The Use of Registral Spacing and Rhythmic Density as Musical Trajectories in a Portfolio of Original Compositions

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Abstract

The Use of Registral Spacing and Rhythmic Density as Musical Trajectories in a Portfolio of Original Compositions is a doctoral research in composition that focuses on the construction of a musical trajectory of a composition by using the transmutation of its registral spacing and rhythmic density. The thesis consists of two parts: a portfolio of original compositions and an academic commentary. The portfolio comprises compositions for a vocalist with various mediums, small ensemble (up to six performers), solo instrument with electronics, small ensemble with electronics, and gestural devices with electronics. The academic commentary covers the initial ideas regarding expression and abstraction in arts and music which laid the foundation for the study of this research on the organisation of musical spaces in a composition to achieve an alternative musical trajectory that does not rely on the use of thematic/motivic development. It discusses the notion of non-linearity in some compositions from the portfolio which use the fragmentation of their texts and a sectional form based on the changes of the musical characteristics between sections as the musical trajectory; these approaches were my first experiment that dissociated from the convention of thematic/motivic development. The main part of the commentary focuses on how the changes of rhythmic density and registral spacing are used to create a musical trajectory; this section also includes how these musical aspects can be used to construct phrases and the structure of a composition. It later covers how working with electronics introduced me to the use of frequential and registral areas as part of a composition's musical trajectory and how the experiences with electronics and instrumental composition influenced one another and, more importantly, my compositional process. It also discusses issues regarding notation and the search for the most suitable notation for each composition in the portfolio.

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Introduction

The Use of Registral Spacing and Rhythmic Density as Musical Trajectories in a Portfolio of Original Compositions is a doctoral research in composition that focuses on using the organisation of musical spaces, both vertically and horizontally, as a musical trajectory of a composition. This research topic is based on the aim of experimenting with different compositional approaches when the notion of thematic or motivic development is absent. This introductory chapter will clarify how the research topic was originally formed from the initial ideas regarding expression and abstraction in music, how the research project later concentrated on the organisation of the musical materials in my compositions, and alternative musical materials and musical trajectories explored by other composers.

The notions regarding expression and abstraction

One of the two notions from which this entire research project and the development of my compositional style stem is that expression is one of the most significant elements of an artwork; the notion also raises questions concerning its relevance to musical composition, contemporary art music, and what music really expresses. Expressions or artists' urges to express their emotions have been considered to be crucial to the creative process or the artwork itself. Leo Tolstoy states that 'the artist should be impelled by an inner need to express his feeling.'[1] According to R. G. Collingwood, it is also apparent that artist's expressions have a vital role during the creative process which leads to his conclusion that the 'artist's business' is to 'express emotions'.[2] The importance of expression has also been applied to music. Wassily Kandinsky praises music for being 'the art which has devoted itself [...] to the expression of the artist's soul'.[3] These concepts have had a significant influence on me even prior to my doctoral study. I always

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[1] Leo Tolstoy, *What is Art?*, trans. by Aylmer Maude (New York: Funk & Wangles, 1994), p. 154.

[2] R. G. Collingwood, *The Principles of Art* (Oxford: Clarendon Press, 1983), p. 130.

[3] Wassily Kandinsky, *The Art of Spiritual Harmony* (London: Constable & Co., 1914), p. 41.

believe that I am expressing something through my compositions. However, I started to question about what exactly that is being expressed through an artwork; how Kandinsky's abstract paintings which contain no narrative or title can express his emotions, how the structure of a painting and its colours can be expressive, and how much an artwork can express by itself without the assistance of its description or title. These questions also raised doubts about whether my belief in expression was still applicable to music; what a piece of absolute music really expresses as it is non-representational and has no connection with any stories, what musical elements alone can convey independently from their extra-musical elements that are attached to the composition. I have been intrigued to further explore the fundamentals of artistic expression and the role it plays in contemporary art music, especially in my own compositional process.

The other notion that is also the foundation of this research and enhances my artistic development is the notion of abstraction in art and music. I have been drawn to abstract visual art because of its defiance of a millennial-long convention of representational painting, its independence from any forms or objects in reality, and the freedom it provides the audience to perceive and interpret. Wassily Kandinsky claims that 'art can communicate more clearly through its abstraction.'[4] Theodore Adorno compares contemporary music to abstract art in one of his essays and states that 'all colours and materials have their own meanings'.[5] I have studied the relationship between visual art and music regarding the notion of Realism before.[6] This led me to have an interest in investigating the connection between abstraction in visual art and music for the benefits of my compositional development. Having had the questions concerning

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[4] Kandinsky, *The Art of Spiritual Harmony*, p. 62.

[5] Theodore W. Adorno, *Essays on Music*, ed. by Richard Luppet, trans. by Susan H. Guillespie (Berkeley: University of California Press, 2002), p. 189.

[6] An essay 'Realism in Music' was submitted as part of my master's study at the Royal College of Music between 2014-2015. The essay covers the original concepts of 'realistic art', the movement of Realism in the nineteenth century, the movement of Photorealism in the twentieth century, and how composers since the Baroque period have adapted the notion of Realism in their music.

expression, I started to wonder how emotions, or anything at all, can be presented via an abstract medium such as music and as music has always been considered abstract, how abstract visual art can have any influences on music at all. Moreover, I also started to question that if the original abstract movement defies the tradition of figurative painting and avoids any reference to any forms or objects in reality, what the equivalent aspects are in the field of contemporary composition. I also believe in the freedom of perception and interpretation that abstract elements strengthen in both visual art and music. Witold Lutosławski also had a positive view on abstraction in music and argued that 'its [absolute music's] abstraction establishes a framework for subjective experience that does not falsely assume that all listeners will interpret sonic phenomena in the same way.'[7] Being able to find the compositional techniques that can facilitate such liberation may potentially uncover numerous possibilities for musical composition which will be undoubtedly beneficial to my own artistic development.

Since I decided to execute my research on these areas of interest from a composer's perspective alongside the development of my compositions, I aimed to record how this study would affect my compositional process throughout the course of this research in the form of a portfolio of original compositions accompanied by an academic commentary. Although the direction of the research was rather clear, there was no apparent destination that could mark the end of this research project. I merely aimed to use my own compositions and their compositional processes to experiment with any ideas that would emerge while doing the research. I also aimed to use any opportunities during the doctoral course to compose for different types of ensemble and experiment with everything I discover in various ways. At the beginning of my first year, I began studying pieces of literature surrounding the notion of expression in music

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[7] Lisa Jakelski, 'Witold Lutosławski and the Ethics of Abstraction', *Twentieth-Century Music,* 10 (September 2013), no. 2, 169-202 (p. 184).

which further introduced me to the concept of abstraction in music and what other composers have already

explored.

The focus on musical ideas and their organisation

An extensive study on the notion of expression in music sent this research into the labyrinth of

subjectivity until I arrived at the conclusion that music does not only express emotions or feelings; 'musical

ideas' are also expressed through music regardless of its genre or style. This gave me a clear direction to

focus on objective aspects that can be discussed and explored further in my compositions. The discord

regarding the expressions of music and the development of composition have coexisted for centuries. 'Can

music express emotions?', 'what does expressive music mean?', 'what is being expressed in music?', these

questions have troubled me during the first year of this doctoral research. The more I studied, the more I

found that discussions on expression were perpetual and the answers to these questions could be very

subjective to each individual. Although focussing on the philosophy of aesthetics was thought-provoking

and very inspiring, it could not help my research and compositional style to progress in any measurable

direction. According to *Vom Musikalisch-Schönen* [On the Musically Beautiful], Eduard Hanslick affirms that

music can arouse and express human feelings, but this is not the main purpose of music; composers should

concern themselves with the musical ideas and how to devise them rather than what emotions they intend

to express.[8] This view is also supported by Kendall Walton's definition of the term 'expressive' that being

'expressive' does not involve only the expression of human emotions or feelings; it can be 'whatever it is

that is expressed'.[9] Walton agrees with the idea that music is expressive, but he also identifies that, without

any assistance of literary materials such as titles or programme notes, music's expressiveness is limiting

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[8] Eduard Hanslick, *On the Musically Beautiful*, trans. by Geoffrey Payzant (Indianapolis: Hackett Publishing Company, 1986), pp. 31-32.

[9] Kendall L. Walton, 'Listening with Imagination: Is Music Representational?', *The Journal of Aesthetics and Art Criticism*, 52 (1994), no. 1, 47-61 (p. 47).

because of its generality of semantic content. For example, music cannot distinguish emotions of a similar sort from one another such as 'fear' from 'anger' or 'love' from 'longing' and it is unable to portray very specific emotions such as embarrassment or jealousy.[10] Krzysztof Penderecki stated during an interview that he did not believe that music can express anything and although some information is given in the title, music is only about its structure and form.[11] I thought that it would be more beneficial to myself and the research if I could stop the urge to find out whether music can express emotions, what it is exactly that music expresses, or how a piece of music expresses anything at all. Its subjectivity could be very difficult to develop as a research topic in composition. It is also apparent that every composition commonly expresses musical materials that can be perceived, explained, and discussed on an academic ground. Although the research was going to explore the notion of abstraction, focussing more on an objective aspect of composition, such as musical materials and musical trajectories, could surely guide me towards a clearer direction in achieving a more tangible outcome.

Definitions of abstraction and abstraction in music

Abstraction in the musical realm cannot only be defined similarly to the visual art counterpart because of the natural abstract nature of sounds. Kendall Walton simply defines 'abstract' as non-representational, non-objective, and non-figurative.[12] Michel Seuphor also describes that 'a painting is abstract when the absence of any other form of sensible reality compels us [...] to judge it according to values that have nothing to do with representation or with the imitation or reproduction of some other thing' and 'has nothing to convey to us except the pure elements of composition and colour.'[13] It is

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[10] Kendall L. Walton, 'What is Abstract about the Art of Music?', *The Journal of Aesthetics and Art Criticism*, 46 (1988), no. 3, 351–64 (pp. 354-56).

[11] Danuta Mirka, *The Sonoristic Structuralism of Krzysztof Penderecki* (Katowice: Music Academy in Katowice, 1997), p. 332.

[12] Walton, 'What is Abstract about the Art of Music?', p. 351.

[13] Michel Seuphor, *A Dictionary of Abstract Painting: preceded by a History of Abstract Painting* (London: Methuen, 1958), p. 3.

noticeable that the term 'abstract' that is applied to a piece of visual art cannot be directly used on music as it refers to some unique elements of visual art. I would like to summarise the first definition of 'abstract' by using Hanslick's view that abstraction in music occurs when the music expresses only its musical content because of the absence of its semantic properties.[14] However, music has always been considered abstract and there has been a movement of absolute music. Malcolm Budd asserts that music is the art of sounds that should not be interpreted like symbol or language which involve semantic elements.[15] As such, music's abstract quality was studied by Mark Evan Bonds who asserts that 'music is by its nature an abstract medium.'[16] Julian Johnson also identifies music's unique abstract quality that a work of instrumental music does not have to be about anything like other forms of art.[17] Therefore, to execute a research based only on this particular definition might also lead to another never-ending whirlpool of subjectivity as it can be claimed that there is no other way to make music 'more abstract' than it already is or to benefit from studying on its abstraction at all.

I later found that the term 'abstract' in music should be interpreted from another perspective which implies the act of distancing from conventions and a lot of composers have already tried to explore in such direction. Kirk Varnedoe explains that the term 'abstract' derives from a Latin term 'abstractus' which means 'to pull or draw away from'.[18] Julian Johnson also gives another angle of 'abstract', which he uses to describe Anton Webern's music, that 'it is referred to the absence of conventional (nineteenth-century) emotional *topoi* [...] – an observation that notes the absence of tonal melody and harmony and the linear, trajectory contour of nineteenth-century emotional denotation.'[19] Lutosławski also states that

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[14] Walton, 'What is Abstract about the Art of Music?', p. 353.

[15] Robin Maconie, *Other Planets: The Music of Karlheinz Stockhausen* (Oxford: Scarecrow Press, 2005), p. 59.

[16] Julian Johnson, *Webern and the Transformation of Nature* (Cambridge: Cambridge University Press, 1999), p. 214.

[17] Mark Evan Bonds, *Absolute Music: The History of an Idea* (Oxford: Oxford University Press, 2014), p. 2.

[18] Kirk Varnedoe, *Pictures of Nothing: Abstract Art since Pollock* (Princeton: Princeton University Press, 2006), p. 47.

[19] Johnson, *Webern and the Transformation of Nature*, p. 215.

being abstract or absolute for music is beyond a composition without a programme.[20] The different

perspective of the same term is very intriguing and opens up even more possibilities for the research project;

what is the music going to be if it is drawn away from its conventional musical syntax such as its 'beat-

oriented' or 'motif-oriented' nature?,[21] how can composers use a 'sound-based' approach rather than a

'note-based' approach which has been the convention of musical composition?.[22] I decided to start looking

at what other composers have done in order to make music more abstract than its natural state and to

distance their music from millennial-long conventions of western art music.

Approaches explored by other composers

One of the strongest traditions of western classical music is the use of thematic or motivic materials

as the main figure in a composition; many composers have tried to challenge or distance their compositional

styles from such tradition with different compositional techniques. The attempts became evident since the

invention of Serialism which challenged the convention of tonal harmony and melody; many other

compositional styles were drastically developed after the Second World War. Edgard Varèse stated in one

of his lectures that 'there will no longer be the old conception of melody or interplay of melodies. The

entire work will be a melodic totality. The entire work will flow as a river flows.'[23] In the lecture 'MUSICAL

FORMING' given in London in 1971 Karlheinz Stockhausen covered the attempt to experiment with 'non-

figurative composition' which avoids any repetition of a theme or a motif.[24] Luigi Nono also had similar

ideas regarding melodic elements in a composition by replacing such elements with linear gestures based

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[20] Jakelski, 'Witold Lutosławski and the Ethics of Abstraction', p. 184.

[21] Arne Eigenfeldt, 'Exploring Moment-form in Generative Music' <https://www.researchgate.net/ publication/306207035_ EXPLORING_MOMENT-FORM_IN_GENERATIVE_MUSIC> [accessed on 30 May 2018].

[22] Joanna Demers, *Listening through the Noise: The Aesthetics of Experimental Electronic Music* (New York: Oxford University Press, 2010), pp. 13, 50.

[23] Edgard Varèse and Chou Wen-chung, 'The Liberation of Sound', *Perspective of New Music,* 5 (Autumn-Winter 1966), no. 1, 11-19 (p. 11).

[24] Karlheinz Stockhausen, *Stockhausen on Music,* ed. by Robin Maconie (London: Marion Boyars, 2000), p. 41.

on the concept of 'abstract constellations of acoustically defined sounds'.[25] Iannis Xenakis also considered

abstraction to be the strongest impulse of art. He once argued that 'the play of forms and colours detached

from their concrete context imply conceptual relationships of a higher level.'[26] In 'Metastaseis', Xenakis

focussed on the use of 'non-figurative' elements and showed an 'audible process in music' such as the

speed and direction of a musical gesture and the change of timbres and texture as the main musical ideas

of the composition.[27] Similar to Xenakis' experiment, Pierre Boulez has explored an alternative trajectory

in 'Éclat'. He explained that the composition has 'no direction' or 'perceptible development' and the

feature of the piece is its timbre.[28] Lutosławski also experimented with the absence of strong thematic

material in his Symphony No. 2 and focussed on the development of rhythm as a musical trajectory through

the rhythmic management of dense harmonic and polyphonic texture.[29] Denis Smalley's

'spectromorphology' is also a very unique approach to acousmatic composition and the organisation of

musical structures that focuses on the shape of sound spectrum in time.[30] I believe that although many

composers have tried to distance their works from the convention of western classical music by devising

their own musical materials or exploring various musical trajectories, there are possibilities that I can find a

compositional approach that suits my personal interests and can help me explore this territory further.

The focus on musical trajectories

What I learned from different approaches of other composers was that the attempt to distance

themselves from the convention rely on not only the invention of new musical materials but also how

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[25] Helmut Lachenmann, 'Touched by Nono', *Contemporary Music Review*, 18 (1999), part 1, 17-30 (p. 19).

[26] Nouritza Matossian, *Xenakis* (Lefkosia: Noufflon, 2005), p. 134.

[27] Matossian, p. 76.

[28] Báliant András Varga, *Three Questions for Sixty-Five Composers* (Rochester: University of Rochester Press, 2015), p. 21.

[29] Charles Bodman Rae, *The Music of Lutosławski* (London: Faber, 1994), p. 108.

[30] Denis Smalley, 'Spectro-morphology and Structuring Processes', in *The Language of Electroacoustic Music*, ed. by Simon Emmerson (London: Macmillan, 1986), pp. 61-93 (p. 61).

their music progresses, or the musical trajectories. In my opinion, a musical trajectory is how the music progresses from one section to another or from the beginning to the end. It is the musical process that occurs in each section which listeners can follow throughout the composition. Paul Griffiths states that composers compose around the materials that they have; with new musical materials, therefore, compositions should be constructed differently as well.[31] This also applies to this research project whose aim is to experiment with various ways a composition can progress.

The original belief concerning expression in music led me to focus mainly on musical materials of a composition that shares some commonalities with the notion of abstraction. Further research on the attempts of other composers to abstract their music from both its extra-musical elements and the convention of thematic or motivic development has directed this research towards the aim to create a portfolio of original compositions that is distant from such traditions as well. As I tried to distance my compositional approach from using a theme or motif and their development as a trajectory in a composition, I started this research project by exploring other aspects of music that can be used as the medium on which the music progresses. The first chapter of this commentary will cover the concept of non-linearity that was the first attempt to draw away from the convention of linear motivic development and linear trajectory through the fragmentation of texts in vocal compositions and the use of a sectional form which were the foundation of other approaches explored in later stages. The second chapter will discuss the use of the organisation of spaces as a musical trajectory which includes the focuses on the organisation of vertical or registral space, the organisation of horizontal space or rhythmic density, and how to construct a phrase and develop the structure of a composition with this approach. The third chapter concerns the organisation of materials in different registral areas as a musical trajectory and how composing for electronics developed the use of registral spacing further. Lastly, the fourth chapter will discuss different

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[31] Paul Griffiths, *A Guide to Electronic Music* (London: Thames and Hudson, 1979), pp. 26-29.

notations used in my compositions such as notation for electronics, fixed, and proportional notations which

played an important role in communicating with performers and directly contributed to the achievement

of this research.

Chapter 1: Non-linear Approaches

This chapter focuses on the non-linear approaches behind a selection from my portfolio of original compositions including 'Never-ending Torture', 'Tea-Time', '…with steps we take…', 'Quartet', and 'Natural Currents'. The non-linear concept played an important role in the early stage of this research project as it was the first experiment in distancing from the conventional compositional approach by using the fragmentation of texts in vocal pieces, a sectional form, and the contrast between musical characteristics in order to create a musical trajectory that is not based on any thematic or motivic relationship. This chapter also aims to show the influence of fragmented lyrics on the structures of the compositions. Discussing the concept of non-linearity in these compositions will provide the basis for understanding the use of musical spaces as musical trajectories in other compositions in the portfolio.

The notion of non-linearity in music has been studied by many composers and theorists; exploring the idea in my compositions was a good starting point to obtain alternative outcomes that are distant from what can be achieved by using a conventional approach. According to Jerrold Levinson, music is a 'temporal art' as it requires a span of time to present and perceive a piece of music, whose elements are also 'arranged and perceived in a linear order'.[32] Jonathan Kramer states that the trajectory of a composition is generally in a one-directional linearity, which he defines as 'the determination of some characteristic(s) of music in accordance with implications that arise from earlier events of the piece'.[33] In other words, musical ideas design how a piece will progress and later materials bear connections with the original materials presented earlier in a composition. He also proposed the concept of 'non-sequential musical events' which liberates the trajectory of a composition from the linearity of cause and effect. Luigi Nono has also experimented with the principle of 'delinearisation' which focuses on discontinuing a musical narrative by

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[32] Jerrold Levinson, *Musical Concerns* (Oxford: Oxford University Press, 2015), pp. 158-66.

[33] Jonathan D. Kramer, *The Time of Music* (New York: Schirmer Books, 1988), p. 20

using the spatialisation of an orchestra or the fragmentation of musical materials.[34] It is definite that the time in a composition will still proceed in a one-directional temporality from the beginning to the end and it is supposed to be listened to accordingly. It is also irrefutable that listeners will still listen to different sections of a composition successively with the underlying concept of cause and effect. However, I believe that experimenting with the non-linearity of the presentation of musical materials will result in a different outcome which will benefit the development of my compositional approach.

The fragmentation of texts

The fragmentation of the texts in my vocal compositions was the first attempt to explore the concept of non-linearity which defies the nature of vocal writing that normally narrates a whole story with a vocal part; instead, I aimed to present expressions of a composition by compartmentalising the lyrics and reducing the amount of information it provides. The first opportunity I received at the very beginning of the doctoral study was to compose a short composition for harp and soprano, 'Never-ending Torture', as part of an event to share stories of the people related to patients in a coma. It was clear to me that some texts were needed in the composition, but I wanted to compose differently from the normality of vocal writing, especially of a composition for voice and harp. I intentionally made the text ambiguous in terms of storytelling and fragmented the text into separate sections. The lyrics in each section were not used to narrate a clear story or an event but to express particular emotions through the instrument and the voice. Apart from this first piece for soprano and harp, I also had opportunities to compose 'Tea-Time', a piece for soprano and electronics, and '...with steps we take...', a composition for soprano with small ensemble and electronics, on my second and third years consecutively. Although these compositions were not from around the same period of my study, the fragmentation of text was similarly explored with their unique

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[34] Mario Vieira de Carvalho, 'Towards Dialectic Listening: Quotation and Montage in the Work of Luigi Nono', *Contemporary Music Review*, 18 (1999), part 2, 37-85 (p. 51).

mediums. Later in this chapter, I will be covering some analyses of these pieces regarding aspects of lyrics fragmentation, the structure of the texts, their influences on the structure of the pieces, and how this concept of fragmentation affected the structural approach of my other compositions. However, more detailed analyses of 'Tea-Time' and '…with steps we take…' in regard to electronic sound processing will be covered in Chapter 3.

'Never-ending Torture'[35] explores the use of the fragmentation of lyrics in an attempt to experiment with a non-linear trajectory in a vocal composition; the fragmented text has a significant influence on the piece's structure and the sonorities of different sections which develop into a sectional form in other compositions in this portfolio. 'Never-ending Torture' is a composition for soprano and harp that was first composed at the very beginning of my doctoral study as part of a concert of Cardiff-York Universities Coma and Disorders of Consciousness Research Centre which aimed to portray the stories of people involved with patients in a vegetative state. The piece was inspired by the notes expressing the emotions of the family members of the patients. Instead of narrating the entirety of their story, I used texts comprising short expressive words or phrases that were unspecific to any particular situation and did not describe any scene. The lyrics are fragmented and are of a little amount for a six-minute composition.[36] It also incorporates vocal techniques that clearly do not contribute to the storyline including vocalisation, in the first system of the first page and the fourth system of the fifth page,[37] whispering, the last system of page 2 until the rehearsal mark A, and humming, the entire section at the rehearsal mark A.[38] Texts in different sections focus on different expressions, for example, some expressive phrases including 'No!' or 'Help him!' are featured in the first section as cries for help, the whispered text is as if the singer is talking

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[35] Poumpak Charuprakorn, 'The Use of Registral Spacing and Rhythmic Density as Musical Trajectories in a Portfolio of Original Compositions', Volume 1 of 2: Portfolio of Original Compositions, pp. 1-10.

[36] Charuprakorn, p. 3.

[37] Charuprakorn, pp. 5, 9 respectively.

[38] Charuprakorn, pp. 6-7.

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to a patient, the section at the rehearsal mark B expresses extreme frustration while the last page has a lullaby-like character. Fragmenting and abstracting the text is the main focus that has been experimented in this composition. It shows many possible means of expression and possibilities of an alternative trajectory without using a full, linear narration in the vocal part.

The fragmentation of text was also experimented in 'Tea-Time',[39] a composition for soprano and electronics; the piece relies on a tape track generated from pre-recorded materials and live performance which collectively give the general mood of the composition and partly express the subtext, rather than the whole picture. The composition was composed more than a year later than the first vocal piece. However, it shares the idea of the fragmentation of lyrics and trajectory with quotations from Lewis Carroll's *Alice's Adventure in Wonderland*, pre-recorded sound effects, and phrases sung by the singer that appear to be out of the context. Although the piece has its underlying subtext about how people inefficiently spend time in their everyday life, such concept is not explicitly revealed. It only uses quotations regarding madness and the claim that we are all mad, for instance, 'Are you murdering time?' quotation,[40] pre-recorded sounds made by the singer that imitate ticking sounds,[41] the sounds of a mobile phone,[42] and only short phrases that lack any specification such as 'More?', 'Can I?', or 'Are you?'. The intention was to not openly convey the concept of the piece and subtly express it with a lot of freedom for interpretation. The quotations at the beginning, middle, and end of the piece may have set up a frame of its structure, but the internal structure of the text at sections B and C is intentionally unbalanced as it is not aimed to clearly narrate any story. Instead of having sections with similar length and amount of texts, section B

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[39] Charuprakorn, pp. 11-15.

[40] Charuprakorn, p. 14 and Recordings (CD1), 03: Tea-Time at 2'10".

[41] Charuprakorn, p. 14 (from the third system until the rehearsal mark D) and Recordings (CD1), 03: Tea-Time between 1'52" and 2'45".

[42] Charuprakorn, pp. 13-14 (from the rehearsal mark B until the end of the first system of the next page) and Recordings (CD1), 03: Tea-Time between 0'57" and 1'28".

contains most of the lyrics and also features the interaction between the singer and the electronics while only vocal effects are sung in section C. Another clear observation of this composition is that because of its lack of clear narration or melodic materials, the structure of the piece cannot be developed out of a melodic relationship or the presentation of a trajectory; it has to be designed by considering other parameters such as texture or general sonority instead.

Although the vocal part of '...with steps we take...'[43] is less fragmented or abstracted than the other two compositions that have been discussed earlier, it does not treat soprano as the narrator throughout the piece either. The roles of the singer and ensemble are balanced. The interrupted narration unveils only glimpses of the entire concept. The role of the soprano appears to be independent of the rest of the ensemble as it has its own solo sections on top of processed sounds at sections B and D. The lyrics in theses sections are much more complete as opposed to the ones in 'Never-ending Torture' and 'Tea-Time'. Nonetheless, the text only presents some parts of the entire story, for example, in section B the meaning of the word 'it' is not clearly specified.[44] The soundscape in the background might imply its relevance to nature, but it also leaves ample room for the interpretation of the word; it can imply that something is menacing without any conclusion when the text in section D becomes something about the effects of our actions instead. Later in section F,[45] instead of using more texts to provide more information, the voice becomes part of the ensemble with humming. As the texts in section B do not provide much information about the content, the interaction between soprano and electronics and the position of each word that is placed between the processed sounds act as the actual narrative which is about causes and effects on nature. This concept of cause and effect is also used in section D with live sounds from clarinet

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[43] Charuprakorn, pp. 17-28.

[44] Charuprakorn, p. 20.

[45] Recordings (CD1), 04: ...with steps we take... (live performance) from 4'40" or 05: ...with steps we take... (studio recording) from 4'48".

and muted piano.[46] It can be briefly concluded that because of the fragmentation of the narration in this piece and the unclear definition of the texts, the interaction between soprano and the rest of the ensemble, including electronics, becomes the trajectory of the composition.

The fragmentation of texts and its influence on the structure of a composition

From the discussions above, it is evident that the fragmentation of the texts in my vocal compositions and the 'de-linearisation' of narrations clearly have significant effects on the structures of the pieces. The lack of direction from the texts or melodic relationship impelled me to use other parameters of the music such as texture, range, or sonority to design sections in a composition. Traditionally, sections and the whole structure of a composition are based on thematic-motivic or tonal relationships between sections. As it appears that such qualities are missing in 'Never-ending Torture', during the compositional process I needed to find another approach to replace a thematic connection or a clear trajectory from the lyrics in order for the piece to progress and distinguish each section from one another. The approach that I first explored in the composition for soprano and harp was to differentiate the texture and sonority of each section according to the expressions in focus. The first plan was to have four distinct sections with different intensities, texts, singing styles, and textures. The beginning of the piece until the rehearsal mark A has a dense texture with an expressive singing style. This section also contains dramatic striking sounds and musical gestures with various ranges and lengths in the harp. The music at the rehearsal mark A features humming accompanied by harp's tremolos with the additional pointillistic texture at the end of the section.[47] A dramatic climax arrives at the rehearsal mark B which partly resembles the very first section of the piece. The composition is concluded with the final section with a calm and sparse texture. Deciding a scale or mode for each section by taking different combinations of harp's pedals into consideration was

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[46] A loud attack from clarinet or piano will trigger a birdsong generated by a patch. This will be discussed more in Chapter 4.

[47] Charuprakorn, pp. 5-6 and Recordings (CD1), 01: Never-ending Torture (live performance) from the beginning until 1'20" or 02: Never-ending Torture (studio recording) from the beginning until 1'10".

another aspect of this process that could help distinguish the sonority of each section. It is noticeable that the pedals are not changed frequently throughout the piece; a set of pedals lasts for almost an entire section. The differences and changes of texture, range, or sonority between sections become the main musical trajectory of the entire composition.

The structure of 'Tea-Time' is designed with an aim to distinguish the quality of each section as well. The composition comprises four main sections with different lengths and features. The outer sections, sections A and D, feature solo electronics consisting of pre-recorded sentences and processed sounds while sections B and C focus on the dialogues between the performer and electronics. In the first section, the playback of the sentences and another moving layer of electronic sounds are juxtaposed with a low drone. Sections B and C are the main sections of the piece which explore different textures and sonorities. Although both sections similarly feature the aforementioned dialogues, section B focuses more on back-and-forth interactions of small musical ideas between the two. On the other hand, section C highlights the juxtaposition of two layers of sounds with less precision in terms of timing. These attempts to find an alternative musical trajectory of a composition, influenced by the lack of direction from the text or melodic relationship, led me to focus on the differences in terms of sonority and the shifts of expression and texture of each section.

The use of a sectional form and the contrast between musical characteristics as a trajectory

Using the differences in sonority as the musical trajectory of a composition has been explored by many composers and scholars associated with Polish Sonorism. According to Anton Prosnak, the structure of a composition can be formed by using different sonorities in different sections.[48] Kazimierz Serocki also

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[48] Lidia Rappoport, 'Sonorism: Problems of style and form in modern Polish music', trans. by Jennifer M. Goheen, *The Journal of Musicological Research*, 4 (1983), no. 3/4, 399-416 (p. 400).

had a similar idea for a 'segmental composition': a composition whose sections are divided by their

differences in texture and sonority.[49] Contrasts of musical materials can be the main feature in a

composition as well. Danuta Mirka asserts that the contrast between different types of sound materials is

the main tool in Penderecki's technique.[50] In a conversation with Tadeusz Kaczynski, Lutosławski stressed

the importance of contrast of musical ideas as follows:

> Any strictly composed musical form contains opposing forces. Every form is a product of
> the conflict between these forces. We could call them *centrifugal* and *centripetal*.
> Centrifugal forces result from the variety of the musical material, they must somehow be
> balanced by a centripetal force which will bind these fugitive elements into a whole.[51]

I would like to refer to point I made at the beginning of this chapter again that a composition is perceived

in a linear direction. The successive perception of the musical events will magnify the differences between

the sections and emphasise how the musical trajectory progresses. This compositional approach was later

explored in other instrumental compositions including 'Quartet' and 'Natural Currents'.

'Quartet',[52] a composition for string quartet developed from the non-linear concept experimented

in 'Never-ending Torture', uses the differences of each section in terms of speed, texture, and timbre as

the musical trajectory of the composition. Using sections with different characteristics has been explored

briefly in the piece for harp and soprano. Therefore, during the compositional process of this string quartet,

I decided to have a careful plan of sections to emphasise their differences and structure a clear musical

trajectory for this larger instrumental composition. According to example 1.1, the tempos used in this

composition can be categorised into five main groups: slow (circa. 40 BPM), moderately slow (48-60 BPM),

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[49] Rappoport, p. 401.

[50] Mirka, *The Sonoristic Structuralism of Krzysztof Penderecki*, p. 20.

[51] Tadeusz Kaczynski, *Conversation with Witold Lutosławski* (London: Chester Music, 1995), p. 77.

[52] Charuprakorn, pp. 45-67.

moderate (72 BPM), fast (92 BPM), and with no tempo. The durations can be grouped into four: around one minute or longer, longer than 30 seconds, around 30 seconds, and shorter than 30 seconds. The example also shows that these differences are structured into a piece which includes various forms of an extreme jump between sections with different speeds and durations, for example, the big difference in terms of duration of sections 1 and 2 and speed between sections 3 and 4. As the music progresses to around section 13 onwards, the contrasts appear more frequently.

Section	Tempo (BPM)	Approximate duration (seconds)	Features
1	40/60	80	Harmonics and pizz.
			Density of attacks
			Change of tempo
2	72	35	Intervals (with cresc. or decresc.)
			Pizzicato
3	40	30	Intervals (with cresc. or decresc.)
			Sustained notes and clashes of tremolos
4	92	20	Loose texture
			Pointillistic
			Combination of various timbres
5	72-84	40	Similar to section 3 but with loose texture
6	92	15	Similar to section 4 but with denser texture
7	48-52	60	Long and sustained notes with spacious texture
			Various bowing tecniques
8	72	25	Similar to sections 4 and 6 but with a lot denser texture
			Strong attacks
9	52-60	40	Similar to section 7 but with single bowing tecnique
10	40	20	Clashes of tremolos and vibratos
11	92	25	Density of attacks and tremolos
12	No tempo	40	Interactions between players
			Combination of various timbres
13	72	15	Similar to section 2
14	92	10	Similar to section 10
15	72	10	Similar to section 7 with a lot denser texture
16	No tempo	10	Similar to section 12
17	72	10	Similar to section 15
18	No tempo	10	Harmonics with tremolos
19	92	10	Similar to section 11
20	52-60	20	Similar to section 2
21	72	30	Combination of various timbres and musical ideas
22	No tempo	40	Long and sustained notes with vibrato

Example 1.1: A summary of sections, tempos, durations, and musical characteristics of 'Quartet'

The difference in sonority or musical characteristics is also incorporated as the trajectory of the composition with the sudden changes of speed and duration. For example, the first section contains mainly high harmonics with some pizzicatos; at the end of the first section, sustained intervals with crescendos or decrescendos are briefly introduced which later become the main features of sections 2 and 3.[53] Another example is that the first three sections of the piece have a rather dense texture which is suddenly shifted to the other extreme in section 4.

Another main feature in each section of 'Quartet' is the density of attacks which also plays an important role in distinguishing the texture. Gradual or sudden changes of texture in terms of activity, the frequency of the notes' entries, are apparent in measure 3. This measure clearly has more activities than other adjacent measures that only contains a few long and sustained notes. The area of dense activities also appears in measures 7 and 12 that significantly have more activities than the rest of the section; the same approach is also featured in section 11 (with tremolos)[54] and section 15.[55] It is noticeable that the contrast of textural density appears not only between sections but also within a section to provide a musical direction to itself. Some transitions between sections show extreme temporal or textural differences such as moving from a fast, dense section into another slower section with less intensity. However, the shift between sections with similar texture but varied in speed also adds variety to the trajectory, for instance, the change from section 10, a section with a dense texture but in a slow tempo, to section 11 with a similar textural density in a fast tempo.[56] The sections and transitions in 'Quartet' were planned and used as the musical trajectory of the piece, but other aspects of the composition such as harmony and range are somewhat intuitively through-composed. The analysis of the piece after its

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[53] Charuprakorn, pp. 47-50.

[54] Charuprakorn, pp. 58-59.

[55] Charuprakorn, pp. 62-63.

[56] Charuprakorn, p. 58.

completion uncovered some potentials for the development of structure in other compositions. I started to see that in addition to the contrasts of sonorities that have been the main feature of the string quartet, the structure of a composition can be based entirely on the organisation of its textural density, harmonic range, and dynamic.

'Natural Currents'[57] is a piece for mixed ensemble whose musical trajectory focuses on the differences of textural density, harmonic range, and dynamic within and between sections of the composition. Example 1.2 shows the plan of the intensity of musical activity and the dynamic of each measure. The extreme contrasts between dense and loose textures or loud and soft dynamics are still featured in the composition. Each large section of the piece explores its own distinct textural character. The first section of the piece has texture that is collectively densified by the whole ensemble and the musical direction of each part is somewhat similar to one another. On the other hand, the texture of section A is woven by individual distinct gestures with different characteristics, especially the flute part that stands out from the rest of the ensemble.[58] Each individual phrase within a section also has its own shape and direction, enhanced by the internal changes of density and dynamic. For instance, the changes of textural densities in measures 1, 2, and 3 occur at different rates within different durations. In measure 1 the texture of the ensemble becomes denser at the third and seventh beats of the measure, which is also highlighted by the crescendos. However, in measure 2 the texture of the ensemble takes approximately four beats to reach its densest point and decreases in the next three beats. In measure 3, a similar direction is being repeated but with the peak of its density at the second beat of the measure; this phrase, however, takes the next five beats to decline. These three measures may use a similar gesture and have a similar technique to alter their texture, but the irregular pattern of changes differentiate the direction of each phrase. The

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[57] Charuprakorn, pp. 29-44.

[58] Charuprakorn, p. 36 and Recordings (CD1), 06: Natural Currents (workshop) at 1'05".

subtle changes and the phrases' irregularity are a preparation for the big contrasts of density and dynamic arriving at measure 4. This concept is also the basis of other sections of the piece. The sequence of phrases creates a musical direction within a section and the sequence of sections forms the musical trajectory of the entire composition.
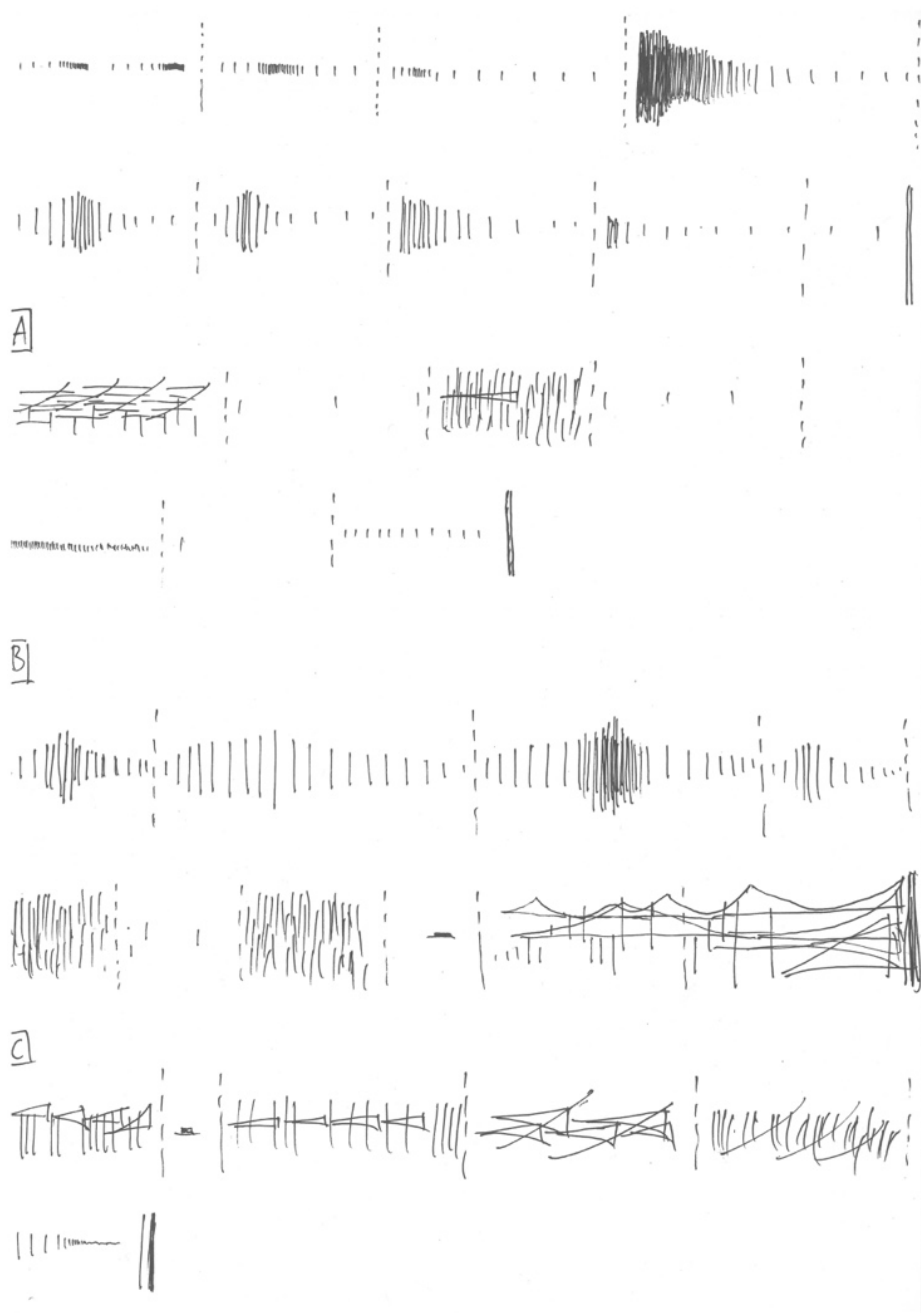
Example 1.2: A sketch of 'Natural Currents'

In addition to the textural and dynamic changes, the change of harmonic range is also another tool used to create the musical trajectory of 'Natural Currents'. Example 1.3 contains the harmonic summary of three excerpts from the composition that show how the music in each section progresses with the assistance of the changes of the harmonic area. The harmonic area of the first beat of measure 4 starts in a low register which later expands into the higher register. From the second beat onwards, the harmonic area expands in both directions towards the end of the phrase. A similar use of harmonic areas also appears in measures 7-9. The harmonic range of the ensemble gradually expands upwards until the end of measure 7. From the beginning of measure 8 until the end of the phrase in measure 9 the harmonic range continues to expand downwards. This direction is simultaneously supported by the decrease in density of its texture as well. Not only gradual changes of harmonic areas are used in the piece, a sudden change is also featured between measures 14-16. The harmonic area of measure 14 is mostly in a high register. After a break in measure 15, the harmonic area is suddenly shifted to the lower register and expands slightly towards the end of the measure.

Example 1.3: A harmonic analysis of measures 4, 7-9, and 14-16

The compositional process of this piece for mixed ensemble gave me the opportunity to experiment with translating a plan regarding the density of texture, dynamic, and harmonic area into a

composition. However, I also learned during the workshop that this composition, its rhythmic notation, and the voicing of each part are overly complicated. Although the attempt to use the aforementioned musical aspects as the main musical trajectory can be understood by an analysis, similar ideas can surely be achieved by simpler rhythmic division and less virtuosic writing. This short composition was a very useful lesson in which I started to use the organisation of textural density, rhythmic density, and harmonic area to create a musical trajectory in a composition.

In this chapter, I have shown the first attempt to distance my compositional approach from the conventions of linear musical trajectory and thematic-motivic development by planning my compositions with various non-linear approaches. I first explored the fragmentation of the text of the composition for soprano and harp with an aim to not narrate the entire story with the text. Alternatively, the text has been abstracted to the point that it only conveys particular expressions in each section. This concept of fragmentation was also applied to two other pieces involving texts. The attempt to differentiate each section with other musical parameters apart from its text or melodic materials drew my attention away from the use of thematic-motivic development. On the other hand, I started to focus on the differences of sections in terms of speed, duration, and timbre and the possibility to use these differences as the main musical trajectory of a composition. I later applied the concept to the composition for string quartet that features the contrasts of tempo, texture, and sonority between sections which also form a musical trajectory of the entire piece. Some sections of the string quartet have their own internal directions created by the changes in its textural density and harmonic area. This has inspired me to compose another composition whose musical trajectory is based entirely on the organisation of textural density, dynamic, harmonic range, speed, duration, and timbre of each phrase and each section. The compositions I have discussed in this chapter have laid the foundation for the next stage of this research project. I continued to fully explore how to create a musical trajectory by focussing on the organisation of sounds within vertical and horizontal musical spaces including the registral spacing and rhythmic density of a composition.

Chapter 2: The Organisation of Registral Spacing and Rhythmic Density and their Influences on Structure

From my perspective, a compositional process is an act of organising sounds and their interactions with one another to create the senses of tension and release. Their positions form a musical trajectory within the frame of range and duration of a composition with the assistance of notation to show how to perform and where each sound is within this frame. The musical materials and the trajectory of a composition can be in any form as long as the concept of a sound organisation remains. Kendall Walton defines the central attention of musical appreciation that 'one must feel tension and release: one must allow oneself to imagine motion and rest.'[59] According to Walton's statement, it seems that listeners can follow the interaction between musical materials presented in a composition and experience the senses of tension and release designed by the composer. The role of a composer might be only to design a 'sequence of sounds' which is located spatiotemporally,[60] regardless of the type of musical material. Morton Feldman claimed that his thoughts behind the construction of musical material were only to project 'sounds into time'.[61] It is probable to assume that the concept of tension and release can be created by any processes, for example, tension created by a dissonant harmony and release by the resolution, tension portrayed by a loud dynamic and release by a soft one, tension and release of textural density, and tension created by using a very small harmonic area. I believe that what I do with my compositions is also designing the musical trajectory based on the concept of tension and release by using any forms of sound as the main musical materials; the key is to show how musical characteristics change from one state to another through time.

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[59] Walton, 'Listening with Imagination: Is Music Representational?', p. 50.

[60] Kathleen Stock, 'Introduction', in *Philosophers on Music*, ed. by Kathleen Stock (Oxford: Oxford University Press, 2007), pp. 1-20 (p. 2).

[61] Morton Feldman, *Give My Regards to Eighth Street: Collected Writings of Morton Feldman*, ed. by B. H. Friedman (Cambridge: Exact Change, 2000), p. 6.

Another of my personal view is that a composition is a frame. It can mean 'a frame of appreciation' that we put on anything we would like to appreciate, such as, focussing on a particular concept and use it as the essence of a piece or framing ambient sounds in everyday life for aesthetic purposes. However, a frame in this regard can be an actual frame of a musical work including its range, duration, and timbral palette. Elliot Carter had a very intriguing view of the space within this frame and divides the space into two axes: 'musical space' (vertical harmonic space) and 'musical time' (horizontal rhythmic space).[62] Penderecki also worked with the 'vertical space' and 'temporal trajectory' of a composition. He focussed on the 'distribution of the sound material in musical time and space'.[63] Therefore, another point that composers have to concern themselves with is how to position musical materials within the space of this 'frame' in order to achieve the intended musical trajectory. Musical notation comes into play as it is a system used to indicate how to perform what a composer has designed. W. L. Windsor asserts that notation is a 'visual representation that follows the general pitch outline on the x-axis and time on the y-axis'.[64] My view on the tempo and pulse in a score is that they are only points of temporal reference showing how fast time passes and the rhythmic division that determines the intensity of musical activities. The notation shows where each individual sound sits inside this frame of range and duration, how a musical idea is constructed, and how a musical trajectory progresses.

In Chapter 1, I have briefly discussed some musical materials of 'Natural Currents' whose musical directions are created by the changes of harmonic range and rhythmic density within each phrase. I would like to use this opportunity to elaborate on how such concept can be put into practice. As discussed above, musical notation is the tool to determine the density of a texture and the harmonic range of any musical

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[62] David Schiff, *The Music of Elliott Carter* (London: Faber, 1998), pp. 44, 46.

[63] Mirka, *The Sonoristic Structuralism of Krzysztof Penderecki*, p. 21.

[64] W. L. Windsor, 'A Perceptual Approach to the Description and Analysis of Acousmatic Music' (unpublished doctoral thesis, City University London), p. 21.

phrase. Example 2.1.1 shows two phrases that are similar in terms of range but have different rhythmic

characters. It is noticeable that the rhythmic density of the first material on the left gradually increases

towards the end of the measure. On the contrary, the rhythmic density of the second example gets to its

peak in the middle of the measure.

Example 2.1: Possibilities of various musical directions created by differences of density and range

As opposed to the first example, example 2.1.2 contains two materials with similar rhythmic density.

However, their difference in harmonic range is rather distinct. The material that occupies a wider harmonic

area has more movements and features its virtuosity while the others are more discreet and display a dense

texture with a very narrow harmonic area. Not only their general harmonic ranges that distinguish their

qualities, but the registral spacing between each note also enhances their virtuosic or static senses.

Examples 2.1.3 and 2.1.4 show multiple combinations of both elements, harmonic range and rhythmic

density, which results in various musical directions. Gradual changes in the density and intervallic spacing

between notes help create these progressive or regressive directions. In an actual compositional context,

dynamics, articulations, and timbres can highlight these organisations of intensity in terms of rhythmic

density and harmonic spacing. I believe that this sequence of changes, or sequence of sound shapes, can form a musical trajectory of an entire composition.

This chapter will cover how the organisation of registral spacing and rhythmic density can be used as a musical trajectory in a selection from the composition portfolio. This includes the analyses of 'Fanfare' and 'A piece for household items' to show the overview of the compositional approach, the discussions about the construction of musical phrases of 'Quintet II' and 'Monologic Dialogue', and the structural analyses of 'Quintet II', 'Inching Phase', and 'Pivots'. The chapter mainly focuses on instrumental writing and the application of the concept in musical compositions.

The overview of the use of rhythmic density and registral spacing as musical trajectories

I would like to start by discussing 'A piece for household items'[65] to shed some light on how the changes of rhythmic density within the ensemble can be used as the musical trajectory of the composition. Although it was not the first composition on which I experimented with the organisation of rhythmic density, it is the most straightforward composition among others in the portfolio. I aim to use the analysis of this piece to show how I adapted the compositional approach introduced earlier in example 2.1 in an actual context. The structure of the entire piece and the construction of each phrase are based on the entries and attacks of each instrument. The first page of the composition features the changes of space, or the duration of silence, between each group of attacks. Throughout the section, the music alternates between a singular attack, which is widely spaced from other attacks, and a group of tightly-positioned attacks. The density of attacks builds up and gets to its peak in the first system of page 2.[66] In section A, the ensemble features multiple layers of rhythmic materials while each layer has its own speed. This creates a steadily

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[65] Charuprakorn, pp. 69-76.

[66] Charuprakorn, p. 74.

dense texture that stands out from the rest of the materials presented before. Alternatively, the texture of the music from the first system of page 3[67] gradually becomes looser as opposed to the opposite feature at the end of the previous page. In the second and third systems of page 4,[68] the musical idea with a dense texture is reused. Each system begins with a dense and complex texture of semi-quavers. The texture of each layer independently transforms into a sparser texture with fewer attacks. This composition follows the concept of tension and release by using the changes in rhythmic density in different sections. The dynamics and timbres, short and long sounds chosen by the performers, are also used to highlight the musical trajectory structured mainly by the organisation of rhythmic density.

'Fanfare'[69] for brass quintet is another composition that can present the overview of the use of rhythmic density and registral spacing as a main musical trajectory in an actual composition context. Shown in example 2.2 are the harmonic analyses of three phrases in measures 1-4, 5-9, and 17-21. The expansion of the harmonic area of each phrase occurs in a rather similar direction. The first two phrases are introduced by a clash of a major-second interval followed by a perfect fifth on trumpets. Measures 1 and 5 present the main musical material that possesses the dissonance-resolution relationship and also the concept of the expansion of intervallic spacing. The harmonic ranges of these phrases continue to expand downwardly with some alternating features of second intervals and resolutions. The fluctuating textures are created from various intervallic combinations that occur throughout the phrases until the very end at which the harmonic areas are extended at their widest. Although a similar musical direction returns in the third phrase from measure 17, its expansion of the harmonic area occurs in both directions as opposed to the downward motion in the other phrases. It still features the clashes of second intervals with a rather late resolution nearly the end of measure 20. These phrases may start with similar manners, but the second half of each

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[67] Charuprakorn, p. 75.

[68] Charuprakorn, p. 76.

[69] Charuprakorn, pp. 77-86.

phrase is different. They end with the harmonic ranges of rather similar sizes, but their inner intervals are varied. The expanding range, movements within the texture, and differences of registral spacing of each phrase form its own distinct musical trajectory.

Example 2.2: Harmonic summaries of measures 1-4, 5-10, and 17-21

It is also noticeable that the expansion of the harmonic area is combined with the increase of rhythmic density which contributes to the musical trajectory of the section. In the phrases discussed above, the registral spacing between each part changes more frequently towards the end of each phrase. For example, there is only one intervallic change in the first measure of the piece while there are three in the second and four in the third. However, in the second phrase, the number of changes fluctuates from four in measure 5 to one in the next measure before it drastically increases to three before the end of the phrase. The gradual increase of entries or attacks is also featured in other sections to create a direction for

the music. In measures 14-16 a bell-tone-like material is introduced for the first time.[70] The entry of each instrument is widely spaced from one another. On the other hand, when the same musical material is presented again in measures 95-96 the entries of the instruments are closer to one another as the music progresses. A similar gesture is introduced again in measure 97, but the music is suddenly diverted to another material instead while the momentum is being built. The use of rhythmic density in a form of entry or attack features in a different character from measure 102 towards the end of the composition. The increase of rhythmic density has been used alongside the increase of dynamic throughout the entire composition. However, it is turned upside-down by combining a progressive rhythmic density with diminuendos instead.

Constructing a phrase with the changes of rhythmic density and registral spacing

'Monologic Dialogue',[71] a composition for violin and live electronics, can be a good example of how to develop the use of rhythmic density and registral spacing as a musical trajectory and how it can be applied to the construction of phrases for the solo violin. Example 2.3 shows the entire harmonic areas of measures 2 and 11 and how they gradually evolve as the music progresses. The harmonic spacing of measure 2 consists of large intervals in the low register and small intervals in the higher register. The violin starts the phrase within the limited space in the high register with a dense texture. The harmonic area expands downwards as the rhythmic density decreases. This gesture is also supported by the change of dynamic towards the end of the phrase. I intentionally used similar gestures in other measures at the beginning of the composition to stress the significance of this material. However, the registral spacing of each gesture is different from one another. Its range and rhythmic density unfold at different speeds and

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[70] Recordings (CD1), 08: Fanfare (workshop) at 0'35".

[71] Charuprakorn, pp. 87-95.

the length of each measure varies as well.[72] A similar gesture is also used at measure 11. From the second part of example 2.3, it is clear that the harmonic area of this phrase is different from measure 2. It consists of large intervals in both low and high registers while the small intervals are compressed in the middle range. The violin also reveals the registral spacing in a different manner. Instead of unfolding downwards from the highest register, the music starts from the densest part in the middle and expands in both directions. The application of musical trajectories created by the changes of rhythmic density and registral spacing appears throughout the composition. Some phrases discreetly show the changes in both aspects, while some other phrases such as measures 7-9 and 18-20 show the range of their harmonic space with a more articulate manner and big intervallic jumps.
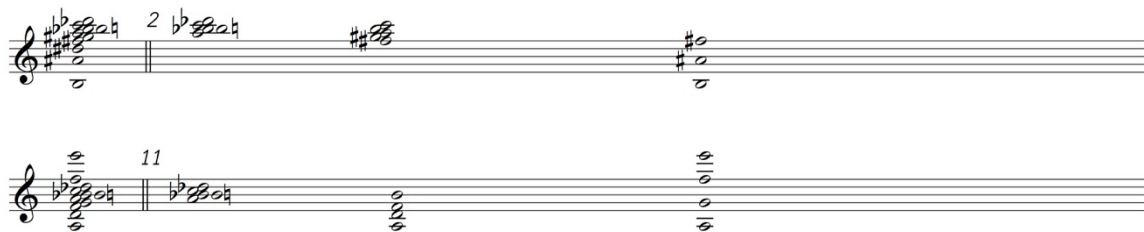
Example 2.3: Harmonic analyses of measures 2 and 11 proportional to the phrases

Although there are possibilities for these musical materials to be perceived and interpreted as melodic or motivic ideas, I do not believe that every sequence of notes or any horizontal intervallic relationships has to always be considered a melody or a motif. Similar to how Lutosławski explained motifs in his string quartet, these materials in 'Monologic Dialogue' may be seen as motifs, but they are not treated like how musical motifs are normally treated in the tradition of classical music.[73] I did not aim to construct

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[72] The use of reverberation enhances the registral spacing introduced by the violin. This processing will be discussed in Chapter 3.

[73] Kaczynski, *Conversation with Witold Lutosławski*, p. 36.

recognisable rhythmic motifs that will be repeated and developed throughout the composition; the focus is the changes of rhythmic density in different sections and how they create musical trajectories. Some phrases might have similar gestures, but the key of each phrase is to show its distinct registral spacing and how it transforms in time.

The construction of a phrase from its registral spacing and rhythmic density can be applied to compositions for multiple instruments such as 'Quintet II'[74] for woodwind quintet as well. In this case, however, multiple instruments collectively create the harmonic area, texture, and rhythmic density of the music. Firstly, I would like to focus on the very first section of the composition and show how each part interacts with one another and how these interactions create the musical trajectory of the section. Between measures 1-4, alto flute, bassoon, and clarinet create the overall shape of the ensemble. The harmonic area and rhythmic density of this section are constructed from the combination of these parts. From measure 2, the rhythmic density gradually increases and takes four beats to reach the densest point at the beginning of measure 3, at which it starts to resolve. The density continues to decrease towards the end of measure 4. Example 2.4.1 shows the changes of the harmonic area from the first measure that contains large registral spacing in the low register and smaller spacing in the higher register. At measures 2-3 the combination of the harmonic areas, which bassoon and alto flute independently occupy, covers a wider harmonic range with small registral spacings in the middle. As the harmonic areas are simultaneously created by multiple instruments, the contrapuntal manner creates various intervals that add another layer of musical direction to the section.

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[74] Charuprakorn, pp. 97-113.

Ex. 2.4.1

Ex. 2.4.2

Ex. 2.4.3

Example 2.4: Harmonic analysis of measures 1-4 and contrapuntal analyses of measures 2-3 and 12-13

According to example 2.4.2, the intervallic spacing between alto flute and bassoon fluctuates throughout the phrase. When the duo arrives in the middle of measure 3, the harmonic range is at its widest. The range of the phrase eventually decreases at the end of measure 4. The same principles are used between measures 12-13 to create a more complex texture.[75] Three upper parts create a gradual increase of rhythmic density towards its peak at the beginning of measure 13 after which the density suddenly decreases. The analysis in example 2.4.3 captures how the registral spacing in these two measures changes through a variety of intervals. The shape of the harmonic area combined with the changes of rhythmic density and dynamic provides a clear musical trajectory to this phrase.

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[75] Recordings (CD1), 10: Quintet II (workshop) between 1'04" and 1'20".

The same concept is applied in a different manner in the section between measures 56-62.[76] Instead of a polyphonic texture, the changes of registral spacing are presented by sustained notes and multiphonics. This selected section can be divided into three phrases: measures 56-57, measures 58-59, and measures 60-62. These three phrases may have similarities in terms of dynamic, but their lengths and how the dynamics change are different. The first phrase takes about six beats to reach its loudest point and four more beats to dissolve, while other phrases take a shorter time to increase and longer to decrease their dynamics. The harmonic spacings of these phrases consist of different intervallic combinations. However, they are all widely spread throughout the entire range of the ensemble. The musical trajectory of this section is the change of the area of multiphonics which has a more complex registral spacing than the rest of the ensemble; the other four instruments that are not playing multiphonics maintain wide intervals throughout this section. As the music progresses, the multiphonics played by alto flute, clarinet, and bassoon is presented in high, middle, and low registers consecutively.

Registral spacing, rhythmic density, and the structure of a composition

During this research project, I encountered difficulties in designing the structure of each composition as I did not intend to use any motivic relationships to form the structure. I could plan how the music should progress within a phrase by focussing on the changes in rhythmic density and registral spacing. However, I could not find any formal connections among these materials. I later started to look for an alternative solution to binding each section of a composition together with other musical aspects. As I tried to design a phrase by planning its harmonic area, registral spacing, and rhythmic density, the same approach can definitely be applied to the structure and the musical trajectory of an entire composition as well. Edgard Varèse also plotted the intensities of a composition in terms of register, speed, density, and

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[76] Charuprakorn, pp. 111-12 and Recordings (CD1), 10: Quintet II (workshop) between 5'43" and 6'27".

rhythmic movement.[77] To some extent, this resembles the concept of Polish Sonorism, the movement that also searched for a new approach in designing the structure of a musical work by focussing on the 'actual shape of the work'.[78]

I learned from the study of Sonorism that similarities, differences, and contrasts of shapes and qualities of sounds are alternative musical aspects that can be used to form the structure of a composition. Józef Chominski, who coined the term Sonorism, claims that sonoristic composers started to have interests in the 'appearance' (or sound qualities) of a musical work more than its 'content' such as motives, themes, and their development.[79] Teresa Malecka affirms that sonorist composers focus on the entirety of sound rather than musical motives in their compositions. She describes the sonoristic compositional approach during the 1950s-1960s that 'the sound shape became the essential architectonic unit instead of motif.'[80] She also adds, in terms of musical concepts, that sound fields, sound blocks, or sound masses replaced the relationship between single tones.[81] Anton Prosnak explains that the musical structure of a sonoristic composition is conditional upon pitch, volume, density, saturation, intensity, and timbre.[82] This is supported by *Grove Music Online* that the definition of 'Polish Sonorism' is the movement that 'explored contrasts of instrumentation, texture, timbre, articulation, dynamics, movement, and expression as primary form-building elements.'[83] Polish music theorists have also studied musical materials used by sonorist composers. Krzysztof Droba's Theory of Textural Models focuses on the typologies of texture and how it changes which

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[77] Fernand Ouellette, *Edgard Varèse: A Musical Biography,* trans. by Derek Coltman (London: Calder & Boyars, 1973), p. 59.

[78] 'Sonoristics, sonorism', *Grove Music Online*, 22 October 2008; accessed 17 September 2019.

[79] Zbigniew Granat, 'Rediscovering "sonorities": A Groundbreaking Theory from the Margins of Musicology', in *Music's Intellectual History*, ed. by Zdrawko Blazekovic and Barbara Dobbs Mackenzie (New York: International Repertory of Music Literature, 2009), pp. 821-33 (p. 822).

[80] Adrian Thomas, *Polish Music since Szymanowski* (Cambridge: Cambridge University Press, 2005), p. 161.

[81] Mirka, *The Sonoristic Structuralism of Krzysztof Penderecki*, p. 8.

[82] Rappoport, 'Sonorism: Problems of style and form in modern Polish music', p. 399.

[83] 'Sonoristics, sonorism', *Grove Music Online*, 22 October 2008; accessed 17 September 2019.

are categorised into three: a static texture, a texture with progressive changes (becoming denser or wider), and a texture with regressive changes (becoming narrower or less dense).[84] I believe that with a similar approach I can consider different sound qualities of different musical materials and organise them into sections. In the absence of motives and their development, the structure of an entire composition can be based on these musical aspects. Moreover, the analytical approaches towards sonoristic music, such as Droba's theory, can be adapted to describe the materials in my compositions that are constructed from the changes of registral spacing and rhythmic density and how they progress in a composition as well.

Since the beginning of this chapter, I have shown how rhythmic density and registral spacing can be used to construct phrases for a solo instrument and multiple instruments in an ensemble. I have also shown that the musical trajectory of each phrase is also created from these musical aspects. In this second part of the chapter, I would like to use the structural analyses of 'Quintet II', 'Inching Phase', and 'Pivots' to show how the organisations of rhythmic density and registral spacing can be used to design the structure of a composition.

The structure of 'Quintet II'[85] is designed by considering its variety of harmonic area and rhythmic density. All five sections have their own distinct musical characteristics and harmonic areas. The choice of instrumentation, all low instruments especially in the first and last sections as opposed to balancing between different registers, derived from the attempt to limit the range of the entire ensemble into a small harmonic space in order to emphasise the experiment with the registral spacing between each instrument. Another advantage of this imbalance is that each line can intertwine with one another within the designed harmonic area. Section A begins in a rather low register with only 2-3 instruments. After the first solo phrase

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[84] Mirka, *The Sonoristic Structuralism of Krzysztof Penderecki*, p. 23.

[85] Charuprakorn, pp. 97-113.

by alto flute, each line of the entire ensemble collectively contributes to the shape of the overall sound. The shape of this section, or its harmonic range, fluctuates according to different registral spacing created by a polyphonic texture. The quality of its texture also fluctuates. The textural density progresses or regresses with a crescendo and a diminuendo consecutively. On the other hand, the shape and texture of section B are much more static with only one line that clearly has more movements than others from time to time, for example, English horn in measure 15 and clarinet in measure 17. Between measures 19-23 the rhythmic density of the ensemble drastically increases while the registral spacing becomes narrower. Section C is more distinct from other sections. The textural quality of this section alternates between very sparse and very dense. However, the registral spacing of the section gradually decreases until it reaches its peak with the width equivalent of a minor-second interval at measure 29.[86] As a contrast to section C, the first half of section D has the widest harmonic area among all sections. The shape and texture of this section are rather static. It features the transformation of the timbre from alto flute's whistle tones and harmonics into bassoon's multiphonics and eventually into clarinet's multiphonics. The second half of the section from measure 43 onwards is another contrast from the first half which shows a polyphonic texture of clarinet and oboe. As opposed to the first half of this section, during the duet between clarinet and oboe the registral spacing and rhythmic density fluctuate until it reaches the end of the section.

Most of section E has already been explained earlier in this chapter, but I would like to focus on the last six measures that conclude the use of rhythmic density and registral spacing as the musical trajectory of the composition and how the changes of the shape of the sound become the musical trajectory. Shown by example 2.5, measures 63 and 64 feature changes in the harmonic spacings in low and high registers. From measure 65 onwards the harmonic area starts in a low register and is limited in terms of range. The entry of alto flute and English horn in measure 66 suddenly expands the harmonic

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[86] Recordings (CD1), 10: Quintet II (workshop) between 1'49" and 3'29".

range of the entire ensemble. These two upper parts later descend towards the rest of the ensemble. This

descent changes the shape of the sound and clearly reduces the registral spacing between each part. The

change of the rhythmic density is totally different from other materials in the piece. While the dynamics of

alto flute and English horn decrease, the rhythmic density become greater until the descending parts

submerge into the sounds of the rest of the ensemble. This last section clearly shows how the musical

trajectory progresses by the changes of registral spacing and rhythmic density.
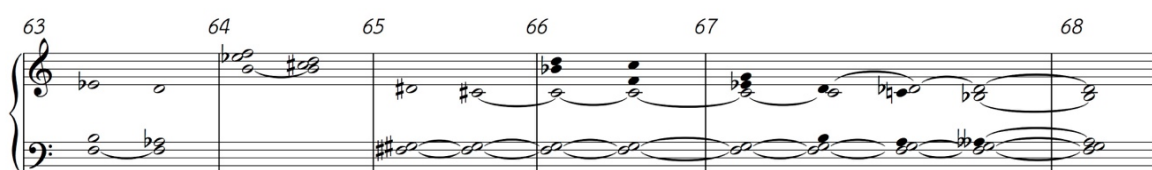
Example 2.5: Registral spacing of measures 63-68

Instead of a harmonic area or registral spacing, the structure of 'Inching Phase'[87] is designed by

considering the shape and quality of each phrase within each section. The piece consists of four main

sections that are distinctive in terms of their musical characteristics. I have also explored the use of multiple

temporalities in some sections to highlight the changes in rhythmic density and registral spacing. The first

section, from the beginning until measure 18, features gradual changes of shape in terms of rhythmic density

and registral spacing. Shown by example 2.6, the shapes of the first two phrases in measures 1-2 and 3-4

change in a rather similar direction. Their harmonic areas reduce while the rhythmic densities

simultaneously decrease. This regressive shape is repeated in measure 5 until a new shape is introduced in

measure 7. The drastic change of registral spacing in measure 7 stresses that this composition progresses

by the changes of the harmonic area.

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[87] Charuprakorn, pp. 115-25.

Example 2.6: The shapes of the phrases in measures 1-2, 3-4, and a different shape in measure 7

At measure 12, the shape with gradual changes returns and the concept of multiple temporalities is introduced for the first time. I have stated at the very beginning of this chapter that I consider pulse or downbeats to be a reference of time which helps determine the speed of how the music progresses. Therefore, having multiple temporalities means that the instruments will move at different speeds. I believe that its texture can have more varieties than having only one temporal reference. Although the regressive shape seems to return from this point onwards, the registral spacing of each phrase remains static while the rhythmic density decreases.

To contrast the gradual changes in the first section, section A starts to introduce sudden changes; a gradual change of harmonic area or rhythmic density interrupted by a sudden change of the same aspect is the main feature of this section. Shown at example 2.7, the registral spacing of the phrase decreases in measure 19. Alternatively, the rhythmic density increases towards the end of the measure.

Example 2.7: Gradual and sudden changes in measures 19-20 and 30-34

A sudden expansion of the registral spacing appears with the tremolos in measure 20 followed by a short solo passage. This gesture of gradual and sudden changes is repeated in various ways throughout the section, for example, sudden shifts of textural density in measures 26 and 28. A more extreme change of registral spacing appears between measures 30-34.[88] Flute and viola join the resonance of the harp at measure 30 and create a wide harmonic area. The ensemble collectively moves the harmonic area down to a rather low register at the end of measure 31. The combination of flute, viola, and harp's resonance is repeated at measure 33, but with a more extreme range. The registral spacing of this measure consists of small intervals in the low register and large intervals in the high register.

The use of multiple temporalities to create a more complex texture has been pushed further in section B with three different tempos. Each line independently, and also collectively, contributes to the overall sound shape of the ensemble. The rhythmic density of each line also decreases at different paces which results in rather different regressive shapes compared to other sections. The registral spacing remains wide throughout the entire section. The last section on the last page of the score features all of the materials that have been introduced earlier in the composition.[89] The concept of multiple temporalities is continued from the previous section. The changes of registral spacing and rhythmic density remain to be the musical trajectories of each phrase and the entire section. Example 2.8 can show how the music progresses towards the end. Gradual changes of registral spacing in measures 54, 56, and 58 are interrupted by sudden changes in measures 55, 57, and 59.

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[88] Recordings (CD1), 11: Inching Phase (workshop) between 2'23" and 2'56".

[89] Recordings (CD1), 11: Inching Phase (workshop) from 4'15".

Example 2.8: The shapes the last three phrases of the composition in measures 54-60

'Pivots'[90] for horn, violin, violoncello, and piano consists of five sections with clear distinctions in terms of timbre and registral area. The musical trajectory of the composition is also created from the changes of rhythmic density, registral spacing, and shape of music. During the compositional process, I paid more attention to the harmonic relationship between different groups of notes by connecting them with pivotal notes. Some sections feature the interactions between sustained tones, which act as pivotal points, and other moving parts. The first section, between measures 1-12, features the normal timbre of every instrument combined with the musical trajectory created from the changes of intervallic spacing. The pivotal notes are used to create some connections between each set of notes in this section. Measures 1-4 show how the harmonic spacing of the ensemble changes while some pitch is sustained during each transition. This also shows the musical interaction between the static part, such as piano in measure 2, cello in measure 3, and violin in measure 4, and the rest of the ensemble that moves around these sustained notes. The pieces might begin with unison chords, but the changes of rhythmic density along with registral spacing are also apparent from measures 6 onwards.

In section A, the concepts of unisons and pivotal notes are replaced by short horn solos. The shape of each solo phrase is regressive; its rhythmic density and dynamic reduce towards the end of each phrase. The pitch of these horn solos is designed to emphasise the interactions between horn and the rest of the

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[90] Charuprakorn, pp. 127-33.

ensemble by creating short bursts of a second interval and resolution while its pitch moves around the notes sustained by others. From measures 16 onwards violin and cello start to imitate the horn's role and interact with the chords sustained by piano as well. Example 2.9 shows the sustained chords in measures 13-17 and the notes that horn, violin, and cello play to create various intervallic qualities. It is noticeable that while the same regressive gesture is repeated multiple times, the harmonic area of the entire ensemble, led by the piano, is gradually rising. The range and the dynamic also reduce until the sustained chords on the piano become silently pressed keys which only resonate horn's sounds at the beginning of section B.

Example 2.9: Harmonic analyses of the registral spacing between measures 13-17 and the resonances created by horn and piano between measures 27-34

The changes in registral area in section B are much more drastic than the first two sections. They are presented in a form of resonance. The seating position of the horn player,[91] lifted dampers in the piano, and very loud solo horn passages create the resonance that has a completely different timbre from any

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[91] Charuprakorn, p. 128.

previous sections in the composition. Multiple temporalities in this section also make the solo part to be more active than the rest of the ensemble. A faster tempo and greater rhythmic density cause more movements in horn's part. Violin and cello maintain the role that interacts with the sustained tones. Alternatively, the interactions in this section are between the string instruments and horn's sounds resonated by the piano. The rising registral area is also presented in this section. Between measures 27-34 the sets of keys that the pianist is required to silently press ascend upwards as the section progresses. The solo horn passages are passed to the right hand of the piano which resonates even better despite the decrease of dynamic. This means that the harmonic area of the resonance created by horn and piano will continue to rise as well.

The resonance in the high register leads the ensemble into section C which consists only of violin's and viola's natural harmonics and notes in the high register of the piano. The entire section C features the change of rhythmic density which is more intense at the beginning of measures 36, 38-41. The change of registral spacing takes place throughout the section in a rather small space in this very high register. Section D shows another distinctive timbre comprising muted horn and sul tasto on muted strings. The registral area that horn, violin, and cello occupy is rather small. It continues to descend until the piano adds intervals in a high registral area. The composition is concluded with these two extreme areas. To summarise, each section of 'Pivots' clearly has distinctive timbre and registral area: normal instrumental timbres at the first two sections, resonance at section B, harmonics and high notes at section C, low and high registral areas at section D. The differences of timbres and registral areas of three sections are visualised by their sound spectra shown in examples 2.10, 2.11, and 2.12.
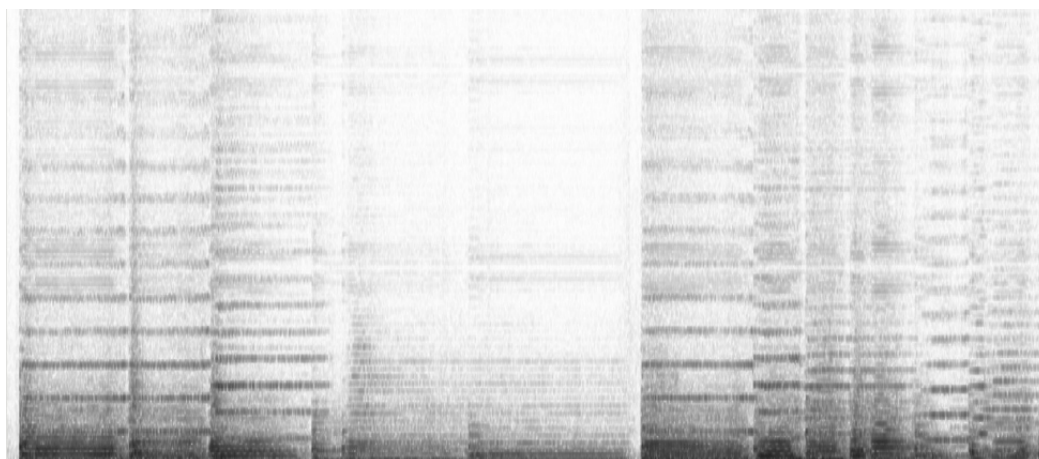
Example 2.10: Sonogram of the beginning of Pivots
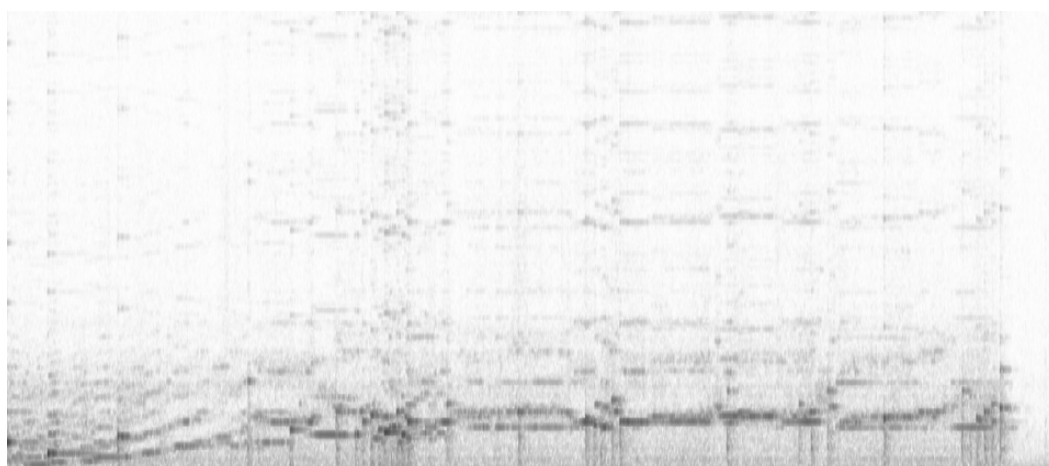
Example 2.11: Sonogram of section C of Pivots
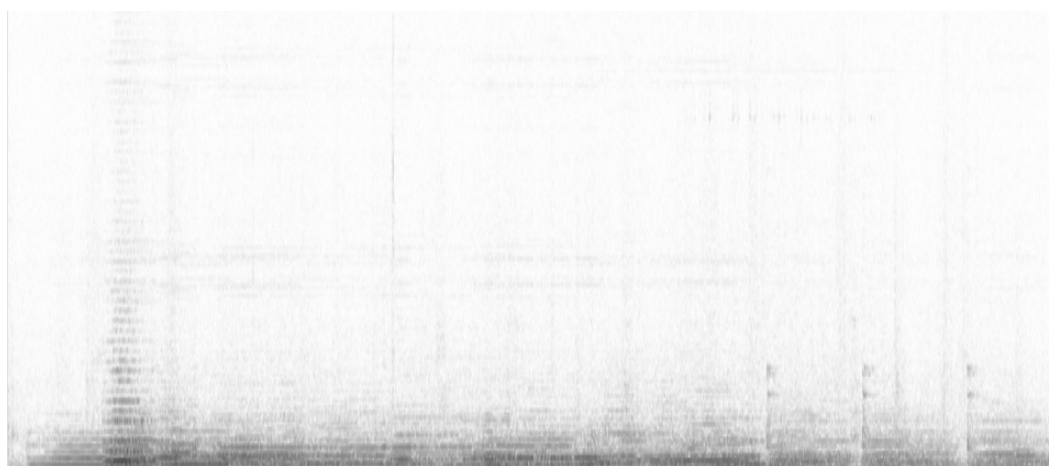
Example 2.12: Sonogram of section D of Pivots

The notion of tension and release led me to focus on the changes in musical characteristics from one state to another and how a sequence of sounds can emphasise these changes. The changes of registral spacing and rhythmic density are used as the main musical trajectories in my compositions. The ways these qualities change create various musical directions that contribute to the overall musical trajectory of an entire composition. I used the excerpts from 'A piece for household items' and 'Fanfare' to demonstrate the application of the approach to an actual compositional context. The examples from 'Monologic Dialogue' and 'Quintet II' focus on how phrases can be constructed from the organisation of its rhythmic density and registral spacing. I have also shown how I structured 'Quintet II', 'Inching Phase', and 'Pivots' by considering these musical aspects, shapes, and contrasts of timbres and registral area. This compositional approach can also be found in other compositions involving electronics which will be explored in the next chapter.

Chapter 3: Composing for Electronics and the Use of Frequential and Registral Areas

Learning more about electroacoustic music had been on my wish list for so many years. I managed to look into it in the first year of this doctoral study and later realised the changes of my compositional approach influenced by this encounter. Even before I started to incorporate electronics into my compositions, the electroacoustic approach already appeared to have a significant influence on my instrumental writing. I believe that the focus on the shapes of sound, registral spacing, and rhythmic density in my compositions also derived from submerging myself in the world of electroacoustic music. I later realised that my prior experience with instrumental compositions has a significant influence on how I utilise electronics in my compositions as well. Since I started working with Max/MSP in 2018, the focus on using registral spacing as a musical trajectory has been developed into the focus on smaller units such as sound spectra, timbres, spectral areas, and the spacing of partials. This chapter contains discussions on a selection of my original compositions including 'Tea-Time', 'Altered Exponents', 'Monologic Dialogue', 'Stretches', 'Stretches II', and '…with steps we take…'. This chapter will focus on the compositional aspects I obtained from working with electronics in these compositions and how the electronics support the use of registral spacing and rhythmic density rather than the technical aspects of the processes. I also aim to show how the organisation of frequential spacing and registral areas can be used as the musical trajectory of a composition.

The compositional aspects emerged from the experience with electronics

The first composition in which electronics were incorporated aimed not only to explore the use of Max/MSP but also to experiment with the registral spacing and rhythmic density in the instrumental part. Working with this composition also established my personal approach regarding the treatment of

electronics. 'Altered Exponents'[92] is a composition for melodica and electronics. The piece consists of five sections with different lengths that explore different sonorities of the melodica, ranges, and the characters of the musical material. Pre-recorded materials, sections II, III, and V, are played in the background with a bandpass filter whose centre frequency moves randomly throughout the composition. The player has to simultaneously follow the score and interact with the tape track. I learned to create a patch that is programmed to play different pre-recorded materials at different designated times according to the time on the stopwatch embedded in the patch. More importantly, the concept of using registral spacing and rhythmic density as the musical trajectory is still explored in a more flexible context with proportional notation; using multiple sections with different lengths and sonorities that have been explored in the earlier stage of the research also plays a significant role in this composition. For example, the first short section comprising several groups of notes is contrasted by the second section consisting of only intervals and chords. In the second section, the harmonic range of each group gradually reduces as the section progresses while the entries the new groups appear more frequently. The intensity of both aspects decreases at the end of the section. The third section features tremolos in various registers which are equally spaced throughout the section. After a mixture of every musical material in section 4, section 5 features only long, sustained notes. This last section, which is the longest among all, is designed to highlight the interactions between the performer and the alternating filtered audio track. I was developing this composition alongside 'Original Exponents', a 1-hour composition for an installation-like performance.[93] The main concepts concerning the interaction between pre-recorded sounds and the performer and the musical trajectory created from the differences of registral spacing, rhythmic density, and changes of characters between sections remain in this 1-hour version. Working with these compositions allowed me to learn how to work with an automated patch for electronics that could operate by itself. This also inspired me to incorporate

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[92] Charuprakorn, pp. 135-37.

[93] See the score of 'Original Exponents' in the appendix.

chance elements into the electronic part, the moving filter in this case, that will produce different outcomes in different performances and make the electronics more organic. Both of these points are vital to the development of the use of electronics in my other compositions.

The importance of the compositional process of 'Tea-Time',[94] another piece composed during the first few months after I started working with electronics, is slightly different from the piece discussed above. In this composition, I explored the sound processing of pre-recorded materials further and started to pay less attention to pitch. 'Tea-Time' is a composition for soprano and electronics which requires the singer to record some phrases prior to the performance which means that the patch will produce a different track with a different performer. Instead of playing the recordings with only filters like the piece for melodica, the patch will generate an audio track via the processes of time-stretching, pitch-shifting, looping, and spatialisation with stereo speakers. For example, in the first section of the piece, the low drone is created by playing the recording of the soprano whispering 'more' backwardly with only 10% of the normal speed. The recording is also transposed down three octaves and a half from the original recording. The vortex-like sound at the end of the first section is also created from the recording of the soprano whispering 'time' backwardly four times faster than the original speed and its pitch is shifted five octaves higher. The sound is repeated very quickly at first, then the speed gradually decreases. Towards the end of the section, the playback speed and pitch gradually reduce to 10% and two octaves lower than the original respectively.[95] Apart from the ambiguity and the fragmentation of the text that have been discussed in Chapter 1, the interactions between the performer and the audio track are also the main feature throughout the composition. The examples above are the evidence of a more flexible approach to working with electronics. In other parts of the composition, some elements of randomness are applied to pitch and rhythm of the

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[94] Charuprakorn, pp. 11-15.

[95] See the sub-patch named 'A3' and the file 'A3_vortex' on Max Patches (CD2), 01: Tea-Time.

electronic part. The pitch of the processed sounds is roughly determined whether it is higher or lower than the original recording. I started to consider the vertical placement of musical material by its registral area rather than an exact pitch. Incorporating chance elements in the patch makes the electronics progress more organically and naturally as opposed to a typically fixed nature of a computer-generated material. This led me to believe that electronics can be flexible and can be treated as if it is another musical instrument.

Working with electronics introduced me to another sound world that I had never used in my compositions before. I totally agree with Lutosławski's statement that 'traditional instruments are less and less suitable for the needs of the composer's imagination.'[96] With the awareness of the possibilities of electronic sounds, I started to compose outside my comfort zone and started to imagine sounds outside the realm of a 12-tone scale and beyond the limits of musical instruments. By using simple processes such as playback, loop, reverberation, and filter, I could see a very wide range of possibilities that a musical material can be transformed or expanded into a larger unit. Using Max/MSP has become an integral part of my compositional process. However, the natural variants in the realisation of instrumental composition and the interaction between performers and electronics, or a technician, still have a significant influence on my compositional approach. Electronic patches of 'Tea-Time' and 'Altered Exponents' incorporate randomness which provides some level of freedom and organicity to the electronics. Other compositions involving electronics also adopt this principle and the role of electronics is equal to the rest of the ensemble.

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[96] Zbigniew Skowron, *Lutosławski on Music* (Plymouth: Scarecrow Press, 2007), p. 241.

The development of the use of registral spacing with electronics

The application of the musical trajectory constructed from the registral spacing and rhythmic density in the violin part of 'Monologic Dialogue'[97] has been discussed in the previous chapter. In this chapter, I would like to focus on how electronics enhance such concept by processing the sound of the violin. At measures 5-6, reverberation is used to highlight the registral spacing of each phrase. Both phases gradually unfold in terms of rhythmic density and registral spacing. With the increase of the input gain for reverberation, the patch will reverberate the phrases and create layers of sounds that emphasise the registral spacing of each phrase. The similar effect is repeated between measures 7-11 with some variations of spatialisation. However, as opposed to measures 5-6 in which the violin's sounds are reverberated and sent to both speakers equally, the reverbs are divided into two frequential areas and sent to different speakers. For example, the cut-off frequency of the filter used at measure 7 is 440 hertz; the reverbs of any frequencies higher than this cut-off point will be sent to the right speaker and lower to the left. Alternatively, the cut-off frequency at measure 8 is 587 hertz. The patch will send the reverbs of any frequencies above and below this cut-off point to the left and right speakers respectively.[98] The reverberation and the frequency-based spatialisation play an important role in displaying various sets of registral spacing of the composition. The changes of registral spacing and sound spatialisation are also featured at the solo electronics passage in section C. The patch freezes the four notes played by the violin at the end of measure 11 and amplifies through the speakers. The registral spacing of each note changes while their output channels are also manipulated. The spatialisation of sound is part of the musical feature of this section as well.

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[97] Charuprakorn, pp. 87-95.

[98] Recordings (CD1), 09: Monologic Dialogue (live performance) between 1'43" and 2'35".

Another electronic sound processing used to create a musical trajectory is the harmoniser at section E. The harmoniser function of the patch generates chords from the individual notes or double stops played by the violin. The changes of registral spacing of each electronically-harmonised chord and how the shape of each phrase changes provide a musical trajectory for this section.

Example 3.1: Harmonic summary of section E

Example 3.1 shows that the harmonic area of measure 21 gradually expands from about the size of an octave into three and a half octaves towards the end of the measure. On the other hand, the harmonic area of the next measure starts with a very wide range and later regresses in the middle of the phrase. After the patch starts to harmonise the violin with microtonal intervals at the last chord of the measure, the harmonic area suddenly expands. Later in the section, the patch continues to generate microtonal intervals. Prior to this point, the notes in the violin part and electronics, intervals, and chords are based on a 12-tone

scale. This microtonal section introduces another sound world that will be explored further in the last section of the piece.[99]

The focus of section F is no longer the spaces between notes, but the spaces between the overtones generated by the patch. The manipulation within this 'spectral space'[100] transforms the structure of the sound and changes its timbre;[101] these changes become the musical trajectory of this section. The electronic patch removes the natural overtones of the violin and only amplifies the fundamental frequencies of each note. The dynamic of these fundamental frequencies will correspond to the dynamic of the violin. New sets of overtones consisting of sinusoidal tones are played by the electronics' operator in order to create 'artificial spectra'[102] above the fundamental frequencies. The additive synthesis that combines these sine waves can rebuild new complex sounds whose timbres are distinctive from violin's timbre that has been used throughout the composition.[103] The manipulation of internal components of the sound, in this case the spectral spacing within the sound spectrum, creates new sound qualities that become the trajectory of this section.[104]

Example 3.2: Fundamental frequencies and artificial spectra featured in section F

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[99] Charuprakorn, p. 94 and Recordings (CD1), 09: Monologic Dialogue (live performance) between 4'50" and 6'28".

[100] Denis Smalley, 'Space-form and the Acousmatic image', *Organised Sound*, 12 (April 2007), no. 1, 35-58 (p. 45).

[101] Jonathan Cross, 'Introduction: Spectral Thinking', *Twentieth-Century Music*, 15 (February 2018), no. 1, 3-9 (p. 8).

[102] Joshua Fineberg, 'Guide to the Basic Concepts and Techniques of Spectral Music', *Contemporary Music Review*, 19 (2000), part 2, 81-113 (p. 92).

[103] Fineberg, pp. 84-85.

[104] Smalley, p. 44.

'Monologic Dialogue' was my first attempt composing for an instrument with live electronics. It certainly liberated my compositional approach from the limitations of instrumental writing. More importantly, I have developed the concept of using changes of registral spacing as a main musical trajectory further. I turned my attention from musical pitch to the fundamental components of a sound which introduced me to various spectral techniques. The organisation of spectral spacing became another possibility that I could explore. Nevertheless, the spectral manipulation also inspired me to look beyond notes in a 12-note scale or registral spacing and experiment on timbres and sound qualities. From my experience, working with electronics combines the worlds of musical pitch and sound and expands the territory that I can explore to develop my compositional approach further.

The use of frequential and registral areas

'Stretches'[105] and 'Stretches II'[106] are my electronic compositions that are different from others in the portfolio; they are designed to be performed by a gestural device called a 'Gametrak controller' and the musical materials of both pieces are created from the synthesis of filtered noise combined with the spatialisation controlled by the performers. The patches and the compositional ideas of both compositions are quite similar. The major differences are that the first composition is for two performers, two gestural controllers, and quadrophonic speakers while the second composition is only for one performer, one controller, and stereo speakers. For the convenience of the discussion, I would like to focus on 'Stretches II' and will mention any differences in 'Stretches' if necessary. The piece requires the performer to improvise according to the instruction given in the score. The 'triggering movements' of the performer, moving the controlling tether towards, then away for him/herself, will activate a band-pass filter that will create a sound comprising a small range of white noise.[107] The performable range of white noise in this composition is

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[105] Charuprakorn, pp. 139-49.

[106] Charuprakorn, pp. 151-59.

[107] Charuprakorn, pp. 144 and 156 for more description of the triggering gesture

between 0 – 5,500 hertz.[108] The position along a left-right axis at which a triggering gesture is performed will determine the frequential area of white noise that this gesture is going to create. According to the pre-programmed patch, the performer can play a single range of white noise, layer each range of filtered noise on top of each other, or simultaneously create a group of multiple ranges of filtered noise. In some sections, the player can also pan the sound to different speakers. Text score is used to provide information on how to control the device, how the patch works in each section, and how to perform or improvise from the given instructions.

The piece is structured by the differences in terms of musical material and spatialisation. For example, the performer is instructed to slowly layer individual filtered noise in section 1. A group of filtered noise, multiple individual ranges layered on top of one another or played simultaneously, will create a new timbre as it is a combination of noise in different frequential areas. Freedom to improvise will allow the performer to explore different timbres throughout the composition. In section 2 the performer is required to increase the intensity of actions and create more sounds while the patch is panning the sounds in different directions. The sounds generated by left or right tethers will be played on the left and right speakers respectively (in 'Stretches' any sounds created by performer 1 will be played on the left speaker and performer 2 on the right speaker). The music is built up to section 3 in which the triggering gesture will generate a group of filtered noise instead of an individual range. A frequency-based spatialisation, low and high frequencies sent to left and right speakers respectively, is also used in this section. The intensity and direction of the musical trajectory ascend to the big sustained sound in section 4. Sections 5 and 6 focus on the movement of sounds between two speakers (at sections 5 and 6 of 'Stretches', the sounds move through all four speakers clockwise or anti-clockwise surrounding the audience). The last section focuses

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[108] The patch actually divides the entire range of white noise, between 0 – 22,000 hertz, into 256 small ranges. Because of the limitation of the device, the performer can only control the first 64 ranges which are located within this frequential area.

on a rising single band of filtered noise and the spatialisation that corresponds to the movement of the performer. The musical trajectory of the piece has a clear development in terms of texture and spatialisation from a single sound, layers of sounds, a group of sounds with a static spatialisation, a group of sounds with a mobile spatialisation, until it arrives at a single sound at the end. Although the piece relies on the performer's improvisation, the pre-designed programmes of the patch will create different sonorities and sonic characteristics at different sections that help shape the musical trajectory of the entire composition.

The improvisatory nature of these pieces requires some level of control from the patch to assure the musical direction toward which the music should progress. Composing with the synthesis of filtered white noise and exploring with timbres introduced me to a wider range of sound. Apart from using pitch and manipulating sound spectrum that had been experimented earlier, frequency or frequential area became another aspect that I started to explore in my compositions.

Apart from the fragmentation of the text that has been discussed in Chapter 1, in '…with steps we take…'[109] I started to experiment with the organisation of musical materials within different registral areas; the changes in timbre and registral area became the musical trajectory of the composition. '…with steps we take…' is a composition for an ensemble with electronics. The piece synthesises three different recordings of ambient sounds, recordings of birds, recordings of cicadas, live performance of the ensemble, and the live processing of the sound of the ensemble. The three different kinds of ambient sounds are slightly different in terms of their sonic components. The first recording, used for around 45 seconds from the beginning, is noisier than the other two. The sonogram at example 3.3 shows that the recording contains noise in every frequential area. The other two recordings, used in between sections B-E and section F respectively, have less noise in the very high and low frequential areas.

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[109] Charuprakorn, pp. 17-28.

In these two recordings, there is dense noise only in two different areas which appear on the sonograms at examples 3.5 and 3.6 as two black horizontal bands lying throughout the sonograms. The gap of noise at the bottom area, the lighter area at the bottom of both sonograms, is within the range of 0 – 2,200 hertz, which is also within the normal range of musical instruments.[110]
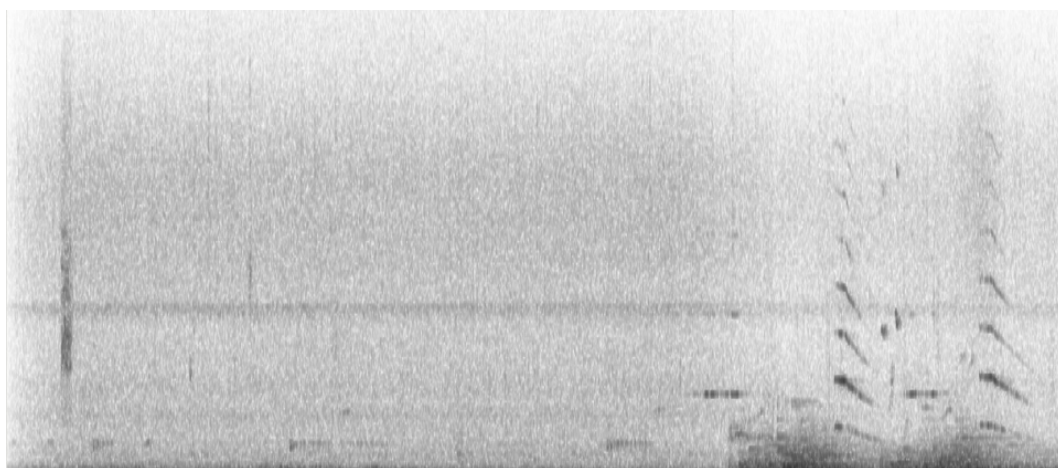
Example 3.3: Sonogram of the introduction and the beginning of section A (the descending lines on the

right represent sul ponticello on the violin)

Having studied these recordings, I had the idea of using distinctive sounds of each instrument within these gaps of noise in the recordings. In section A, it is clear that the ensemble is divided into two groups: the group of high sounds with bright timbres (high, metallic sound in the percussion and the molto sul ponticello sound on the violin) and the group of low, murmurous sounds (clarinet, piano, and tremolo sounds in the percussion). According to example 3.4, the sul ponticello materials on the violin and the scraping sounds on the percussion occupy a large spectral area while the low group only moves within the lowest gap of the background noise.[111]

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[110] If A4 is 440 hertz, C#7 is circa 2,200 hertz. This means that most of the fundamental frequencies of the notes produced by musical instruments are within this frequential area and most of the overtones are above.

[111] Recordings (CD1), track 04 from 0'40" or track 05 from 0'33"
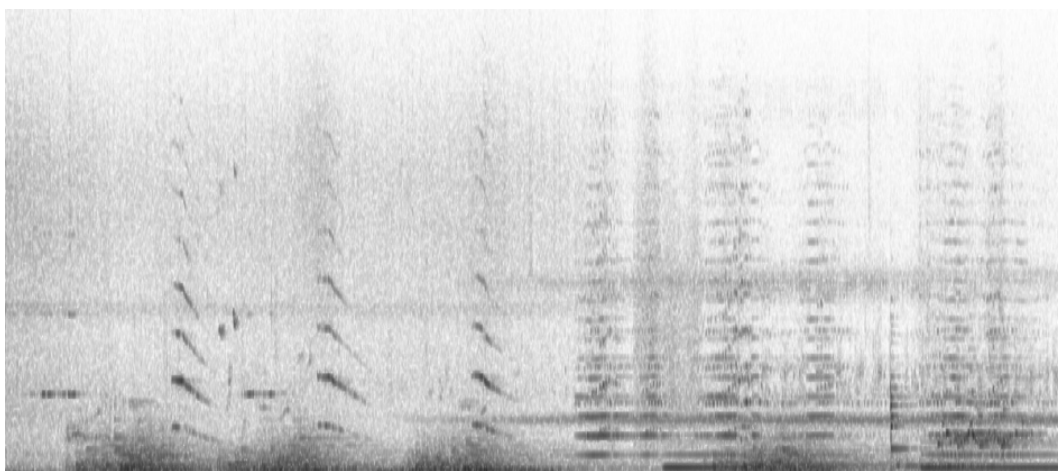
Example 3.4: Sonogram of section A showing sul ponticello passages on the violin and other low sounds

At section C, the ensemble is divided into three groups: high (high-frequency noise of the shaker), medium (high violin and piano), and low (clarinet's multiphonics). The sonogram at example 3.5 shows that each group occupies different spectral areas and alternately features within their own range.[112]
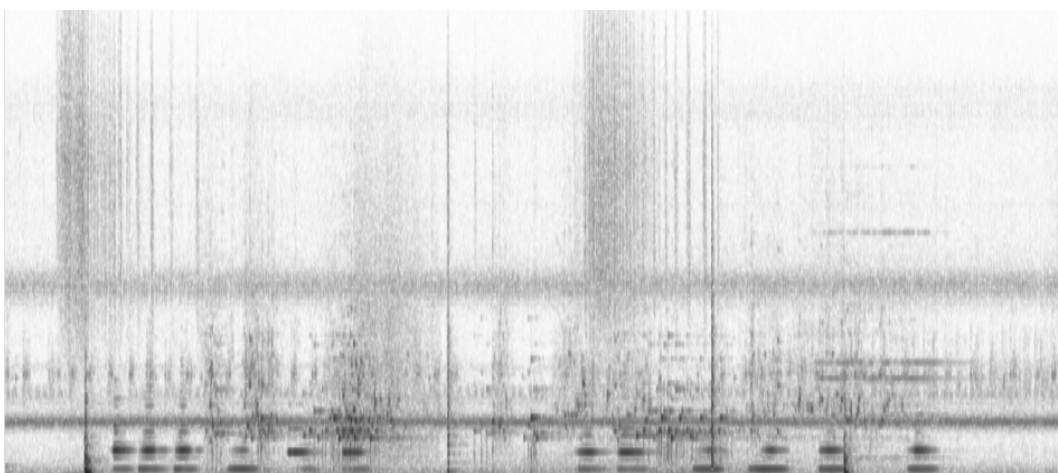
Example 3.5: Sonogram of section C showing two areas with dense noise and other musical materials in

high, medium, and low spectral areas

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[112] Recordings (CD1), track 04 from 2'30" or track 05 from 2'33"

When the background is filled with a different recording with a wider gap between the two bands of noise at the bottom in section F, the ensemble is split into three groups: high (shaker), mid (violin's col legno battuto and metallic, percussive sounds inside the piano), and low (soprano). Example 3.6 shows the wider gap and how each group fills its own frequential areas, especially the bottom gap that is occupied by the humming sounds from the soprano.[113]

Example 3.6: Sonogram of section F showing two areas with dense noise with a wider gap at the bottom
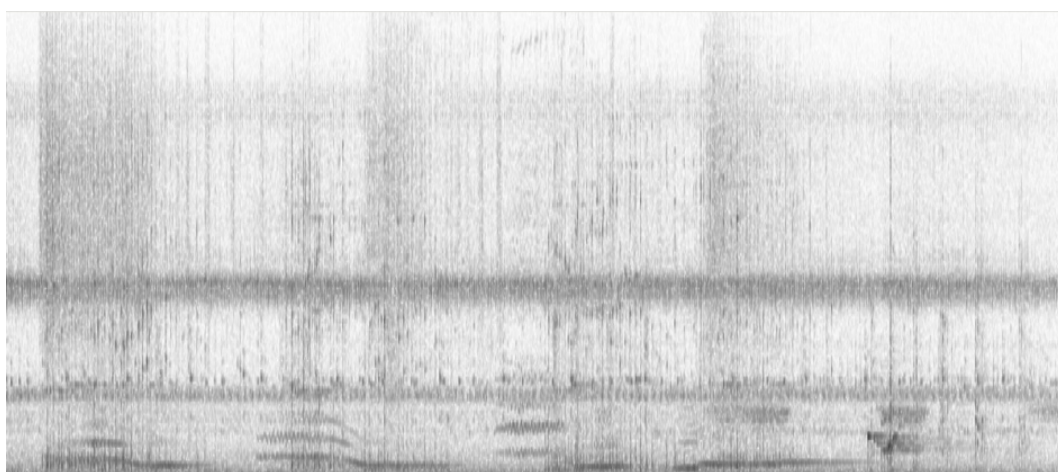
Another feature of this composition, apart from the organisation of musical materials of the background recordings and the ensemble in different spectral areas, is the live processing of the ensemble. In section B, the soprano interacts with the electronic track created by playing the recording of cicadas with the sound spectra of the ensemble recorded in section A. This sound processing is known as 'convolution'. In this situation, a spectral analysis is performed on both recordings of section A and cicadas. Instead of playing the recording of cicadas directly through the speakers, the recording is firstly combined with the spectral components of the recording of the ensemble before being sent to the speakers. Example 3.7 shows the sonogram of the original recording of the cicadas used during this process. It is apparent that it

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[113] Recordings (CD1), track 04 from 4'50" or track 05 from 5'00"

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comprises loud noise in a vast spectral area with softer noise in the instrumental register (below 2,200 hertz). By using this sound processing, it means that the actual sounds of the ensemble, such as the low, murmurous sounds of the clarinet, piano, and percussion or any other sounds within this frequential register, will not be heard as much as some overtones or any other sounds outside this area. Example 3.8 compares the sonograms of sections A and B. It is noticeable that the overtones of the sul ponticello passages on the violin are enhanced by this process. On the other hand, the groups of low sounds that appear at the bottom of the first sonogram are reduced in the others because of the same sound processing. Another live processing that is used to create ambiguity between live performance, background recordings, and processed sounds is the birdsongs in sections D and E. The patch will randomly trigger one of the recordings of birdsongs with a random spatialisation when the microphone picks up a loud attack. Therefore, the attacks from the clarinet, piano, and soprano on page 5 of the score will trigger one of the birdsongs.[114] This function of the patch is also used in section E. The density of the attacks increases towards the end of the section which results in multiple layers of birdsongs.
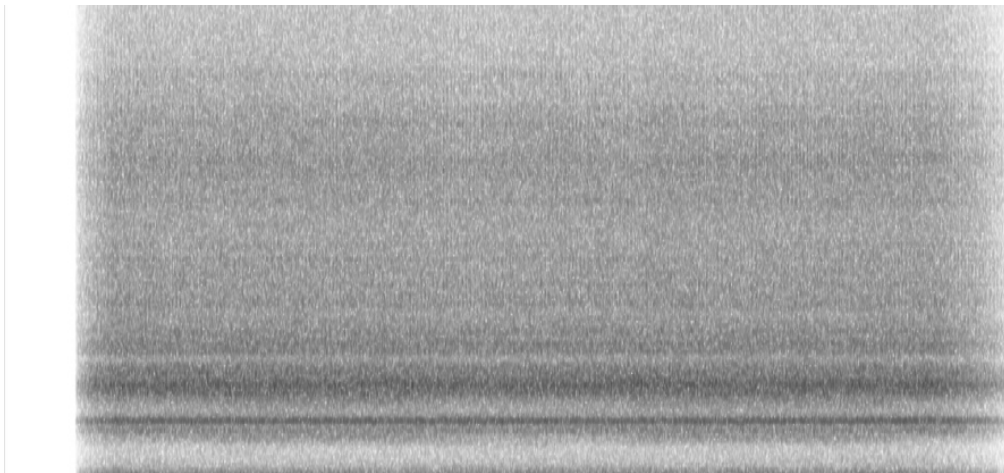
Example 3.7: Sonogram of the sounds of cicadas used for the sound processing (convolution)

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[114] Charuprakorn, p. 25.
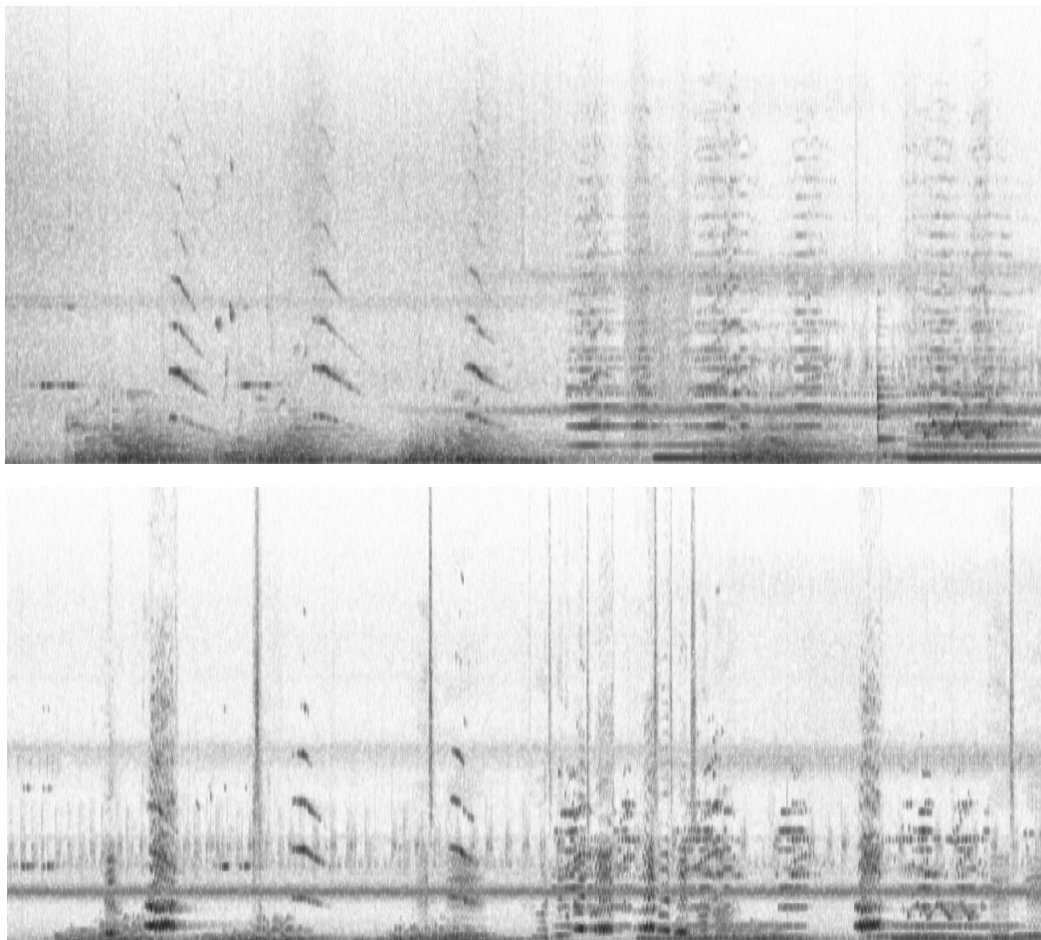
Example 3.8: Comparison of the sonograms of sections A (above) and B (below)

Working with electronics has changed my compositional approach drastically. The main focus of this entire research project regarding the use of rhythmic density and registral spacing as a musical trajectory might have derived from the experience with electroacoustic music. The treatment of musical materials and musical instruments in my acoustic compositions has been influenced by how I shape sounds in my electronic compositions. Vice versa, my prior experience with instrumental writing also has an influence on my treatment of electronics. Chance elements are incorporated in a patch in order to obtain a more organic outcome of the electronic part. The new electroacoustic sound world draws my attention away from the musical pitch. Registral areas, sound spectrum, timbre, spatialisation, sound processing, and other components of sound have become the tools that I use to form a musical trajectory of a composition. Electroacoustic music has now become an integral part of my artistic development.

Chapter 4: Fixed Notation, Proportional Notation, Text Score, and Notation for Electronics

In the first three chapters, I have discussed the compositional aspects with which I experimented during the course of this doctoral study. However, there has been issues regarding notation that constantly occur throughout the period which I would like to cover in this commentary as well. In the world of western classical music, notation plays an important role in transmitting messages and ideas from composers to performers. The conventional notation has become a 'universal agreement' among western classical musicians which is used as the standard communication in the practice. I have been interested in notation as I also believe that notation is the best medium of communication between myself and performers in order to achieve the utmost accuracy in expressing my musical ideas. The character of my compositions, almost every piece in this composition portfolio, sounds rather improvisatory in terms of rhythm or musical idea by having a lot of tied downbeats and no clear motifs or repetition of motifs. On the other hand, the music is notated quite meticulously which raised discussions during workshops, rehearsals, and composition lessons. Moreover, I have been curious about how I should notate the electronic parts such as a tape track or live processing in my compositions. This led me to study more on notation to find possibilities and more appropriate approaches to notation that will best deliver the musical ideas that I am trying to portray which also fits my compositional style. In this chapter, I will discuss the issues concerning notation, the uses of fixed and proportional notation, the use of text score, and notation for electronics.

Issues concerning notation

Throughout the course of this study various notation issues, such as the consideration of using barlines, time signatures, and precise rhythmic notation, emerged in different occasions; these issues offered me an invaluable opportunity to contemplate notation in my compositions and refine how I communicate with performers through notated scores. The very first composition that I composed was 'Never-ending

Torture' for harp and soprano, in which I was also exploring the concept of non-linearity in music. To enhance such concept, I decided to refrain from having measures by using no time signature or barline. Although every musical material was constructed from downbeats, I felt that a downbeat or a tempo should be used only as a point of reference in terms of how quickly time passes. The rhythmic notation and sub-divisions were also used only to show where each note is in time and to determine how fast each gesture is. In the composition for string quartet, in which I also explored the idea of non-linearity, I firstly used a similar approach of notation with no time signature or barline. However, as the piece involved more performers, having no reference of time for the performers caused some problems during the workshop. For the revision of the piece after the workshop, I decided to use barlines and time signatures with the description that barlines and time signatures are for orientation only and do not imply any strong beats.[115] This has become the standard of the notation of other compositions as the same description appears in other compositions as well.[116] However, I still received some suggestions from performers and other composers that this precise notation somewhat contradicts the sense of music that is free from having rhythmic motifs or regular beats. Therefore, I decided to look into different styles of notation in order to find a better solution to this issue.

I had taken into consideration Henry Cowell's innovation of rhythmic notation for unrhythmic or irregular rhythm by using different note heads as I believed that this might work for my compositions that do not rely on a regular rhythm.[117] Although this is a very good example of distancing from pulse-oriented music or notation, using a completely new system of notation, especially for rhythm, would require much more time for players to learn and be familiarised. Using a notation style that resembles Cowell's rhythmic notation might not be convenient in a workshop or a performance that does not have many rehearsals.

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[115] Charuprakorn, p. 46.

[116] Charuprakorn, pp. 32, 89, 100, 117, and 128.

[117] Henry Cowell, *New Musical Resources* (Cambridge: Cambridge University Press, 1996), pp. 58-59.

Moreover, I later found a thesis of W. L. Windsor which covers the prescriptive purpose of notation.[118] For the prescriptive purpose, a notation is used to prescribe the actions that performers have to perform in order to produce a specific sound. Therefore, if I consider the score to be the medium of communication that aims to inform performers of what they need to do, using conventional notation that musicians are used to can surely achieve the aim. This includes a specific registral spacing or the changes of such aspect that I intend to use as a musical trajectory of a composition as well. Although most of my compositions have irregular rhythm, using a conventional notation can provide the points of reference in terms of timing from which performers can produce any rhythmic sub-divisions in order to construct different rhythmic density that I intend to achieve.

Fixed notation

A conventional fixed notation, which is used in almost all of the compositions in the portfolio, helps provide necessary information regarding rhythm and register in order to create the musical trajectory that I design by considering the changes of registral spacing and rhythmic density of the composition. As mentioned above, this form of notation is widely understood and can be very precise and logical in terms of the order of attacks, density, and pitch. Lutosławski asserts that precise notation can 'prevent misunderstanding of composer's intention'.[119] Using a clear notation system makes it easier for me to control the spaces in both x and y axes of the music than using a proportional notation or an open score. Although my compositional style is rather aperiodic and somewhat free from relying on pulses or patterns, showing time signatures and what Kurt Stone defines as 'beat-units' can help performers understand where sounds and silence are in the music when the music has 'non-metric durations'.[120] According to Oscar Bianchi's presentation in a composition seminar at Cardiff University, a notation can be as precise as the

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[118] Windsor, 'A Perceptual Approach to the Description and Analysis of Acousmatic Music', p. 16.

[119] Skowron, *Lutosławski on Music*, p. 40.

[120] Kurt Stone, *Music Notation in the Twentieth Century: A Practical Guidebook* (New York: W. W. Norton, 1980), p. 94.

composer wants in order to provide sufficient information and achieve composer's intentions. However, it does not mean that everything has to sound perfectly like it is notated; precise notation can aim for something approximate.[121] It is true that a conventional fixed notation is a logical system that shows the optimal outcome of the performance which performers should aim to achieve, but this is not the reason I use such system. Because of the precision of the conventional notation, it can logically explain how the rhythmic density of a section or how the registral spacing of the ensemble changes. A fixed notation can clarify how a musical trajectory progresses with the changes in such aspects of a composition.

Proportional notation

I have had thoughts about using proportional notation instead of a fixed one as well. I could find the opportunity to explore it with some compositions involving electronics and the compositions that focus more on the interactions between players, not the precision of the music. Kurt Stone has described the characteristics of 'Spatial Notation' or 'Proportional Notation' that 'its durations are indicated through horizontal spacing or sounds and silences' and its 'measures [...] represent units of time [...], but not meter'.[122] Examples of a proportional notation that I studied during this research project are, among others, Morton Feldman's compositions. In 'Piano Piece (to Philip Guston)' and 'Last Pieces' the pitch of the musical ideas is fixed, but the composer does not indicate any precise timing. On the other hand, in the compositions from the 'Intersection' series and 'King of Denmark' the composer provides fixed timing for each material and leaves the pitch at performer's discretion. The compositions from my portfolio including 'Altered Exponents', 'Tea-Time', and 'A piece for household items' are notated with proportional notation as the timing of each musical event in the compositions is rather approximate and the compositions focus more on the interaction between performers or the performers and electronics. In '...with steps we take...'

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[121] The presentation took place on 12 March 2019 in Boyd Lecture Theatre, Cardiff University School of Music.

[122] Stone, p. 96.

the pitch or approximate registral areas are provided for the performers. However, the rhythmic aspect of each musical material is not fixed. This is also caused by the aim to facilitate the interactions between each instrument and the live-processed electronics. Apart from the interactions, it is clear that these compositions feature layers of musical materials that are juxtaposed to create a musical trajectory from the changes of rhythmic density of registral area. They do not rely on a 'note-against-note' relationship to show how the textural density and shape of the phrase change as seen in other instrumental compositions in the portfolio such as 'Quintet II' or 'Inching Phase'.

Text score

Another system of notation that I have explored in 'Stretches' and 'Stretches II' is a text score. Although a text score informs performers of what to do simply in a form of texts, it will not be effective with every composition, especially other compositions in this portfolio. I found using a text score appropriate for these particular compositions because they could not be realised by using fixed or proportional notations as a result of the technical limitations of the gestural device for which these pieces are composed. The patch is designed according to its 'approximate' nature of the instrument. Therefore, the notation has to facilitate the realisation of the piece. The performers cannot precisely use the controller to send specific data to the patch as the tethers send data dynamically from 0 to 4095 without any clear boundaries between the numbers.[123] To realise the compositions, only rough ideas of the intended sounds are given to the performers along with the information concerning how to execute. The performers are required to memorise only one or two gestures per section, for instance, a 'triggering gesture'; the patch and its timer will change the setting automatically. It is clear that the nature of the instrument, the patch,

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[123] Although the data can be scaled into smaller steps such as 1-10 instead, the range of each number still cannot be clearly identified.

and the composition need the instruction in a form of text score which will ease the realisation process of the performers.

Notation for electronics

As some of my compositions involve electronics, finding an appropriate notation for the electronic part that could give sufficient information to the performers and electronic operators has also been the aim of the study of notation. Although I operated the electronics by myself in all of the performances of the compositions with electronics in the portfolio, some pieces required the performers to interact with the electronic track. Therefore, having a clear notation of the electronic part could help the performers follow the electronics which could definitely save a lot of rehearsing time. Pierre Schaeffer asserts that 'notation only represents musical ideas, not physical sound.'[124] By combining Schaeffer's statement with Windsor's definition of 'descriptive notation',[125] the notation for an electronic part should aim to briefly show how the electronic track 'sounds' like so that the performers can follow and interact with their parts. In Elaine Gould's presentation at Cardiff University, she suggested that a score of a composition with electronics should show the performers what is happening in the electronic part.[126] The information regarding how to operate the patch may not be necessary on the scores anymore as electronic patches these days are pre-programmed and a lot easier to operate, for example pressing one button can change several settings simultaneously. In the score of 'Tea-Time', I used graphic representations of the electronic track along with other written information to assist the singer. It is possible to conclude that the notation for electronics in my compositions is used as a guideline to provide rough ideas of what is happening in the

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[124] Pierre Schaeffer, *Treatise on Musical Objects*, trans. by Christine North and John Dack (Oakland: University of California Press, 2017), p. 17.

[125] Windsor, 'A Perceptual Approach to the Description and Analysis of Acousmatic Music', p. 16.

[126] The presentation was part of a composition seminar on 8 October 2018 at Boyd Lecture Theatre, Cardiff University School of Music.

electronic part for both performers and technicians; any other necessary information is included in the performance notes.

To conclude, a conventional fixed notation is widely used in most of my compositions presented in the portfolio as it is a precise system that can show the construction of a musical idea regarding rhythm and pitch; this greatly benefits the attempt to use the changes of rhythmic density and registral spacing as the musical trajectory of a composition. I have also experimented with proportional notation in the compositions that are more flexible and focus more on the interactions between the performers. Text scores are used in the compositions that rely on the improvisation of the performers. The study of various types of notation has helped me understand the purposes and advantages of different notation systems. The key to this matter is to choose the notation that best portrays certain musical ideas or musical characteristics of each particular composition.

Conclusion

In this academic commentary I have shown, alongside the excerpts of my original compositions, how a musical trajectory can be formed by using the transmutations of registral spacing and rhythmic density. It has also shown other aspects that contribute to the completion of this research. I have discussed the notion of abstraction in music which can be interpreted as the act of distancing from conventions and also the notion that what music expresses is musical ideas and the interactions of sounds or musical materials. As other composers in the past have explored, combining and organising musical materials and its characteristics in different ways can still create a musical trajectory with which the music progresses.

In the early stage, I explored the concept of non-linearity by using the fragmentation of the texts, a sectional form, and a musical trajectory that relies on the change of musical characteristics in different sections. Later in the research, registral spacing and rhythmic density have become the musical aspects on which I pay much attention. During a compositional process I consider vertical spacing, such as registral spacing, harmonic spacing, frequential and registral areas, and horizontal spacing, such as rhythmic density and the density of attacks, to be the primary musical materials. How these aspects and other musical characteristics change throughout the sections form the musical trajectory of a composition. The experience with electronics has also pushed my compositional boundaries further and electroacoustic composition has become another area that I will maintain to explore. My artistic development has been honed by the experience with both electroacoustic and instrumental compositions. The study on notation also has a significant influence on how I notate my compositions in order to deliver the most accurate messages to performers. More importantly, an appropriate notation can show the interaction of musical materials and enhance how the musical trajectory of a composition is created from the transmutation of its registral spacing and rhythmic density.

This research has changed my compositional process and how I perceive other compositions as well. I believe that there are countless possibilities that I can explore this concept further with other types of ensemble or completely different mediums. I would like to conclude this thesis with Joshua Fineberg's statement that 'music is sound evolving in time'. [127] I have shown with the portfolio and the commentary that the sound evolving in terms of its registral spacing and rhythmic density can become a musical trajectory in a contemporary musical composition.

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[127] Joshua Fineberg, 'Spectral Music', *Contemporary Music Review*, ed. by Joshua Fineberg, 19 (2000), part 2, 1-5 (p. 2).

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Appendix

The score of 'Original Exponents'

Original Exponents *for 37-key melodica and electronics*

Poumpak Charuprakorn (2018)

Original Exponents is a composition for melodica and electronics in which its initial ten minutes is expanded into a one-hour cycle through repetition, randomisation, and juxtaposition of musical ideas by both performer and computer. The opening section features five small distinctive segments that vary in length and also explore different sonority, range, speed, gesture, and character of a melodica. Within the cycle, the transformed main section reappears at four points separated by various lengths of silence. The composition aims to provide the experience when the succession and duration of events are, to some extent, indeterminate.

melodica - *pause* - melodica with electronics 1 - *pause* - electronics 1+2 - *pause* - electronics 1+2 with melodica - *pause* - electronics 1+2 with melodica (random order) - **pause**

Lengths of *pauses*: 1' 00", 1' 15", 1' 45", 2' 30", and 3' 30"

The last **pause** has to be 3' 30"; the rest can be in any lengths but each can only be used once.

The underlined inner sections can be swapped.

One system equals 1 minute

The music is rhythmically free but should be proportional to its position in a system

The beginning of each section has to be exact (at 0' 00", 1' 00", 2' 15", 4' 00", and 6' 30")

Grace notes should be played as fast as possible

All notes except grace notes should be sustained in proportion to other notes in the system

When tremolo is indicated, hold the higher note and rapidly press/depress the other one below

Bisbigliando = play the given note and rapidly press/depress other keys in 1-2 octaves above the main note

Accidental only affects the note to which it is attached

The electronics part operates on Max MSP. Please contact the composer for the patch.