synchronized percussive vocal attack with different octave transposition, which bring the feeling of a D chord. Here Wishart maintains the vocal attack of the sound and connects to its tails many different transformations in order to retain the source credibility of the processes, a key technique commonly used in his work. This pitch quality of the *pitchstak* sound is often used in Tongues of Fire to make ruptures and articulations between the other materials [4].

It worth noting that Wishart only achieved so many complex metamorphoses in this piece due to selection of a utterance “theme” that is resembles high uniqueness and complexity. He would not have been able to do so if he had chosen a vocal sample of a single syllable, a sung tune or typical spoken phrase.

6.4 Globalalia

Globalalia came out of collaboration with the composer’s friends, whom recorded radios from all over the world. The source material assembles 134 voices in 26 different languages. The aesthetic goal of Globalalia is to understand and reveal what we have in common as human speech communicators. Although the number of words in all human languages together can reach the order of millions, all of theses languages together are built from a much smaller set of sounds, the syllables [3, 11].

Basics technical challenges naturally emerges from this compositional goal: how to organize and catalog the material, divide the syllables, select and transform or group sets with large numbers of small subsamples, etc. Moreover, the composer claims that the main technical innovation was a set of programs to time-stretch vocal iteratives, like rolled "rr" sounds or vocal grit [11].

The problem is that those sounds cannot be time-stretched in a tradicional fashion because they will lose the quality of rapid and random attacks, hence losing the source credibility. The solution for this problem was:

> The new process first searches for the attacks in the sound (which repeat approximately every 50 milliseconds) with an appropriately sized envelope-tracking window (about three times smaller than the typical flap duration). This gives us an indication of where the tongue flaps are. The process then searches away from the peaks of the flaps to find the minimum energy troughs between the events and finally cuts the flaps apart at (identically oriented) zero crossings. (The zero cuts avoid introducing splices into the sounds, which might subtly alter the sonority at this time scale). We then reconstruct our source, using random permutations of this edited set of flaps [11].

6.5 Encounters in the Republic of Heaven

In his late work, Encounters in the Republic of Heaven (2011), the artist scrutinizes the musical aspects of speech and orality: melody and melodic contours, implicit harmonic fields, rhythm, tempo, bar and also the timbre of individuals. He also intended to represent the musical diversity of human speech across a entire community, thus he recorded diverse inhabitants in the region of Durham, north-east of England.

The aesthetic goal of this piece is to try extract the essence of someone's voice in some way. However, the composer came to the conclusion that this is impossible, due to huge complexity of human source recognition and differentiation [6].

The main technical challenge in this piece is the attempt to make a piece with the musical features of larger structures of speech, from spoken phrases, which will therefore have a pitch contour, a speed and a [6]. One piece acts deals with recordings of teenagers, so Wishart had a doubled and paradoxal challenge: hide or protect the individual characteristics of each teenager – due to ethical and law issues – and also reveal speech characteristics that resembles groups of teenagers, gossiping and some intrinsic personal qualities that differentiate them.

The solution came out by merging different approaches to different excerpt of the recorded conversation:

> I used an envelope follower with a large window set to recognize individual vocal syllables, then retained the centre of each syllable, discarding the onset and tail. The syllable cores were then rejoined in a rapid fixed-tempo stream. This reconstruction maintained the pitch contour, the vowel stream and the expressiveness of the speech line (e.g., laughter is perceptible) while completely disguising the semantic content. This material is then juxtaposed with clear text utterances (e.g., "ginger hair!!") with different processes applied. (Wishart, 2013)

7. CONCLUSIONS

Firstly, Wishart's strong criticism on traditional lattice based music demonstrates that this approach is incompatible with his main aesthetic and compositional foundations: sound continuum and free sound objects; hearing priorities despite of intellectual ones, sound transformations and metamorphosis. Wishart is strictly committed to his viewpoint that the audience hearing is what dictates the effectiveness of the composer's ideias and goals. Thus, the sound metamorphosis in the sound continuum comes to light as a system to retain the listener constantly making correlations between the materials and its respective transformations.

Secondly, as the listener perspective and sense of hearing is one of his main concerns, specific tools must be applied to specific sources in order to achieve perceptually successfull transformations. As he is also aspiring to achieve sound metamorphoses in the sound continuum, the voice emerges as the most suitable source for his goals. It is one of the most malleable natural sound sources and allows continuous timbral articulation and it also has highly intrinsic human recognition characteristics.

The composer's working method establishes at least two goals: one aesthetic and one technical. As shown throughout this paper these two goals constraints even more which material can be used and which transformation can be applied to them. As a result, many pieces of Wishart reveal what can or cannot be audibly done to some materials given the mentioned rules.

By the analysis of some of Wishart pieces, this system of trade-offs shows also that his acousmatic music tends to be strongly audibly organized, in a sense that the materials do not articulate freely or in a improvised fashion, but constantly correlating with each other and its transformations.

Acknowledgments

This study was possible thanks to the support and funding of SEMPRE society. I would like to expressly thank Caroline Ferreira Rosa for all her commentaries, suggestions, and reviews. Finally, I would like to thank the anonymous SysMus18 reviewers for their valuable commentaries and suggestions.

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