Composition for classical guitar and live electronics
exploring note, nodal and noise qualities in extended instrumental techniques

Glover, Joshua J.

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Composition for Classical Guitar and Live Electronics: Exploring Note, Nodal and Noise Qualities in Extended Instrumental Techniques

Joshua J. Glover

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Table of Content

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Abstract

Contents of portfolio:

1. Printed Score and Audio CD for *Extensions: for Classical Guitar and Digital Delays*;
2. Supporting Written Documentation with Critical Commentary

This portfolio explores the note, nodal and noise qualities of instrumental techniques on the classical guitar and their possible integration into electroacoustic music. It proposes that Smalley's *Spectral Typology*, from his *Spectromorphology and Structuring Processes* (1986), can be used to quantify instrumental techniques and interpret their musical properties through the evocative descriptions are attributed to them.

This supporting documentation contains an overview of Smalley's article and discusses the biases, amongst members of the electroacoustic community, towards acoustic instruments. It also presents two case studies on Panayiotis Kokoras' *Slide for Guitar and Electronics* (2002), and Jerome Combier's *Kogarashi for Guitars & Live Electronics* (2002) which interrogate note, nodal and noise qualities through different mediums of electroacoustic composition.

My own work, *Extensions for Classical Guitar and Digital Delays* (2014) explores the evocative definition of nodal qualities as a compositional catalyst for texture and gesture forming.

Audio CD Information:

1. *Extensions*: I. - 3' 32''
2. *Extensions*: II. - 5' 11''
3. *Extensions*: III. - 8' 13''
4. *Extensions*: IV. - 5' 10''
5. *Extensions*: V. - 4' 30''

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I cannot thank enough, the vital, warm and constant support of my family and friends who have enabled my to pursue my study with the highest of confidence and stability: their support cannot be understated.

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1.1 Introduction

This portfolio explores the relationship between Denis Smalley's *Spectral Typology* (Smalley 1986) and the instrumental techniques of the classical guitar. In *Extensions for Classical Guitar and Digital Delays* (2014) I utilise the evocative descriptions of nodal qualities as a catalyst for the composition process, engaging with the physical and harmonic restrictions of the instrument to develop composition methods that transform pitch qualities into nodal textures and gestures.

This portfolio has two aims: the first is to explore the note, nodal and noise qualities in instrumental techniques; and the second, is to understand how these techniques have been incorporated into the practices of current composers. Its purpose is to extend the particularly descriptive notions of note, nodal and noise qualities from electroacoustic literature into instrumental music, illustrating the creative compositional potential of an evocative language. It also investigates the notion that acoustic instruments are limited in terms of their nodal and noise qualities and discusses how composers have subverted these limitation in current literature.

This inquiry into the nature of sonic properties on the classical guitar is both a personal and academically influenced one. Formally as a guitarist, I was unsettled by the constant tonal references the instrument evokes in most modern music; it seems to function incidentally rather than musically. This project on a personal level is a reinvention of the instrument. Academically it links my interests in descriptive tools and compositional languages.

This supporting written document consists of six chapters each denoting the influences, limitations and processes of investigation for this project. The purpose is to acquaint the reader with the research parameters and composition methods generated from note, nodal and noise qualities.

Chapter 2 outlines and evaluates the vocabulary of Smalley's *Spectral Typology* (ibid.) and its descriptions of note, nodal and noise qualities. It discusses the perceptions of instrumental techniques by members of the electroacoustic community and states the boundaries for this study, its assumptions and rational.

Chapter 3 details the research design of this portfolio, appropriating its methods and tools for the musical composition, commentary and case studies; which analyse the artistic interpretations of note, nodal and noise qualities. It also presents Smalley's *Typology* as a method for quantifying sounds and the sonogram as a way of visualising a sound's spectral content.

Chapter 4 is a critical commentary on *Extensions.* It discusses the catalyst for the work, the limitations of the instrument and the compositional framework designed to subvert these limitations. It also analyses the spectral content of textures and gestures that attempt to generate nodal qualities.

Chapter 5 presents two case studies of Panayiotis Kokoras' *Slide for Guitar and Electronics* (2002) and Jerome Combier's *Kogarashi for Guitar and Live Electronics* (2002). It details their compositional output, framework, aesthetic influences and analyses the note, nodal and noise qualities of their work. It also discusses the expressive potential of different mediums (mixed-media & live electronic) in electroacoustic music.

Chapter 6 is a summary of the portfolio and its findings. It discusses the potential application of Smalley's *typology* to other acoustic instruments, and suggests that the evocative vocabulary with which he describes these qualities can function as a link between electroacoustic and instrumental composition practices.

2.1 Literature Review

2.2 Background

In acoustic literature, instrumental techniques and their sonic qualities are scarcely discussed outside of a musical score. Traditionally they are presented through an action-based or descriptive notation; the former details articulative methods to the performer; and the latter describes an approximate sounding result. Although for the acoustic composer incorporating these sounds into their practice requires only aural memory. For the electroacoustic composer it provides limited information on the behaviours and timbre of a sound: the perception of sonic capabilities are obscured by metaphorical and mechanical communication. In order to relate the acoustic properties of instrumental techniques to the perceptive faculties of the electroacoustic composer, we need to review and understand the methods of categorising these sound based on their qualities. Furthermore, highlighting the perceptions of instrumental material by members of the electroacoustic community will clarify why these categories of quality have not been attributed to acoustic instruments in the past.

The aim of this chapter is to acquaint the reader with the notions of note, nodal and noise based sounds and the perceptions of acoustic instruments as their source. By presenting them, the reader should gain a better insight into what these sound types are and how they are used in this study, and the biases held towards acoustic instruments as a source for these types of sounds. The literature reviewed in this chapter begins with Smalley's *Spectral Typology,* from *Spectro-morphology and Structuring Processes* (1986), and concludes with a general review of the perceptions of orchestral instruments as a source for nodal and noise qualities.

2.3 Review of Smalley's *Spectral Typology* and the *Note-Noise Continuum*

Denis Smalley's *Spectral Typology* and the *Note-Noise Continuum* from his article *Spectromorphology and Structuring Processes* (1986) details and describes the qualities of three distinct sound types: note, nodal and noise. All three distill the listening experience into categories based on the aural perceptions of a sound's spectrum, which 'encompasses the totality of perceptible frequencies' (Smalley 1986: 65).

Figure 2.1: Note to Noise Continuum (Smalley 1986: 65) - illustrates the spectral typology for sounds.

Smalley defines the *note proper* as a sound type that focuses the listener's attention upon a fundamental rather than its overtones: 'the note may be spectrally coloured' but 'we are more interested in its fundamental pitch than its overtones' (ibid: 66). The *harmonic* and *inharmonic spectrum* subvert the listener's attention away from the fundamental and towards its natural or remodelled overtones; in the *harmonic spectrum* 'intervals of the harmonic series govern' (ibid.); *inharmonic* qualities are only available through computer manipulation in which a sound's spectrum has been remodelled based on the composers' aesthetic notions and/or compositional frameworks. The *nodal* quality is a 'band or knot sound which resists pitch identification' (ibid: 67); it may contain the *note proper* but its spectral density, like clusters of notes on the piano, make the perception of these qualities difficult to distinguish. *Noise* 'is so compressed that it is impossible to hear any internal pitch structure' (ibid.); examples can be drawn to the sound of the ocean and wind.

The most pertinent and engaging aspects of Smalley's *Typology* are that it offers (1) a method for sounds to be categorised based on their spectral content, and (2) a way for these sounds to be interpreted based on the author's evocative descriptions. The latter, although not originally proposed by Smalley, can be viewed as an extension of language. It creates a link directly between the descriptive elements of the language and potential influences on the composition process: the descriptive influences the musical. An example of this is the description of nodal qualities as sound that 'resist pitch identification' (ibid: 67). The word *resist* is particularly strong, it evokes a musical scenario where sound is struggling against, perhaps even from, a pitched counterpart forcing it to enter into dialogue. There is a degree of subjectivity in generating these scenarios, the language functions more as a catalyst for a creative enterprise, rather than a detailed structural layout.

In literature, the visual aspects of Smalley's language have been utilised as both a compositional framework and as an analytical tool; see Blackburn's *The Visual Sound-Shapes of Spectromorphology: an illustrative guide to composition* (2011) and Hirst's *A Cognitive Framework for the Analysis of Acousmatic Music: Analysing Wind Chimes by Denis Smalley.* (2008). Rather than utilising the *note-noise continuum*, both focus on the morphological aspects of the vocabulary, forming visual sound-shapes that represent the aural experience.

The *spectral typology* has been published in two forms: the original 1986 publication, which is used in this study; and the revised 1997 article *Spectromorphology: Explaining Sound-shape*. Instinctively one might associate the most recent iteration of the *typology* as superior, given the time that has passed since its inception, and the popularity of its amended *morphological* counterpart. There are however several alterations in this recent article that limit the way practitioners can incorporate the *typology* into their creative practices. These alterations require further clarification to illustrate the importance of the earlier article on this study.

The 1986 article is reliant on the *typology* as a way of categorising different sound types - which aids the listener's ability to quantify the musical experience. It is then combined with the *morphological* vocabulary, which one can use to study a sound's shape and

spectral architecture, to form a *spectromorphological* description of a sound. There is a similar attempt to combine these in the 1997 article. However the scope of the typology, and consequently its importance in the spectromorphological vocabulary is greatly reduced.

There are two alterations to the typology that warrant discussion. The first, which eliminates the nodal category[1], requires the listener to think of sounds as either note or noise with an undefined and vague middle ground. Here any comprehension of sounds as a complex phenomena is hindered by a *typology* that forces them into opposing categories; sounds are varied and rarely fit into well defined boxes. An advantage of the earlier publication is that sounds can be quantified along a continuum, taking into account sonic variety: the *typology* offers a method of approximating types of sounds for analytical convenience. The second alteration, which removes the evocative definitions of the *spectral typology*, limits the possible subjective interactions one can have with Smalley's language. Consequently, developments in compositional and analytical practices, paralleling the work of Blackburn and Hirst, are limited by the lack of an engaging vocabulary.

This portfolio intends to expand upon the visual notions of the *spectromorphological* vocabulary by utilising the descriptive qualities of the *note-noise continuum* to influence and inform the composition process.

2.4 General Review of the Perceptions of Acoustic Instruments

One concurrent issue that arises in the discussion of orchestral instruments and their potential incorporation into electroacoustic music, is the notion that nodal and noise qualities have been eliminated from orchestral instruments as they have been perfected over the centuries. This review discusses the perceptions of these instruments as a viable source for nodal and noise qualities and details examples in which these qualities are present. An example of this perception can be found in Emmerson's *Living Electronic*

[1] *Note* and *nodal* categories become *note.*

Music (2007), in which the author discusses the vibrancy of acousmatic music against the backdrop of fixed instrumental practices:

> The acousmatic world has no boundaries while that of the western instrument has developed with an increasing elimination of all but a narrow range of timbre variation, the promotion of stable and fixed pitch, fixed noise and, perhaps most important the virtual elimination of noise components. (Emmerson 2007: 104)

The potency of non-instrumental sounds then, for the electroacoustic composer, imposes limitations on the 'quality' of source material. In this respect, all sounds regardless of their sources, imperfections and errors are treated as sonically viable material. The vibrancy of acoustic errors and noise qualities is also detailed by Emmerson:

> Noise is a fundamental source of information about the world and pitch can only indicate a single dimension (a length). So-called errors and noise components have the potential to give us extensive additional information on other dimensions, materials and actions, and their relationships. We need of an acoustic of all sound, unconstrained by (though not ignoring) that of the traditional musical instruments of the world. (Emmerson 2007: 20)

This boundary between electroacoustic music and acoustic instruments is particularly troubling as an instrument's musical potential appears to be restrained. There needs to be a connection which unifies the sonic capabilities of acoustic instruments with the sonic palette of the electroacoustic composer.

Such connections have been made by Smalley and Wishart, in which an ensemble of western instruments functions as a large musical organism that generates a mass of spectrally dense musical material:

> In this music there is often a loss of instrumental identity as the orchestra is 'resynthesised' into a kind of spectromorphological hyper-instrument. While we may sometimes be conscious of instrumental identity, we can equally be persuaded to forget individual note-gestures as these individuals are subsumed in streams and collective motions. (Smalley 1999: 109)

Wishart, similarly acknowledges the sonic capabilities of an instrumental mass, in:

> Penderecki's *Polymorphia*, we have a fairly typical example of this composer's approach to composing music which no longer conforms to traditional lattice (pitch structures). In particular, he uses thick groupings of pitches only a quarter-tone apart and also textural aggregates of sounds with no, or ambiguous, pitch content. (Wishart 1985: 32)

One can also draw parallels between this larger musical organism, which generates spectrally vibrant material and the practices of the spectral composers Grisey and Murail; the work of Xenakis; Lachenmann and his process of *musique concrète instrumentale*; and Ligeti's concept of *micropolyphony.*

2.5 Summary and Implications

This chapter has presented a review of Smalley's *Spectral Typology* and a general review into the perceptions and limitations of acoustic instruments and their potential as a larger, unified, musical organism. Smalley's *Typology* presented note, nodal and noise qualities. The general review discussed the natural acoustic limitations of a solo instrument, and presented a method for subverting them by creating a larger musical organism. As a result of this review, this project needs to consider the limitations of the guitar as a solo instrument and devise a compositional framework that draws on the suggestions from Smalley and Wishart; indicating that spectrally dense acoustic music can be generated by multiple instruments sounding at once.

3.1 Research Design

This chapter describes the research design adopted by this project and is divided into three sections: the first details the assumptions and considerations of the research and the researcher; the second discusses and justifies the research design; and the third lists research tools. The conclusion will summarise all of the above and discuss the potential problems and limitations of the project.

The research aims are restated below to remove any inference between chapters:

> (1) To explore the note, nodal and noise based qualities in instrumental techniques on the classical guitar;
> (2) To understand how these instrumental techniques and sonic qualities are incorporated into the compositional practices of current composers.

3.2 Assumptions and Methodological Criterion

Before discussing the design of this project it is important to frequent the reader with any assumptions that underpin this project; these are connected either to individual research aims or to the biases of the researcher. By acknowledging them, one may begin to generate appropriate tools for the project: transforming assumptions into methodological criteria.

The aims and nature of this project present two assumptions: the first is an objective and quantifiable view of sounds based on their spectral qualities; and the second is the subjective, namely artistic, interpretations of sounds. The latter is relevant to my engagement with sound as a composer and the former is vital to the understanding of sonic qualities on the classical guitar. Both act as if valuable knowledge can be gained from either process and when used in combination they aim to unify these objective and subjective elements, in turn creating a deeper understanding of the research area.

One can form a methodological criteria for selecting research methods when these assumptions are rephrased into questions:

(1) What objective methods or tools can be used to understand the note, nodal and noise qualities of instrumental techniques?;
(2) How can compositions exploring these sounds and techniques create a deeper understanding of the classical guitar's potential?

3.3 Research Methods

The following section will discuss the research methods used in this project and will justify their placement in this study. The aim is to introduce the reader to the methods and to any specific limitations or boundaries placed on the study. The research design intends to reflect upon the applications of the *spectral typology* in two ways: (1) primarily as a catalyst for creative output; and (2) secondarily as an analytical device that can create distinctions between different types of sounds. The methods are as follows:

(1) Musical Composition and Critical Commentary;
(2) Case Studies.

Both methods differ greatly in how the researcher applies himself: the composition process is a period of creative focus, the researcher is linked subjectively into the process of musical investigation; the case studies require the ability to reflect critically upon the works of others - there is a degree of separation between the researcher and cases. The order of these methods is imperative to the success of this study as any one method can directly influence the other - even on a subconscious level. This potential influence is particularly troubling when one considers the integrity and legitimacy of the composition process, which involves a deeply subjective interrogation of the research area. To illustrate this, if one conducted the case studies before the composition process, the repertoire under investigation (which is exploring the sonic qualities of the classical guitar) could directly influence the researcher's composition practice. In turn, this could lead to the reproduction or filtering of previously studied music. In an attempt to reduce this influence, the above methodological order has been selected.

3.3.1 Musical Composition and Critical Commentary

Underpinning my engagement with the research area is the assumption that creative interpretation is vital to the understanding of note, nodal and noise qualities. As a composer, my main focus is to produce a composition utilising these sounds so that it may present, through musical discourse, essential and rather useful information about these qualities and their integration into acoustic music. It is important to acknowledge that a musical work on its own is not completely informative and the comprehension of certain key principles may be misinterpreted or missed completely if not stated formally; this only applies to a research project with outcomes that are relevant to practitioners and researchers. Therefore, it is essential to provide the reader with a critical commentary detailing how the research area has been explored in the work; this also involves a clarification of the musical context in which material has been place.

The following section will define the practical criteria for the composition process and propose a structure for the critical commentary.

3.3.2 Composition

The process of musical composition is both a technical and aesthetic process, dealing with the organisation of material according to the composer's perceptions of the subject matter and the technical parameters and strategies one assigns to them:

> These strategies, which combine technique competence with aesthetic resolve, interact with each other at many levels to guide the creative process and define hierarchies of musical elements. The need for unity within musical discourse is the basis for a set of regulations that are expected to aid the generation of coherent music expression. (Sigal 2009: 15).

These composition regulations consist of a practical criteria that signpost, limit and ground the work in the subject matter, whilst preserving a creative environment in which the composer can still be highly expressive. Most of the criteria were defined in my initial proposal for this project, and others, like the duration of the work were subject to discussion with my Director of Studies. The criteria is as follows:

1. Composition of approximately twenty minutes in length;
2. Grounded in the live electronics or mixed-media settings;
3. Exploring at least two of the note, nodal and noise qualities.

A difficulty arrises in exploring note, nodal and noise qualities that warrants further discussion. Firstly, a tool needs to be developed to study and analyse musical structures to see if they actually contain these qualities - discussed in 3.4.1; second, a process informed by this tool needs to be developed so nodal and/or noise qualities can be explored; if these qualities are not present in the final composition then the research project will have failed to investigate their potential in acoustic music.

This process consists of three steps: (1) the composition of individual lines; (2) the recording and superimposing of these lines in Pro Tools; and (3) the assessment of nodal qualities via a sonogram. This process will be repeated if nodal qualities are not present. The initial generation of musical material, rather than trying to emulate the nodal scenarios of electroacoustic music, should be informed though the descriptive parameters of Smalley’s language (discussed later).

3.3.3 Critical Commentary

Musical composition has two agendas: the first is that of the composer's aesthetic notions and knowledge of the musical material in question; the second is the framework for the composition, which establishes the form and methods of interrogating this material. Aesthetic notions are an interpretive device and directly affect both the musical material and the framework for the composition. Understanding these agendas and their relationships between one another is essential in detailing how note, nodal and noise-based sounds may be incorporated into acoustic composition. A problematic aspect of composition is that the music, although directly linked to these agendas as a product of their methods, cannot accurately articulate the decisions that lead to its creation: total comprehension of the aural experience as a research process requires additional information.

A critical written commentary has been selected as the method for detailing these compositional agendas. It will discuss and justify the actions of both the composer, and individual musical structures; this includes the formal harmonic and melodic principles and any use of external effects like digital delays, or live electronics. The following structure will be utilised for the commentary:

1. Introduction to Main Aspects of the Composition;
2. Structure and Form;
3. Principle Music Elements;
    3.1. Harmony,
    3.2. Thematic Ideas,
    3.3. Rhythm,
4. Discussion of Electroacoustic Technology;
5. Concert Presentation;
6. Note, Nodal and Noise-based Examples;
7. Summary.

It is important to note that the commentary does not focus on isolated examples of note, nodal or noise qualities, instead it has to recognise the context of the work and how each element of the music contributes to a network of relationships that evoke these qualities; larger gestures or phrases may serve as an example.

3.3.4 Case Studies

Just as a single musical composition requires a commentary to discuss, present and introduce vital information about the work, so does a composition need to be contextualised and understood in the wider scope of musical expression. Expression in this instance refers to the integration of note, nodal and noise-based sounds into a composer's composition practice. Contextualisation places this study and its musical composition into familiar and existing musical literature that interrogates the phenomena of sound types though different aesthetic notions. The assessment of other compositions, the qualities they explore and the manner in which they are interpreted will validate this project and confirm or refute its aims and objectives.

The case study method, developed by Robert K. Yin, is an integral part of this wider contextualisation and confirmation. It recognises at the forefront of its investigative process the need and relevance of context to a phenomena, which in this case happens to be musical compositions:

> The major rationale for using this method is when your investigation must cover both a particular *phenomenon* and the *context* within which the phenomenon is occurring, either because (a) the context is hypothesised to contain important explanatory variables about the phenomenon or (b) the boundaries between phenomenon and context are not clearly evident. (Kin 1993: 31)

The need to ground the interpretation practices of a composer into the discussion of sonic properties is essential to the success of this project. Without the recognition of the composer's aesthetic principles and composition style, the project fails to answer its fundamental question on the possible integrations of these musical elements.

There are several considerations one must make before pursuing this method, namely: how many works will be selected?; what is the selection criteria?; and what limitations, if any, will be placed on the selection process? Limitations and selection criteria are important as they narrow all probable compositions, which in preliminary research amounted to over fifty, to ones that fit the specific needs of this project.

To answer these questions there must be a set of criteria that refine and limit the remit of this project and its possible cases. The selection criterion is divided into two sections, one for the composition and one for the composer. It is as follows:

(1) Composition;
   a. It must involve live classical guitar playing,
   b. It must have scores and audio available,
   c. It must use at least two of the three sound types (i.e. note, nodal and/or noise),
   d. The work must be written for mixed-media, live electronics or digital playback.

(2) Composer;
   a. The composer must have an existing body of compositions in his current aesthetic practice.

This criteria attends to several key issues; the first is practical, dealing with the availability of musical scores and audio, without which no study could take place; the second refines the project to a set of mediums, all of which encourage different relationships between the composer and the sonic material; and the third limits the amount of sonic qualities present in the work.

Two compositions were selected under the case study criteria, both of which present an array of note, nodal, and noise material. The works selected are as follows - for audio links please see the bibliography:

(1) Panayiotis Kokoras: *Slide for Guitar and Electronics* (2002);
(2) Jerome Combier: *Kogarashi for Guitar and Live Electronics* (2002).

The works approach the guitar from two polarising aesthetics: *Slide* explores the concrete nature of the guitar by guiding the listener's attention to the unheard sounds of the instrument; and *Kogarashi* utilises the guitar and its live transformations as a metaphorical device - see case studies for detailed introductions.

It should be noted that these works do not necessarily utilise the *spectral typology* directly, and there is no mention of it by the composers; however, their music can be quantified under its parameters. The knowledge one could gain from studying their music in this manner is not merely practical (i.e., a method of quantification), but also a method of linking electroacoustic and acoustic disciplines through a singular set of sonic criteria; which have no particular bias to either discipline[2]. This is not an attempt to merge disciplines as their separation is necessary, but it is a step towards highlighting their similarities and the practical applications of a unified sonic criteria.

[2] Although Smalley initially conceived the *spectromorphological language* as a tool to describe electroacoustic music, large aspects of its vocabulary speak more generally of structures in music.

The structure for each of case studies will be identical and is as follows:

(1) Biography of Composer;
   a. *Biographical Information,*
   b. *Aesthetic Notions and Compositional Practices,*
   c. *Key Works,*
      i. *Illustration of compositional praxis,*
      ii. *Illustration of aesthetic notions,*
(2) Introduction to Composition for Guitar;
   a. *Why was the composition selected?*
   b. *What does it intend to present to the listener?*
   c. *How did the composer achieve this?*
(3) Assessment of Note, Nodal and Noise Qualities;
   a. *Example 1,*
   b. *Example 2,*
   c. *Example 3,*
(4) Conclusion;
   a. *Review of Note, Nodal and Noise Qualities.*

The structure for these case studies has been selected because it grounds the note, nodal and/ or noise qualities of the work in two musical contexts; the first is that of the work itself and the particular narrative it possesses; the second is that of the composer's larger body of work and his prevailing aesthetic notions, examples from this body will also connect these sonic qualities to his interpretive practices.

3.4 Research Tools

In order to understand note, nodal and noise qualities and their incorporation into electroacoustic music, one needs to develop tools to quantify and study their qualities. The audible experience of these sounds alone is not enough as it details nothing about its absolute qualities; although the aural experience can be articulated, the descriptive vocabulary one attributes to them may be misinterpreted. To understand these qualities in more detail there needs to be an objective tool to view of these sounds.

The following section, reviews and details the two research tools used in this project: the first is Smalley's *Spectral Typology* & the *Note-Noise Continuum* (Smalley 1986) which proposes the concepts and quantifiable parameters of note, nodal and noise qualities; the second, is the sonogram which presents the spectral content of a sound visually. This visual representation is an aid to the aural experience, it does not replace that experience, it merely supports and confirms particular qualities in the sound.

3.4.1 Spectral Typology & Note-Noise Continumm

Smalley's *Spectral Typology & Note-noise Continuum* (ibid.) was initially introduced in the literature review, both are essential in the discussion of instrumental sounds, assigning their qualities, based on their spectral content, to note, nodal or noise categories. The following section will detail the terminology and definitions to be used in this project, they are as follows:

(1) Note;
   a. note proper,
   b. harmonic spectrum,
   c. inharmonic spectrum,
(2) Node;
(3) Noise.

These three types are used to quantify and discuss the spectral qualities present in instrumental techniques on the classical guitar. The *note proper* carries the strongest connections to traditional music, consisting of a fundamental and harmonic and inharmonic overtones; *harmonic* and *inharmonic* qualities can be emphasised either through instrumental techniques or by filtering its spectral components. *Nodal* qualities 'resist pitch identification' (Smalley 1986: 67), its internal pitch structure is blocked either by a 'sound-density whose unified compactness makes it difficult to hear its internal pitch structure' (ibid.) or by its timbre. *Noise* is dense and compressed it is 'impossible to hear any internal pitch structure (ibid.); sounds like the ocean or the wind possess these qualities.

3.4.2 Sonogram

> *The sonogram makes it possible to relate sounds intuitively to visual images. It allows the recognition of individual sound objects, descending and ascending contours, silences, sound density in both the frequency and time domains, registration, sound profiles, characters and gestures. (Ungvary, Waters 1990)*

The sonogram is the electroacoustic composer's primary tool for visualising the spectral content of a sound. The term spectrum refers to a composite of frequencies that act as the building blocks of sonic material; a simple example is a note which consists of a fundamental (e.g. D, E or F) and harmonic overtones. In reality we may perceive these building blocks as one or a handful of sounds linked together, where we are unable to distinguish a particular frequency from the totality of the sound. The advantage of the sonogram is that it allows one to suspend the passing of time (the boundary of the audible experience) to look purely at the spectral architecture of a sound.

The most common presentation of sound on a computer monitor is the *wave*, which details both time and amplitude - most notable in DAWs. For a sonogram to present frequency information, a process known as *Fast Fourier Transformation* (FFT) converts time-domain data into frequency-domain data. This conversion, which removes our reliance (although not completely) on the passing of time, produces a spectral photograph illustrating the various amplified frequencies of a sound. A sonograms can be three- or two-dimensional and its appearance can be highly customisable[3]. For this study, a simple 2D black and white sonogram is used: the *x* axis represents time and the *y* axis details frequencies (20Hz - 20,000 kHz).

The sonogram is utilised in two ways: first as a method of informing the composition process; and two as an analytical tool. As part of the composition process it informs the composer of the spectral content in early compositional sketches, if nodal and noise qualities are not present in the sketches they are redesigned to evoke these qualities. As an analytical tool it assesses the qualities in the case studied works.

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[3] This is entirely dependent on the software one uses.

> Spectrum photos display sonic formations vividly, but they do not quite speak for themselves (a tempting illusion). The commentaries, therefore, direct the reader's attention to those elements that are essential for an understanding of the photos - some of these elements prominent, many of them more subtle. (Ungvary, Waters 1990)

It should be noted that the sonogram provides information on the internal structures and behaviours of a sound, it does not offer or describe our perceptions of that sound. Each sonographic image will be accompanied by a diagram depicting important or note worth features of the excerpt, a commentary will also describe the sounds and classical guitar techniques that have generated them - this is informed through the score.

3.5 Conclusion

This chapter has detailed both the research methods and tools that will be utilised in this project. A musical composition and accompanying critical commentary is the main investigative method, utilising both musical expression and Smalley's descriptive vocabulary as methods of engaging with different sonic qualities. Case studies contextualise the project, detailing how instrumental techniques on the classical guitar have been utilised by electroacoustic composers. The research tools enable the investigative process to employ both an objective sound criteria and sonographic view of a sound's spectral content and intensity.

4.1 Critical Commentary on *Extensions*

4.2 Introduction

The initial investigative processes for this work began when I encountered Smalley's *Spectral Typology* (Smalley 1986: 65), which proposes a method of quantifying a sound based on its spectral qualities. A rather striking feature to these qualities is the evocative language Smalley attributes to their definitions, each appearing to imply a set of musical scenarios. An example of this is his definition of nodal qualities as a 'band or knot of sound which resist pitch identification' (ibid: 67). The words *resist* and *knot* are particularly expressive, implying a setting in which sounds struggle against a pitch orientated setting. One can draw parallels between the descriptive aspects of Smalley's language and Ligeti's concept of micropolyphonic music, which is defined as 'a mass of a musical texture made of a high number of individual parts which cannot be distinguished' (Okonsar N.D: 14). Smalley later describes nodal sounds in very similar terms as 'a sound density whose unified compactness makes it difficult to hear its internal pitch structure' (Smalley 1986: 67). The parallel between acoustic and electroacoustic literature is intriguing as it suggests that expression and language can act as a bonding agent between the two disciplines.

Recognising the potential in his theory of types, I wanted to incorporate this language in my compositional practice to generate nodal material that originates from, and struggles against pitches on the classical guitar; connecting with Smalley's original definition. This leads to a number of engaging research opportunities focused on extending the instrument beyond its harmonic and physical limitations, both of which impede the production of nodal qualities. Harmonically this is the extension of the instrument into microtonality, removing the implied tonal centres of the open tuning. Physically, it is the multiplication of the instrument itself, using digital delays to superimpose and construct nodal textures and gestures in real-time; forming a larger musical organism. Form is also a method of extension as thematic material and the relationships between individual movements expand outward from the third most central movement; elaborating on the symmetrical processes of Bartok's *String Quartet No. 4* (1927). This commentary will detail the following elements of *Extensions*: (1) form; (2) pitch and thematic material; (3) digital delays; and (4) nodal examples.

4.3 Form

This section discusses the form of the work which functions on two levels: the first is the relationships between individual movements based on symmetrical processes; and the second is the relationships between the outermost movements and the central third movement. It begins with an examination of Bartok's *String Quartet No. 4* and its influence on my composition.

4.3.1 Bartok's Arch-Form

Bartok's *String Quartet No. 4* is a five movement work that utilises symmetry as a method for organising thematic material and tonal centres across movements. The arch-form (Fig. 2.1), which links movements to their opposites, creates an environment where the composer can shape thematic relationships on a larger structural scale:

> One of the most instantly notable factors of this work is the unusual nature of the overall form. This work, along with the fifth quartet is presented in five movements. This allows Bartok to incorporate some of his concepts in regards to symmetry. The work is set up with corollaries between diametrically opposing movements incorporating similar features. (Ladd 1999)

Bartok also utilises these links to reinterpret and interrogate material, rather than simply repeating it, something which can be demonstrated in his tempo and expression markings for each movement (Fig 2.1). The most notable of these are the *con sord*. and *pizzicato* marks for the second and fourth movement. Here performance techniques function as timbral filters for thematic reinterpretation, a point which is similarly echoed by Babbitt:

> Bartok employs the instrumental resources of the quartet to achieve phrase and sectional articulation. Extreme shifts in purely sonic effect are used to define large formal relationships, while more subtle shifts in tonal balance, often effected through doublings, define smaller sections. (Babbitt 1949)

Figure 2.1: Bartok's Arch-form

Extensions utilises this form as an initial layer of symmetrical relationships, preserving the notion of reinterpretation. I was also keen to extend Bartok's process of symmetry by constructing a second layer of relationships (Fig 2.2.), that anchor the outermost movements thematically to its central and largest movement: the third. These additional connections differ greatly to the third movement of Bartok's *Quartet* which is thematically isolated and 'stands alone in nearly all factors' (Ladd 1999).

The schema for *Extensions* is below: the top represents the arch-form and the bottom denotes individual relationships to the third movement:

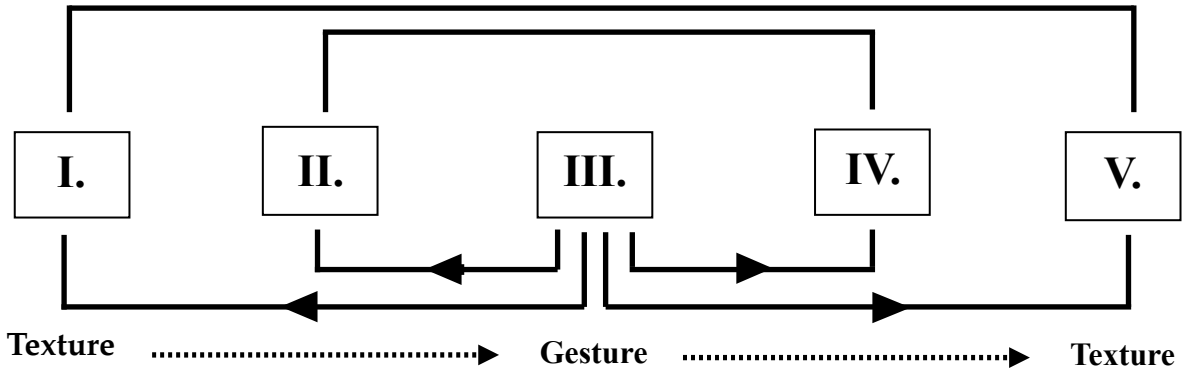

Figure 2.2: Form and Relationships Network in *Extensions*

4.4 Pitch Functions

In earlier compositional sketches I was concerned with how pitch could be used to explore nodal qualities on the classical guitar, as a strong pitch presence would deteriorate its qualities. One of these concerns was the standardised tuning (E, A, D, G, B & E) which is harmonically restrictive: implying specific tonalities through its open strings e.g. an E minor triad (E, G, B) and G major triad (G, B, D); and limiting notes to those belonging only in the tempered system. Another was the problematic nature of extended techniques that offer a range of timbral qualities but with a large performance based cost: the physicality and focus of the performer can be lost to the detail of articulation. There are many examples of composers attempting to subvert these limitations to improve the musicality of the instrument: transcriptions of Bach's *Lute Suites* have the low E and G detuned to D and F# respectively; and Riehm's *Toccata Orpheus* (1990) is an attempt at choreographing the intense physical nature of extended techniques; capitalising on the performer's energy. However for *Extensions* there needed to be a stronger unifying concept that allowed layers of pitch content to be generated over short periods of time.

Microtonally became the prevailing melodic and harmonic device in the work. Removing the implied tonal functions of the open strings and the expressive limitations of the tempered system. A scordatura (Fig. 2.3) requires the A and G strings to be tuned a microtone higher, destabilising paired open strings (E-A, A-D, etc). The only exception to this is the B and E strings which remains stable against an unsteady microtonal background (see II. mm. 68).

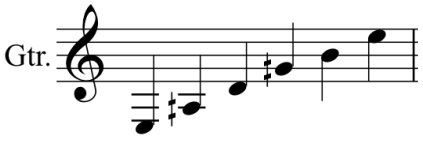

Figure 2.3: Scordatura

The open strings also function as pitch centres for the work, each of which have a range of microtonal inflections orbiting around them. These centres are transposed across the range of the guitar to increase its expressive capabilities (see Fig. 2.4 & 2.6). In some conditions these inflections actually replace the central pitches and disrupt the listener's perception of natural and microtonally altered pitches (Fig 2.5).

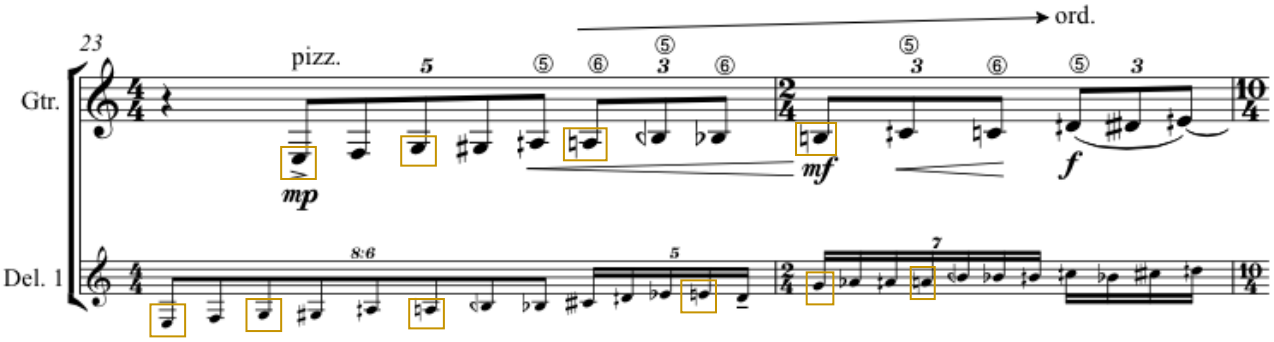

Figure 2.4: Example of Pitch Centres in Movement III.

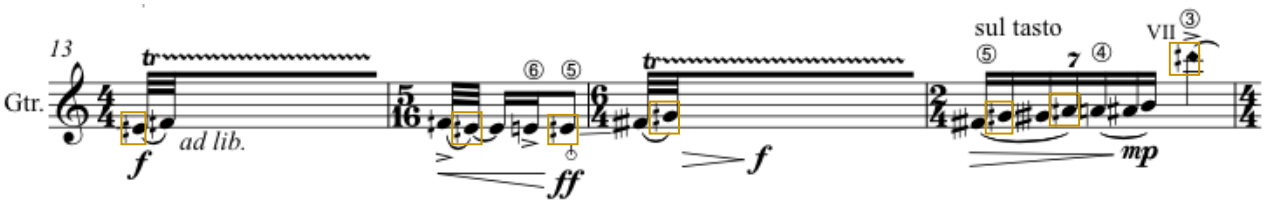

Figure 2.5: Example of Replaced Pitch Centres in Movement II.

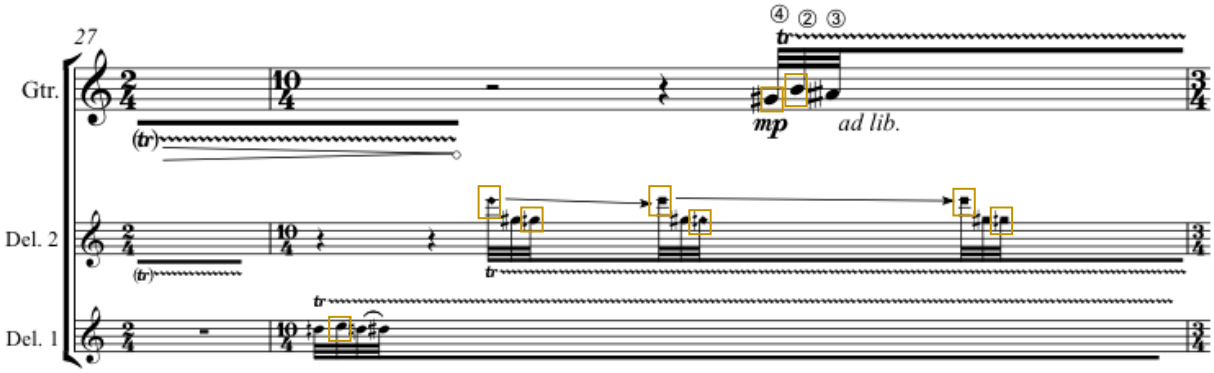

Figure 2.6: Example of Pitch Centres in Movement I.

4.4.1 Thematic Material

There are three themes throughout the work: the first is an ascending motive moving towards a microtonally altered B (Fig. 2.7); the second is a microtonal gamut around the open E string (Fig. 2.8); and the third is a stifled trill (Fig. 2.9). All thematic material from movements one, two, four and five is derived from the principle theme in movement three (Fig. 2.7); this builds on the structural relationships discussed earlier.

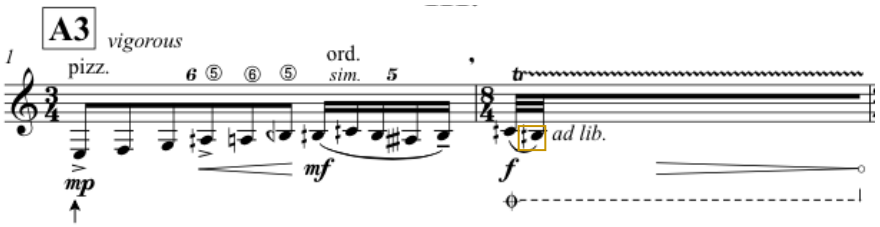

Figure 2.7: Principle Theme of *Extensions* in Movement III (mm. 1-2)

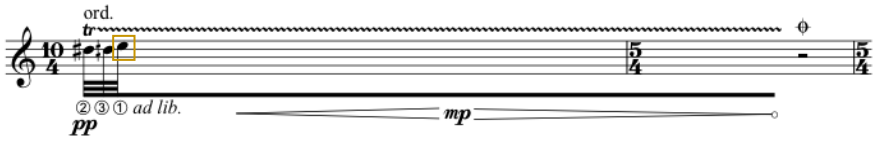

Figure 2.8: Theme of Movement I and II (mm. 1-2)

Figure 2.9: Theme of Movement II and IV (mm. 1-3)

Each of these themes seem to possess inherent sonic characters: the microtonal gamut (Fig. 2.3) is laminar and quite textural, possessing very few striking features; whilst the principle theme (Fig. 2.5) has a sense of motion and personality, it seems gestural; the muted trills fall somewhere in-between texture and gesture, its potential is stifled. I wanted to apply these characters to the overall shaping of the work; moving from textural material that sets a nodal context; to a phrase that reaches out and tries to engage the listener - muffled by its technical properties; to gestures that possess motion and confidence (see Fig 2.2).

4.5 Digital Delays

The idea of an augmented instrument is not particularly new, it speaks more broadly of modifications that alter sonic output; one can regard the preparations of a piano (nuts, screws, and paper placed in and on the strings) as such. However the popular application of electronics to acoustic instruments has lead to the development of an extensive mixed-media electroacoustic repertoire; which played a formative role in the shaping of this work. Although an awareness of many mixed-media works may have unconsciously influenced this composition, I would like to acknowledge several works that directly affected the process. The aim is to clarify influences and to position my work in existing repertoire. The compositions are as follows: Davidovsky's *Synchronism No.10* (1992); Ligeti's *Clocks and Clouds* (1972); Ferneyhough's *Time and Motion Study II* (1973-76); Tom Williams' *Dart* (2012); Tristan Murail's *Tellur* (1978); and Rodrigo Sigal's *SINAPSIS* (2009).

It may be apparent that not all of the works mention above utilise delays, electronics or playback: this is intentional. The application of technology to any work can be of great value, depending on the composer's aesthetic vision, but it can also be limiting to those who have knowledge of, or have just encountered its potential - I fall into the latter category. Although preliminary sketches indicated the need for delays, I chose to limit my education of Max/MSP and previous applications of delays in literature to a minimum. This was primarily out of a concern for 'writing to suit the software' rather than to suit the nature of the piece: delays were viewed as a tool to produce a specific aesthetic result.

The formative aspect of the digital delays is that it breaks the performance limitation of the guitar as a solo instrument and instead, creates an environment in which it can extend itself and its musical properties outward toward the listener. This limitation is as much a practical one as it is physical as fretboard positions restrict and dictate the available range of the instrument during any particular phase. Nodal qualities, which are generated through the staking of lines, are also limited by the finite amount of phrases the performer can play simultaneously as individual lines are rooted to pitch centres.

Understanding this limitation, I developed a recording and playback system (digital delays) in Max/MSP that would enable the guitar to function as an augmented solo instrument, allowing in real-time, phrases and lines to be developed and superimposed on one another - as if it was part of a larger ensemble or musical organism. The projection of delays in concert mimic the arch-form of the work in which recorded material is placed into the outermost speakers: the formation of nodal qualities becomes an immersive experience.

Godel, Escher, Bach by Douglas Hofstadter, a book on the importance of self-reference and recursive structures in the attainment of consciousness, also played an important role in the shaping of my compositional aesthetic and more specifically in the idea of self-imposing previously heard material through delays. The author illustrates his ideas through fugal and canonic structures which are either written into the text itself or illustrated through musical literature; notably Bach's *Musikalisches Opfer* (BWV 1079). Hofstadter's thesis is that meaning is generated through the imposition of itself. One can find examples of this in *Extensions*, where the stacking of previously heard material refers back to itself and more subtly to the various interpretive idiosyncrasies of the performer.

4.6 Nodal Qualities: Textures and Gestures

Textures and gestures are musical qualities that describe the general motion and energy of a given section of music. The terms are not limited to music but are universal. Textures are laminar and present a particular setting or environment; one can draw an analogy between the textures of objects, that are either smooth, grainy or rough, and the subtle sensory experience they evoke when touched. Gestures on the other hand possess movement and character, they are indicative of an action; the movement of a praying mantis or the jagged edges of a cliff face seem gestural. Textures and gestures function as methods of interrogation for nodal material.

A cyclical research process was developed to tackle the development of nodal qualities. This consisted of three stages: (1) the composition of individual lines; (2) the recording and superimposing of these lines in Pro Tools; and (3) the assessment of nodal qualities via a sonogram. This process was repeated if nodal qualities were not present. Initial phrases, rather than trying to emulate the nodal scenarios of electroacoustic music were informed though the descriptive parameters of Smalley's language: vocabulary directed the composition process.

The following section will illustrate nodal qualities in the work by comparing and contrasting initial statements of phrases to complete textures or gestures; complete in this context refers to all delayed lines being present. It will also detail their processes of transformation. Each sonogram is illustrated with arrows and letters that highlight important aspects of the image - these letters are also referenced in the text.

4.6.1 Textural Example

Textures are constructed by the layering of individual lines that in themselves possess very few distinguishing features. In the first and fifth movement the aim is for pitch centres to become indecipherable as a texture forms. Although pitches are still perceived by the listener, the texture is not grounded to particular subset of notes: an acute understanding of the audible experience is subverted through the imposition of multiple gamuts of notes.

The first example is the initial statement of the phrase in the first movement (Fig. 2.10). Here the fundamental (A) and it's overtones (B) are clearly articulated and the foundation for the texture is set: emerging from nothing, increasing in amplitude and returning back into itself. The spectral energy is fixed to a pitch centre (A) with slight fluctuations around it. The only prominent feature of the phrase is the attack of the *snap pizzicato*, which is spectrally richer than note based material: it possesses no fundamental or overtones.

Figure 2.11 is an example of the complete texture, present in the last 30-40 seconds of the movement. Here the defined pitch parameters of the initial statement, its fundamental and overtones are lost as lines of surrounding microtonal pitches are superimposed. Pitch centres become broader with no single phrase dominating the spectral texture; a blurring of pitch

content develops nodal qualities. The prominence of the *pizzicato* in the initial phrase is reduced to a slight peak in the texture, the mass overriding its presence (C).

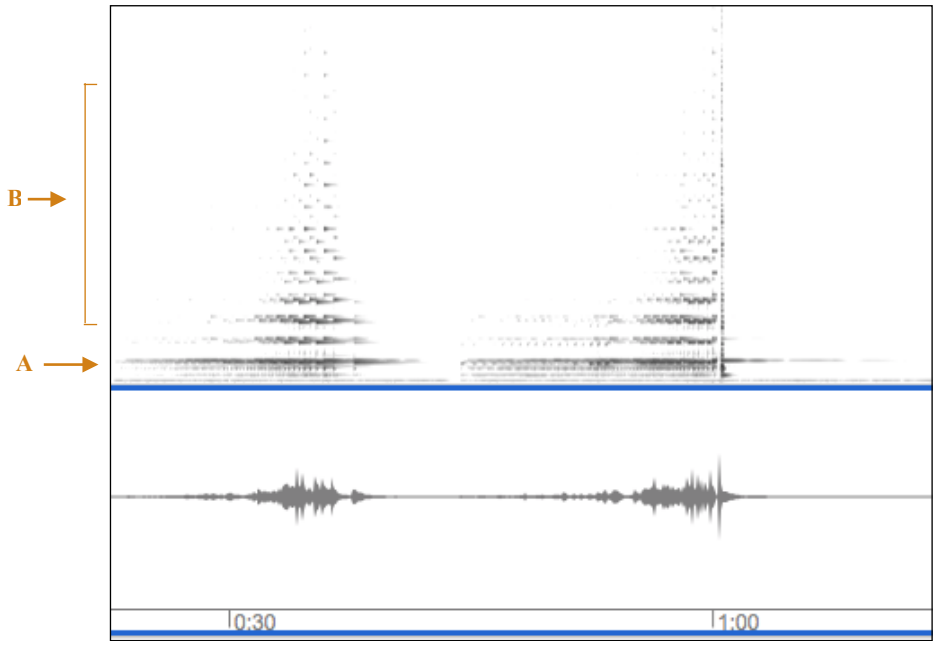

Figure 2.10: Sonogram of Movement I. (Mm. 3-10) - displaying the fundamental (A) and overtones (B) of pitch content.

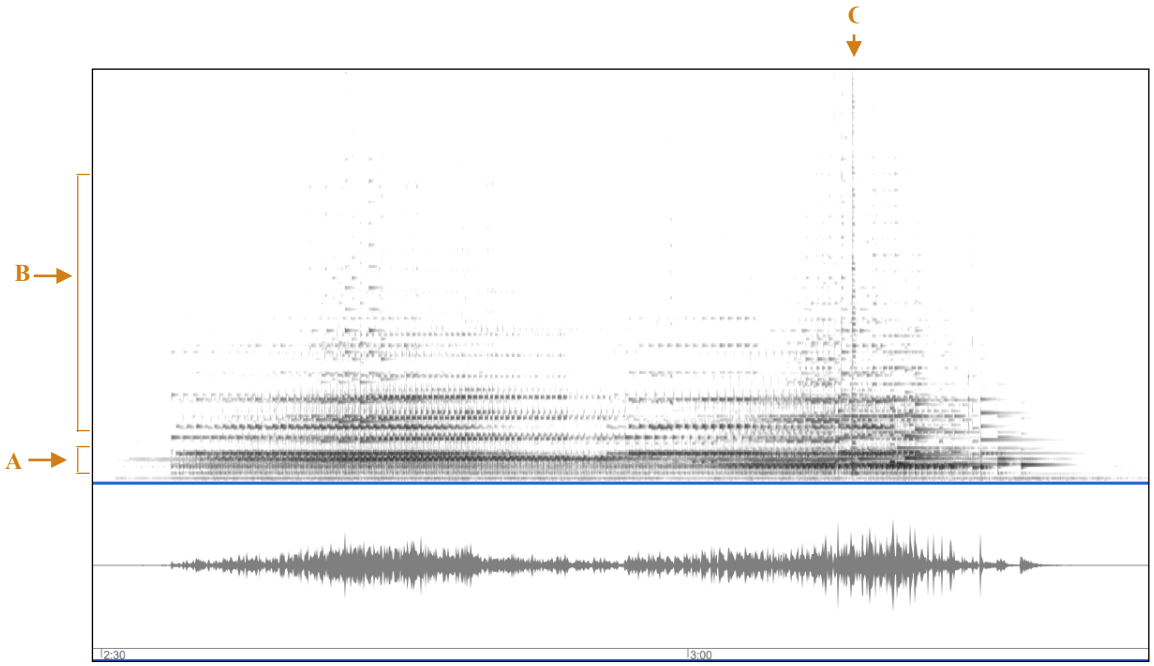

Figure 2.11: Sonogram of Movement I. (mm. 24-31) - presenting special blurring of the initial fundamental (A), overtones (B) and snap pizzicato (C).

This blurring of spectral information occurs in the fifth movement too, but rather than emerging and dissipating together they flow in and out of one another, thickening and thinning the texture as time progresses (Fig. 2.13). The initial phrase is given for comparison and is similar to that of the initial example but with clearer sections dividing the material as the pitch contour rises (Fig. 2.12). This flowing from one phrase to another presents itself clearly in the spectral texture: initially, both lines emerge together in a thick texture with no clear harmonic dominance (D); one line then disappears and harmonic clarity is established (E); its counterpart then returns creating a spectral mass similar to the first movement (F). The nodal qualities of this texture emerge as pitch centres are obscured.

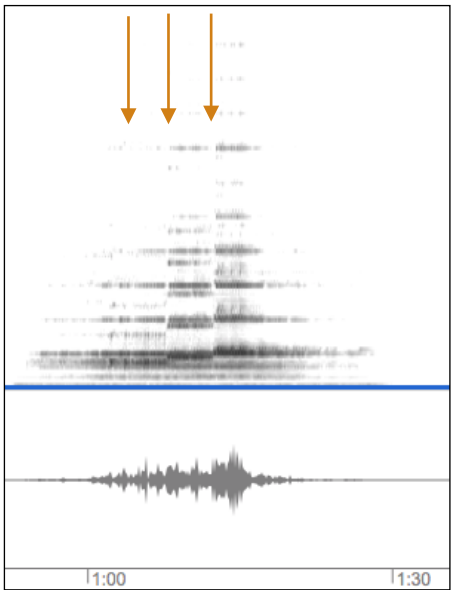

Figure 2.12: Sonogram of Movement V (mm. 9-13) - depicting the separating spectral content of ascending lines (C).

Figure 2.13: Sonogram of Movement V (mm. 25-30) - displaying emerging nodal qualities (D) which become note based (E) before returning to nodality (F).

4.6.2 Gestural Examples

Gestures contain many distinguishing qualities some of which are present in individual lines and some which are built over the interpolation of several phrases. In both cases, phrases and the overall form of the gesture pursues a motion or movement towards a common musical goal. In the case of the third movement, this is a gamut of notes similar to the textures of the first and fifth movements (see III. mm. 70). In Figure 2.14, the four gestural phrases emerge from an unstable harmonic background in which phrases compete for the attention of the listener, meeting in a mass of textural information that evokes a new, stable environment. The pitch centres of gestures rather than being in-decipherable like textures, appear disorientated and confused as the ear tries to pin down focal points in the gesture; accents in the piece emphasise this disorientation. Nodal qualities are present but deteriorate as the characters of individual lines divert the listener's attention.

The opening phrase is given below for reference, its only notable spectral features are the pitch climbs in C and D which lay the foundation and general motion for subsequent phrases.

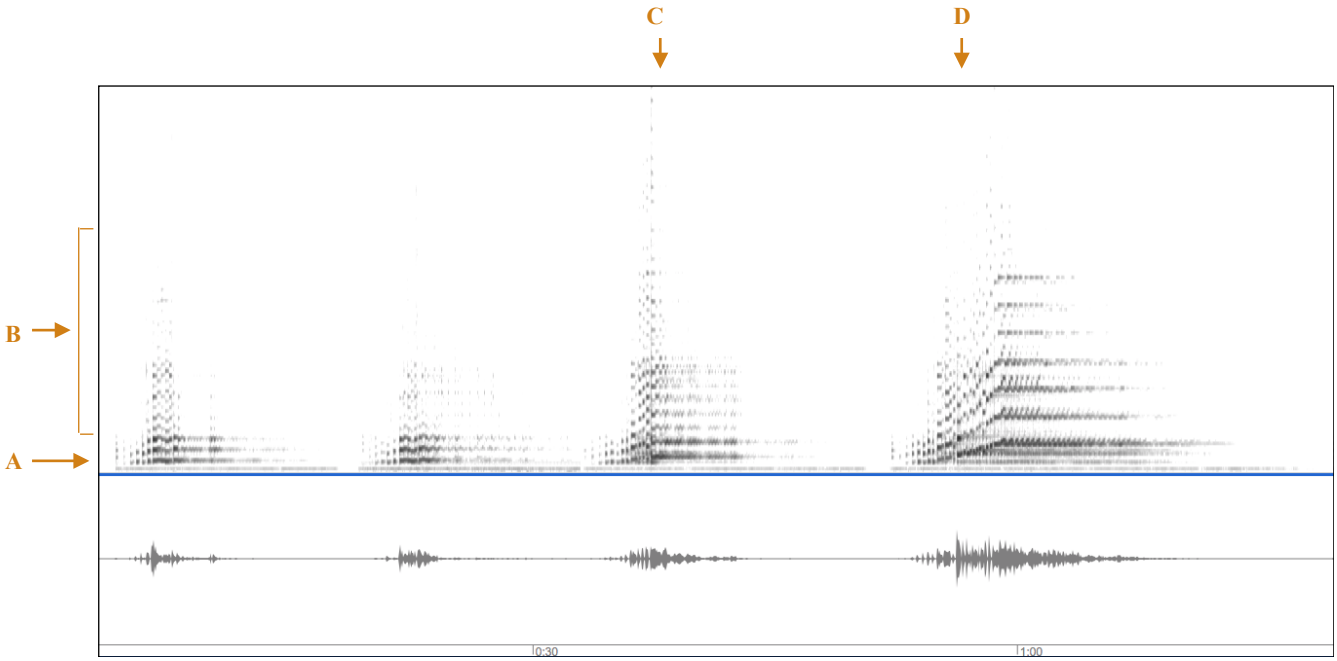

Figure 2.14: Sonogram of Movement III. (mm. 1-13) - highlighting strong pitch presence (C & D).

The complete gesture (Fig. 2.15) is however, remarkably different to its predecessor containing an increased level of spectral vibrancy and density throughout. In the first and second phrase (C & D) new motions and lines dovetail to prolong melodic interest and expound new spectral information into the silences. Nodal qualities are softly implied in the dovetailing.

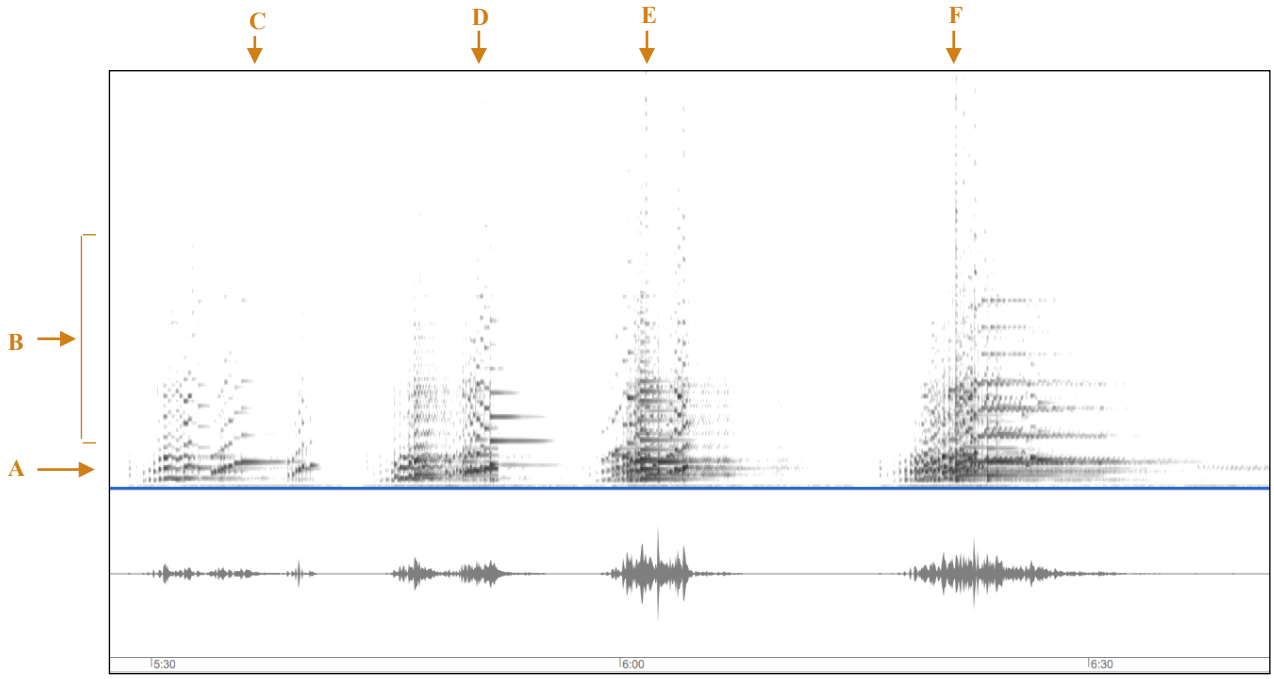

Figure 2.15: Sonogram of Movement III. (mm. 57-70) highlighting phrase extensions and nodal dovetailing (C & D) and spectral thickening (E & F).

The third and fourth sections (E & F) are the most similar to the original phrase. With the ascending motion being preserved and the melodic material being reinterpreted along microtonally altered pitch centres. The characters of these phrases are more prominent in the aural experience than the sonogram, which indicates a unity between independent lines and their motions. The spectral information highlights the thickening of the original ascending theme rather than the characters of phrases. The most notable example of this is the fourth phrase (F) which compared to Fig 2.13 possesses exactly the same motion but without the definition: the gesture's nodal qualities are produced when the punctuation of individual lines is blurred by competing phrases.

Similar to the textural elements of previous movements, pitch centres and surrounding microtones are used to obscure obvious note associations and evoke nodal qualities. Gestures differ in that the prominent features of different lines prevent the listener from orientating their experience of the work to a set of pitch centres. Phrases and their individual characteristics intrude on the constant perceptive faculties of the listener.

4.7 Conclusion

By utilising Smalley's evocative definition of nodal qualities as a catalyst for my composition I was able to develop and confirm two aspects of this research project: firstly, that the classical guitar, although present in physical and harmonic limitations, can, through a set of research practices and compositional frameworks produce some nodal sonic qualities; second, that Smalley's vocabulary can be applied to acoustic composition as a way to generate musical material, although this may not be the intention of the author it does present many practical and engaging opportunities for acoustic composers.

Both aspects of this research project were intrinsically linked to the compositional process. The acknowledgement of instrumental limitations and the development of a compositional framework to augment, extend and subvert these restrictive qualities led to a mass of textural and gestural qualities. This composition also marks the first step in utilising a language, previously used by electroacoustic composers, to generate new musical material in acoustic music.

5.1 Case Studies

This section details the use of instrumental techniques as a source for note, nodal and noise-based qualities in different electroacoustic mediums, namely: mixed-media, and live electronic. Both mediums present new dimensions to instrumental material by transforming and augmenting the instrument in a variety of ways: mixed-media utilises the studio as its primary investigative tool, analysing and manipulating sounds according the composer's aesthetic notions; live electronics connects the instrument to computer patches, augmenting its potential and allowing the composer to explore a wider sonic palate in a live, interactive, environment.

This chapter presents two case studies on Panayiotis Kokoras' *Slide for Guitar and Electronics* (2002) and Jerome Combier's *Kogarashi for Guitar and Live Electronics* (2002). The former explores the objective qualities of these techniques. The latter illustrates the expressive potential of these sounds through a poetic narrative.

Each study comprises of three sections: the first is an introduction to the composer, their aesthetic practices and notable works; the second is a discussion of the aforementioned work, detailing its musical language; and the third is an assessment of its note, nodal and noise qualities, which are presented in sonographic form. Arrows and letters are used to draw the reader's attention to notable aspects of the sonogram; they are also referenced in the text.

5.2 Panayiotis Kokoras: *Slide for Guitar and Electronics* (2002)

Panayiotis Kokoras is a Greek composer of instrumental and electroacoustic music who studied with I. Ioannidi & A. Kergomard in Greece and with T. Myatt at York University.

He defines his musical practice through the processes of *Sound Composition* & *Holophony. Sound Composition* 'uses timbre as the main form breaking element, it controls and develops to a great extent the morphoplastic attributes of the sound objects used' (Kokoras 2014). *Holophony* is an aesthetic framework in which 'independent sounds (phonos), contributes equally into the synthesis of the total (holos)' (ibid.). Sounds in the *holophonic* practice are causally linked to the larger form. Both musical parameters unify through his composition practice to generate vast timbral landscapes. His is also informed through extended techniques, tactile sounds, augmented, partial sounds and synesthesia.

His most notable composition, the *Grand Piano Trilogy*, is based upon the sounds of the piano and consists of three acousmatic compositions: *Breakwater* (2000), *Response* (2001) & *Magic* (2010), all of which have received numerous awards and performances. The *Trilogy* is perhaps most demonstrative of his composition processes: *Breakwater* for example, expands on the sonic notions of the piano by utilising the properties of breaking waves to shape gestures; *Response,* investigates the tensions between the strings of the instrument and external objects - expanding its timbral qualities; and *Magic*, explores the granular aspects of these sounds.

5.2.1 Introduction to *Slide'*

Slide for Guitar and Electronics (2002) is an example of nodal and noise qualities that are transformed through the composer's aesthetic practices. The catalyst for the work is a spiritual notion:

> Colours are not used because they are true to nature but because they are necessary to the particular picture. (Kandinsky 1912)

Kokoras draws an analogy between Kandinsky's colours and picture, to the sounds and composition of a composer. In *Slide* (2002) the classical guitar functions as both sound and composition, linking the expressive and compositional potential of the instrument to the sounds it produces; this connection resonates with Kandinsky's comment and Kokoras' concept of *Holophony.*

This notion is particularly engaging as the composer uses the various colours (timbre) of instrument techniques to generate musical material:

> I explored in depth the unusual characteristics of the guitar's sound idiom. I played the instrument by scratching on the strings, knocking on the back of its body, hammering and sweeping, and even breaking, the strings themselves. I coupled the guitar with the use of 'unconventional' objects treated as an extension of the guitar, like brass or glass slides, metal sticks or brushes. (Kokoras 2002)

Once these sounds are recorded Kokoras utilises studio techniques to amplify unheard qualities of these techniques: 'I tried to isolate fragments which are rarely perceived by the listener - or even the performer - in the course of a performance' (ibid.).

5.2.2 Sonographic Descriptions of Kokoras' *Slide*

The following examples details the presence of note, nodal and noise qualities in the composition and discusses their use in the given section of music. Sections are denoted as phrases or gestures; a gesture is a short passage of the composition (-30''), which has a particular motion and behaviour; a phrase is longer (+30''), it presents long term compositional decisions.

Figure 3.1 included examples of inharmonic and harmonic note and nodal qualities. Kokoras time stretches the initial sound to draw attention to its nodal qualities, it has accented pitch aspects but the listener's ear is focused on its elongated spectral qualities (A). Three sounds then enter into a dialogue; the sliding of the hand against the guitar (B); a percussive action (C); and filtered, note-based, slides (D). The first sound has pitch associations but is not anchored to them, it seems nodal. The second too has pitch connotations, possessing a high and rather intense click: the attack subverts the pitch. The third is note-based, spectrally

filtered to accent the particular motions of the action - which glissandi upwards and downwards.

In Figure 3.2, Kokoras uses repetition as a method of focusing the listener's attention towards the guitar's sonic qualities. The phrase beings with the repeated attack of a *snap pizzicato* hitting against the fretboard (A), although grounded to a pitch its harsh and undulating amplitude draws the listener into its spectral density; which rather than being completely note based, with clear separation between the fundamental and its overtones, is blurred: noise qualities are introduced through repetition. The phrase then transitions to a descending motive which pulls the listener's attention to its pitch qualities (B). The empty spectral space is then filled with the iterative bouncing of the slide against the strings. Kokoras then introduces the sounds of the slide against the frets themselves, these sounds are focused to four spectral bands that accent its motions and pitch contour (C). The phrase concludes with the snapping of a guitar string.

Figure 3.3 is a highly illustrative example of Kokoras drawing attention to the unheard qualities of the classical guitar; amplifying the sounds of the slide rubbing against the strings. The gesture begins with the sound of the slide (A), its interior motions sculpted to accent the general motion of the slide against the guitar. Granulated versions of this sound then appear, anticipating the dialogue in Fig. 3.1: its subtle noise qualities perforate the silence (B).

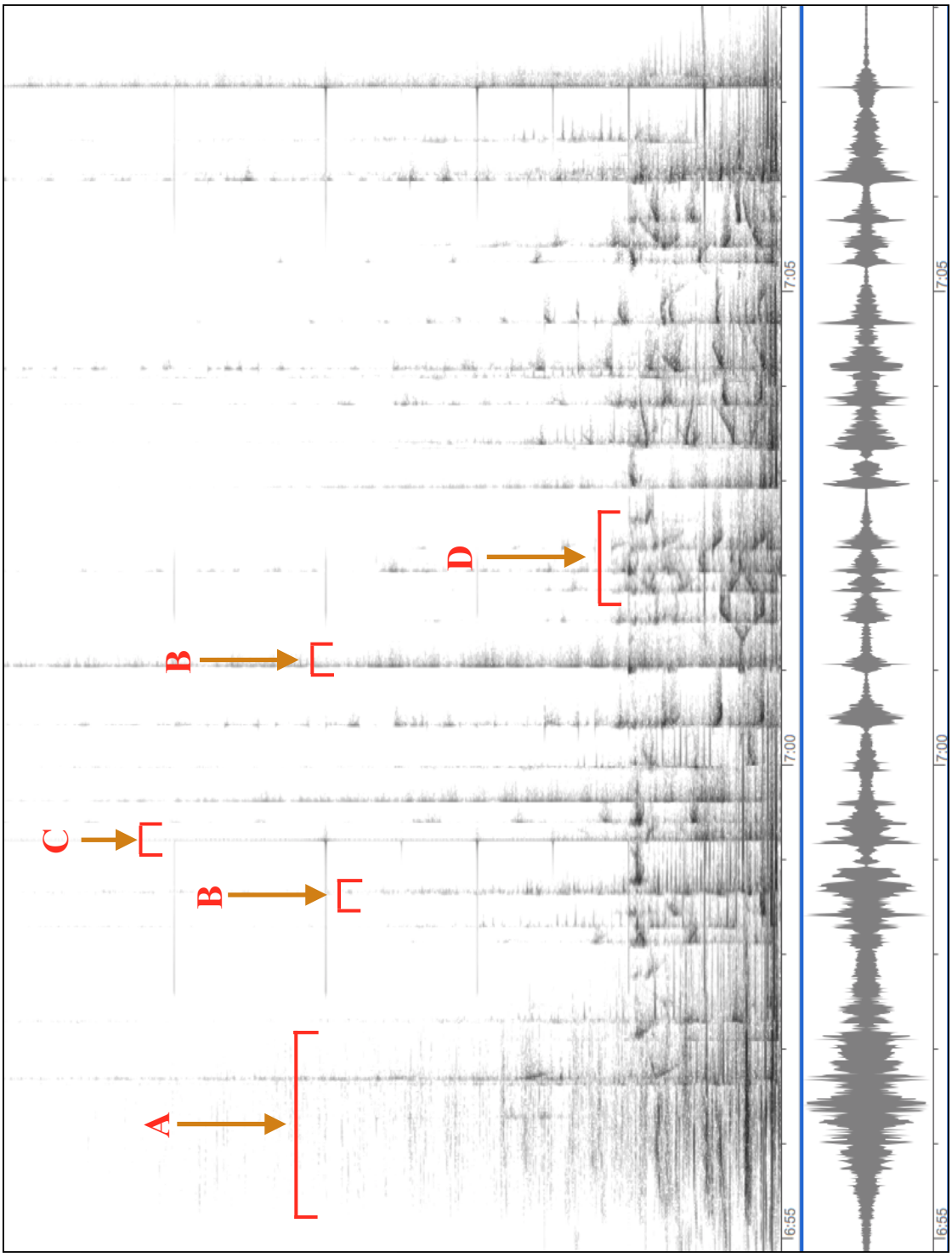

Figure 3.1: Sonogram of *Slide* (6’ 55’ - 7’ 08’’) - demonstrating time stretched attack of scratched strings (A), harmonic and inharmonic filtering of glissandi (B) and percussive actions (C)

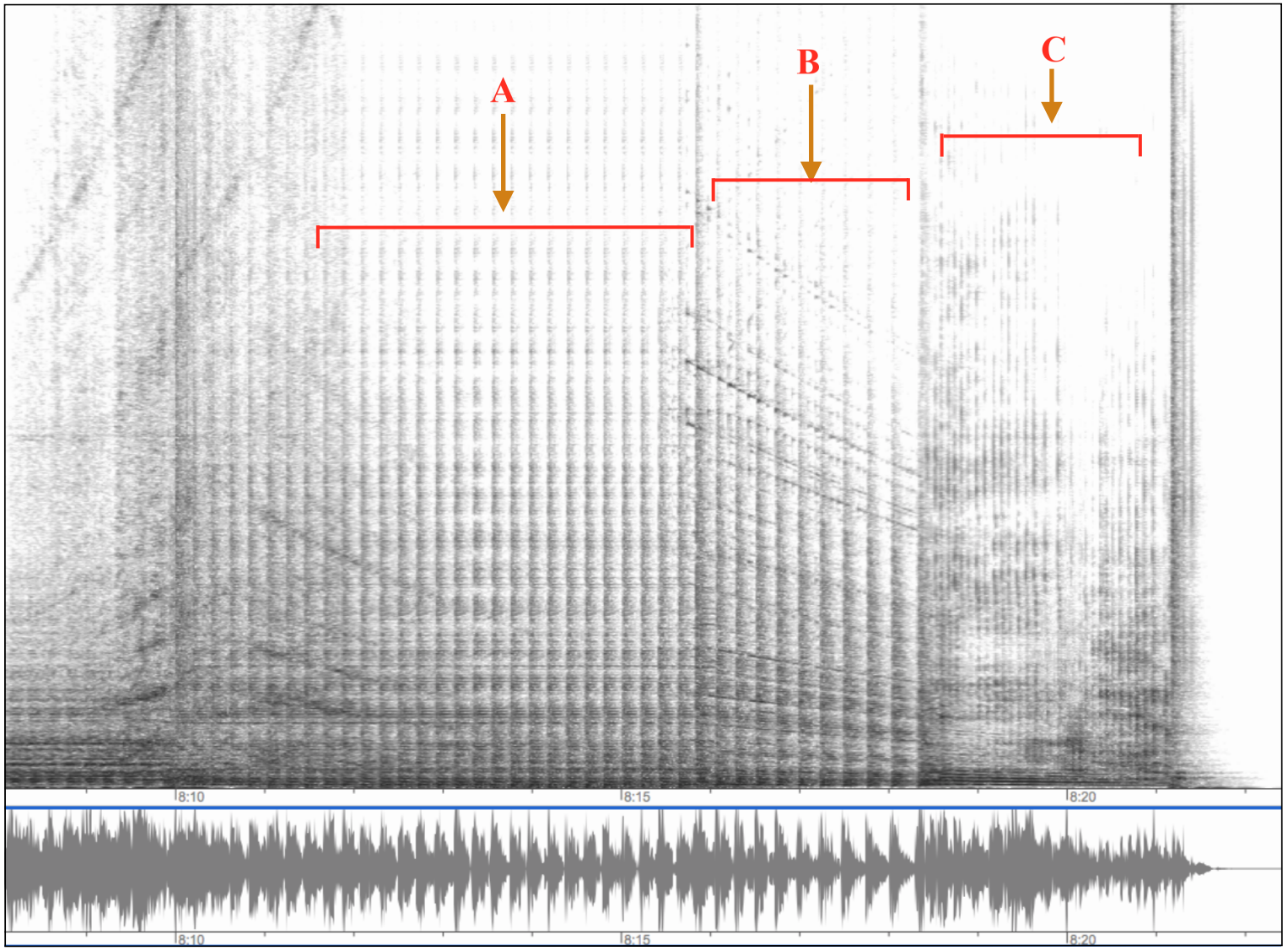

Figure 3.2: Sonogram of *Slide* (8' 08'' - 8' 34'') - indicating the repeated nodal based attack of a *snap pizzicato* (A) which is coupled, in a descending phrase, with the rebound of the slide against the strings (B) before transitioning to the sound of the slide against the frets (C).

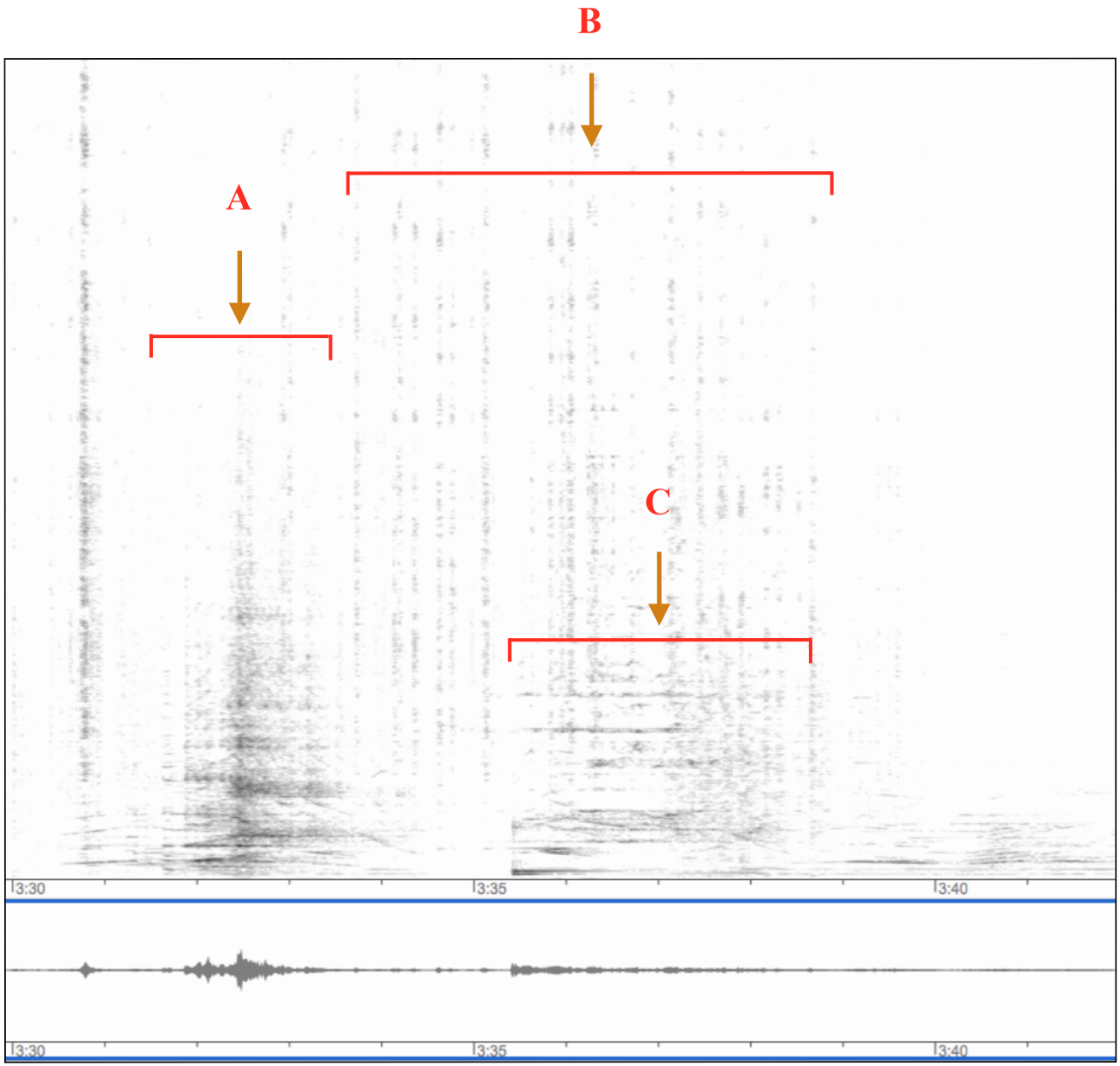

Figure 3.3: Sonogram of *Slide* (3’ 30” 3’42”") - demonstrating the sound of the slide against the strings (A) being granulated to accent its noise qualities (B) and in-harmonically filtered note properties (C).

5.2.3 Summary of Spectral Qualities in Kokoras' *Slide*

The following study has highlighted several engaging features about the guitar: the first is that note, nodal and noise qualities are in fact available to the composer through a wide range of extended instrumental techniques; and second once recorded they can be manipulated and spectrally altered in the studio to reveal unique properties that normally pass the perceptive capacities of the listener. Separating these techniques from their articulations is the most important tool in Kokoras' artistic style, as it enables him to study the sound based on its spectral content rather than its method of articulation; a full spectral understanding of these qualities only occurs when the notion of articulation and the energy that actuates it is suspended.

Kokoras, through his compositional practice has developed a wide range of nodal and noise based material that illustrates the sonic capabilities of the instrument. Through his aesthetic notion of *Sound Composition*, in which the fundamental aspects of the sonic experience are placed in timbre, he has illustrated the musical potential for these sounds by drawing the listener into qualities that are rarely heard.

5.3 Jerome Combier's *Kogarashi for Guitar and Live Electronics* (2002).

Jerome Combier is a French composer of instrumental and live electronic music who studied at the National Conservatory of Paris in 1997 with A. Bonnet while writing his Master's thesis on the principle variations of Anton Webern.

His aesthetic notions evoke either the supernatural or the poetic; music functions as an expressive analogy. Speaking about his interpretation of Samuel Beckett's *Lessness* (1970) in his orchestral score *Gris Cendre* (2006), he discusses the relationship between structure and perception of structure as a process for revealing unusual sonic qualities:

> After reading and rereading this brief text, I realised that the words were in a particular order, that the phrases formed a structure–a perceptible structure–that I was happy to grasp onto as a manner of listening. I dared to believe that this thought process would enable me to hear an unusual form which might be baffling, even to me. (Levy 2010)

Another example of Combier evoking the poetic is in *Air Steles for Ensemble and Electronics* (2007) based on the last watercolours of Giorgio Morandi, which have deteriorated and are 'no longer visible' (Combier 2007). Here the electronics 'erode the sound carried by the instruments, scales and harmonics dilute in soft saturation' (ibid.).

5.3.1 Introduction to *Kogarashi*

Kogarashi for Guitar and Live Electronics is also influenced by poetics, notably Shakespeare's *King Lear* (Act III). A translation of the *Kogarashi* reads: *The First Sign of Ghosts*. Ghosts in this instance are:

> The ghosts are those of King Lear (act 3) which resonate in his spirit, impregnable ghosts wandering on the land where Lear is completely lost. A supernatural force, this mythology, he believes, subdues him. From them nothing comes but sighs borne on the wind. A wind that carries the breath of unknown voices, or actually his own voice ("breathing, my voice returns towards me" said the Japanese poet). A wind that is space rendered audible, but a space where the sun steals away, where all is mingled, noises and sounds, where sky becomes earth and earth becomes sky. Lear dies there and is born there at the same time. (Combier 2014)

This poetic notion is a composition framework for Combier, as extended performance techniques are used to evoke particular musical scenarios: the unarticulated glissandi to-and-from the bridge represent the subtle whispers of the ghost of King Lear (Fig 3.5); percussive actions with the palm of the hand connects the confusion of noises and sounds, earth and sky, as he becomes lost in the moor (Fig 3.4); and the prolonged melodic phrases of the guitar evoke its atmosphere (Fig 3.4).

Sounds are not limited to the instrumental techniques of the guitar and the work includes electronically generated tones and textures. Sonographic images may contain other sounds, like the wind or electronically generated tones but will not reference them. Arrows and brackets will attempt to separate the spectral information of the guitar from external sounds; although this is not always possible.

5.3.2 Sonographic Descriptions of Combier's *Kogarashi*

Figure 3.4 is an example of iterative and percussive nodal qualities. The gesture begins with a tremolo on Db which transitions to muted *pizzicati*, here the iterative nature of the sound draws the listener's attention to its blunt attack, rather than its note content (A). A set of sustained harmonics (B) then appear, anticipating the earlier re-harmonisations, filtering and extending its note qualities (Fig. 3.5). Percussive and pitch actions then intrude on the sparse harmonic texture. The sound of the guitarist hitting the strings is spectrally dense, in-between nodal and noise, the upbeat of this phrase is accented by the performer playing above the nut of the guitar (C).

Figure 3.5 demonstrates *inharmonic* and *harmonic* note qualities and nodal sounds. The sound of the hand against the strings opens the gesture, possessing clear ascending and descending spectral information (A); the sound acts as an anacrusis for percussive actions - discussed in the previous paragraph. A quick succession of sustained and re-harmonised notes then appear (B), their fundamentals and overtones prolonged to thicken the spectral texture. The iterative *pizzicati* then return to conclude the gesture, with their note qualities emphasised through filtering.

The final example (Fig 3.6) illustrates the re-harmonised note qualities of the guitar, and the specific spectral filtering of those sounds played back by the computer. The phrase is a collection of a rapid and successive note and percussive qualities. It begins with sustained and re-harmonised notes (A) entering into dialogue with muted and arpeggiated notes (B). Nodal qualities are present against the backdrop of sustained harmonic material, the repeated attacks of muted notes highlight their spectral density.

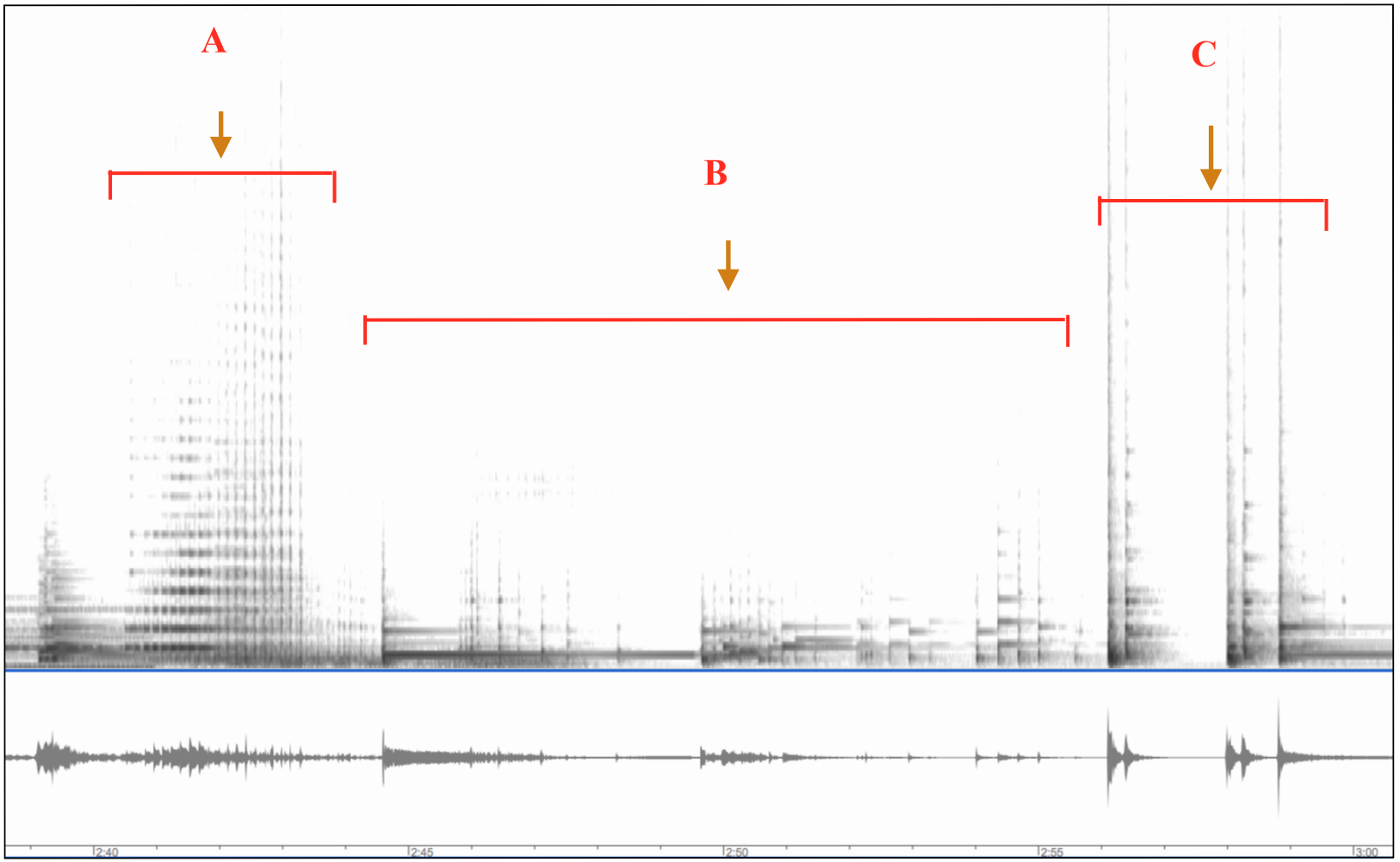

Figure 3.4: Sonogram of *Kogarashi* (2' 39'' 3'01''') - illustrating the transition between staccato notes into muted, iterative sounds (A) which evoke nodal qualities, mixtures of note and iterative are in B. Percussive hit on strings, appreciated out into a muffled chord (C).

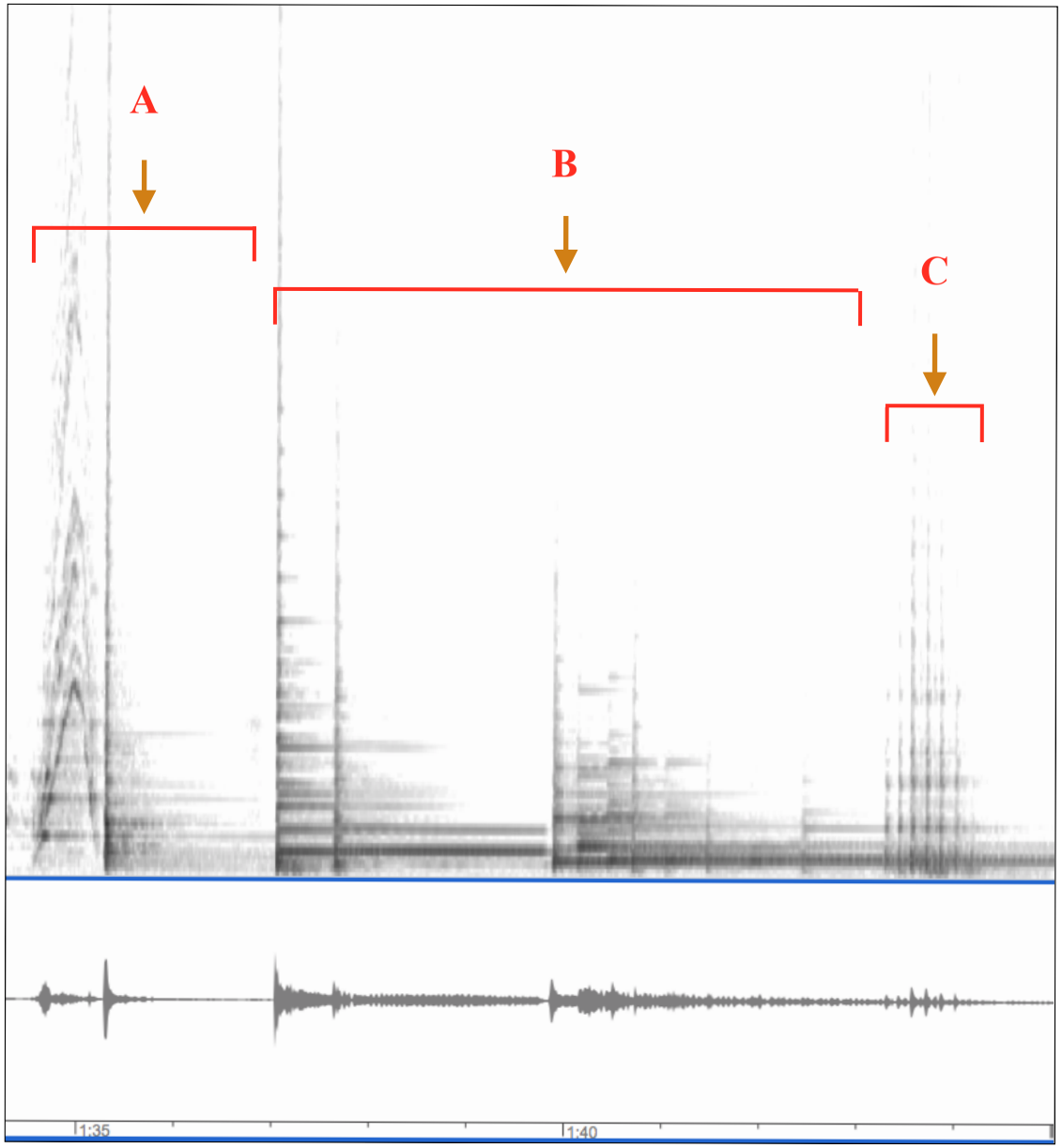

Figure 3.5: Sonogram of *Kogarashi* (1' 34" - 1' 45") - illustrates the nodal qualities and interior motion of the hand sliding across the strings (A), the re-harmonisation of the pitch qualities inharmonic and harmonic (B) and iterative pizzicati (C).

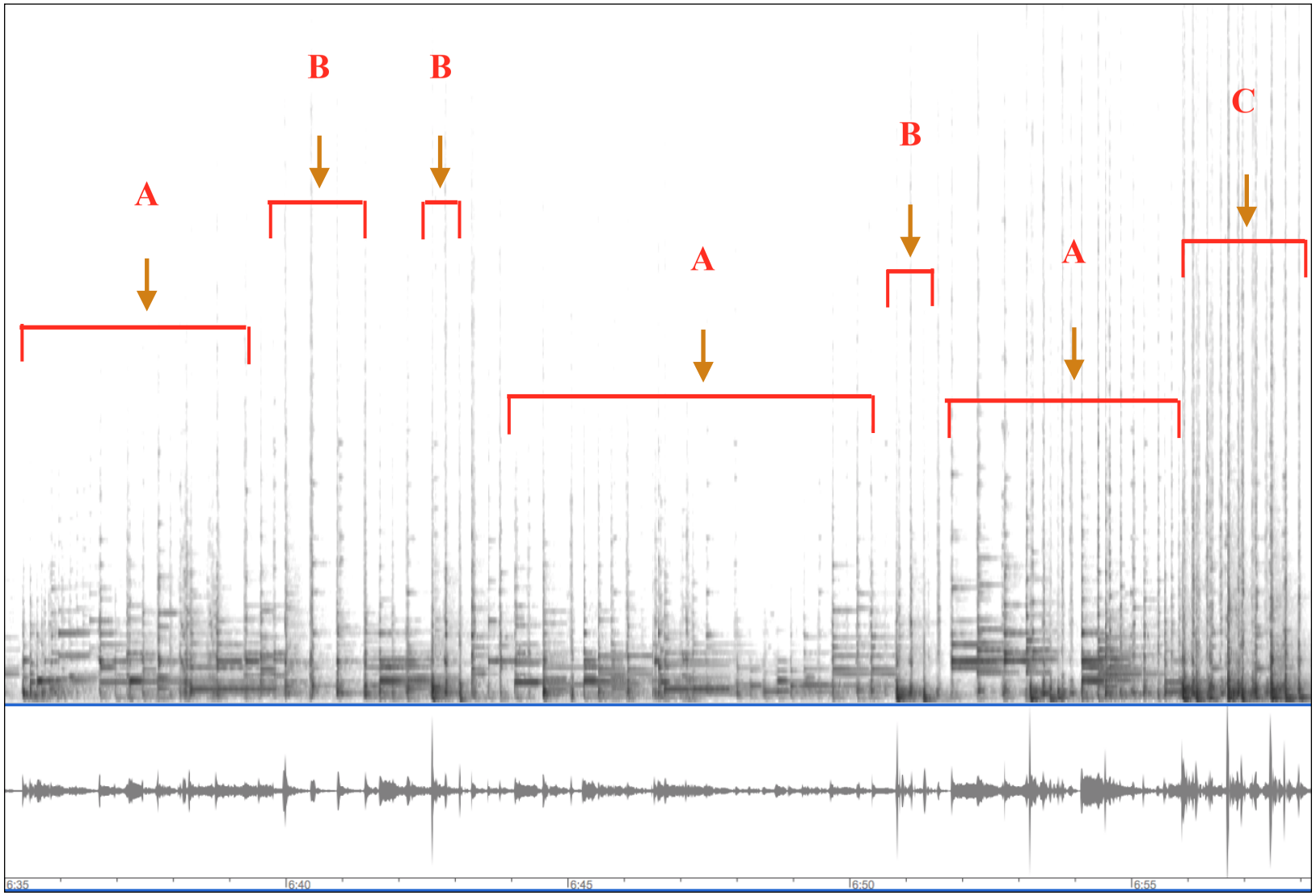

Figure 3.6: Sonogram of *Kogarashi* (6' 35'' - 7' 00'') - details information between the filtered and harmonised sounds of the live guitar and those of computer playback, which clash spectrally (A). Introduces the spectrally dense percussive action against the strings (B). C highlights the attack portion of the percussive action.

5.3.3 Summary of Spectral Qualities in Combier's *Kogarashi*

Jerome Combier's *Kogarashi* illustrates the expressive potential of instrument techniques by utilising their individual qualities to evoke poetic scenarios or notions: the music and its sonic qualities function as an expressive agent. This is unlike Kokoras' work, where the listener's attention is focused on the inherent qualities of the guitar. Combier utilises noise, nodal and note qualities to shape the listener's perception of poetic ideas; like ghosts, the moor or King Lear. The live electronic nature of the piece preserves the performer's interpretive capabilities; the work is grounded metrically rather than absolutely.

This section has illustrated two features of the guitar; the first is that note, nodal and noise qualities are available to composers through a wide range of instrumental techniques, all of which can be manipulated by electronics; the second is that these qualities can be expressive, and are not limited to a purely objective narrative that focuses the listener on their internal spectral qualities - they can embellish metaphorical or poetic notions.

5.4 Review of Case Studies

This chapter, in line with its aims and research objective, has presented a review of instrumental techniques in electroacoustic literature. Its intentions were to understand how these techniques and their unique sonic qualities have been incorporated into current musical practices. It achieved this by assessing the spectral content of Jerome Combier's *Kogarashi for Guitar and Live Electronics* (2002) and Panayiotis Kokoras' *Slide for Guitar and Electronics* (2002). Both express through different mediums, the wide and expressive potential of this sonic material.

6.1 Conclusion

The following chapter concludes this research project and details its findings and results; which have been produced through the processes of my musical composition and commentary, and the inquiry and analysis of nodal and noise qualities in electroacoustic literature.

This project has demonstrated that by using an objective classification of sound types, and the evocative and engaging definitions attributed to them, one can begin to generate and develop larger music structures on the classical guitar. In my composition *Extensions,* nodal qualities are explored through a framework that augments the instrument past its harmonic and physical restrictions; which previously hinder the production of nodal and noise qualities. It has also presented, in case study form, two compositions that explore nodal and noise qualities through artistic and aesthetic notions. Kokoras' *Slide for Guitar and Electronics* (2002) interrogates the instrument through a range of extended techniques; his composition practice highlights the unheard qualities of these sounds, drawing the listener's attention to a sound's inherent qualities. Combier's *Kogarashi for Guitar and Live Electronics* (2002) employs a metaphorical framework for the piece, using instrumental techniques to evoke and represent poetic notions.

For practical reasons the scope of this project has been refined to investigating note, nodal and noise qualities on the classical guitar alone: although it is not limited to that instrument. Similarities can be drawn with the timbral qualities of woodwind, brass, percussion and string instrumental families, and to individual instruments in these families. This indicates, on a larger investigative scale, possible extensions for this project and the general research area.

As a final remark, this project has illustrated the nodal and noise qualities of the classical guitar through my composition *Extensions* and case studies of Combier's *Kogarashi for Guitar and Live Electronics* (2002) and Kokoras' *Slide for Guitar and Electronics* (2002). The possible extensions for this research area, and the connections it implies between acoustic and electroacoustic disciplines, are incredibly exciting and engaging and present ample future research opportunities.

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