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Rhythm, Timbre and Space as Musical Expression

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Rhythm, Timbre and Space as Musical Expression

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in

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by

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June 2017

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June 2017

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Fernando Rincón Estrada

Dedication

This work is dedicated to my family, Susana and Santiago, the foundation and source of joy in my life.

Acknowledgements

I want to deeply and wholeheartedly thank Clarence Barlow for his unconditional support and help.

To my committee members Dr. Curtis Roads and Dr. JoAnn Kuchera-Morin, I will always be grateful for their interest, valuable help and invaluable time.

To my wife Susana, all my gratitude and debt.

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PUBLISHED MATERIAL AND PRESENTATIONS

Recordings

1. El Pusilánime bajo la Noche del Silencio *for solo soprano*

Performers: Beatriz Elena Martínez
From: Un hombre puede ser flor
Circulo Colombiano de Música Contemporanea, 2013

2. Improvisación Libre 28042010 (extracts)

Performers: Jorge G. García (Laptop) – Fernando Rincón Estrada (Laptop, controller, cd reproducer)
From: lado B, nuevos encuentros sonoros – 2010 -2011
Fundación Espacio Cero, sponsorship Orquesta Filarmónica de Bogota, Bogota. D.C, 2011

3. de lo secreto en los rastros *for guitar, live electronics and fixed media*

Comissioned by Fundación Espacio Cero for Festival “en tiempo real; nuevos encuentros sonoros”
Performers: uiachii. guitarra y electrónica (Guillermo Bocanegra, guitar, Ana María Romano G., live-electronics).
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Academic Articles

Ensemble Feedback Instruments
Muhammad Hafiz Wan Rosli, Timothy Wood, Hannah Wolfe, Anis Haron, Karl Yerkes, Charlie Roberts, Fernando Rincón Estrada, Matthew Wright
Proceedings NIME, Baton Rouge, LA, USA, May 31-June 3, 2015

Academic Presentations

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Abstract

Rhythm, Timbre and Space as Musical Expression

by

Fernando Rincón Estrada

This dissertation comprises a collection of works that address aspects of sound occupying space. Those aspects refer to inner components of timbre and rhythm and how these may influence the perception and projection of sound. These works also address the interaction of physical or virtual spaces and spatial attributes of sound in regard to rhythm and timbre. The composition of timbres serves as fundamental base for the musical material contained in the works, using sound synthesis and extended techniques as a paradigm for articulation and instrumentation of sound in vertical and horizontal layers. Rhythm is not only a parameter that articulates time; it may also be the parameter that articulates musical material. The relationships of timbre and rhythm serve as expressive substance for the elaboration of immersive soundscapes that are molded by time and memory.

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Chapter 1

Rhythm, Timbre and Space as Musical Expression

Introduction

As an introduction to this document, is important to establish the principle of how musical material is understood within the contexts of my compositional technique, resources and tools. This principle states that musical material is defined at its core by sound, and at the same time said material is constituted by a configuration of harmonic relationships. These relationships are framed in a timeline and they can be based from simple to complex within the same instance. At the same time there are external elements to this inner core that also have influence and interact with this initial core, to give a definition and character to the final sound structure[1]. The conditions of the external elements are defined by the source and its ways of producing sound. The idiomatic character of the sources contributes immensely on the shape and characters of the resulting sound.

So the contents of a sound structure may be very varied and include different aspects and elements that still constitute musical material and may be defined as musical material as well. Two cases of discrete elements affecting musical material relevant to this document are noise and acoustic and virtual space. Nonetheless we find universal elements that are inherent to the core of any kind musical material. What provides the character of universal is the fact that music would not be sounding if they

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[1] I am basing this concept and term on the idea of *clang* defined by James Tenney in his book META-HODOS and META Met-Hodos.

Tenney James, *Meta+Hodos: a phenomenology of 20th-century musical materials and an approach to the study of form ; and, META Meta+Hodos,* [Oakland, Frog Peak Music, 1986], 23-26 were not present. Time and duration along with rhythm as its main manifestation can be settled as one of the universal elements. At all levels, micro, meso and macro temporal levels, time influences and affect qualities and characteristics of sound, sound structures and sets or collections of sound structures. At the same time timbre is one more of the universal elements, as it was mentioned before it is inherent in the nature of sound to give quality and identity to sound sources.

The complexity in the relationships and interactions of these inner and external elements leads to approach musical material in a modular fashion, in ways of modules. As each of the elements may be addressed individually as they possess their own set of structures. Those structures interact and interplay in a network of relationships that may manifest as musical gestures, streams of sounds, or rhythmical structures, and these manifestations included within the boundaries of musical material. Pertaining this document I approach three broad modules: rhythm, timbre and space. And from these three modules I address implementations of different aspects that are related to each one of them. Most importantly all three of them are interrelated and articulated as musical material and in the following document I will present several examples of how this articulation takes place. The level of articulation, connection and correspondence determines the musicality end expressivity of the musical material

An important consequence from approaching these elements as modules is that layering, simultaneity and linearity become essential concepts to explain and illustrate the articulation and interaction of the modular elements.

1.1 Rhythm

For this section is important to establish a sequence in the evolution of rhythmic development techniques that have been process of my compositional background. The use of additive rhythms has been recurrent and foundational on my applications of rhythmic structuring. The flexibility found in the modular arrangement of pulse and rhythmic patterns is a major advantage in this kind of rhythmic structuring. A result of that flexibility is an organic complexity in rhythmic patterns that enable more interesting and dynamic rhythmic layers of time events. Those layers are subject to faster and quicker changes of pulses, subdivisions and densities. Some applications of this flexibility may be observed in the rhythmic structuring of Olivier Messiaen's and Igor Stravinsky's music. In my case the implementations of Messiaen's approach are more relevant to my work, as they use prime numbers as multipliers and additive values to build rhythmic patterns.

One implementation of said technique may be seen in *Split Narrow*[2], where three rhythmic layers at the micro level [3]are present. The first upper layer is the grouping of durations of different pulse lengths, which they add to the same total value of basic units. The total value may be subdivided in to different combinations of grouped values. As an example, a total added value of 19 eight notes may be subdivided to different combinations of groups of three values, such as: a.) 7+7+5, b.) 11+5+3 or c.) 13+3+3. Each of the combinations adds to the same value of 19 basic units of eighth notes. And each combination carries inherently certain conditions, which makes it more suitable

[2] Solo Organ and Eight-channel Fixed Media.

[3] When making reference of rhythmic micro level in acoustic contexts, I am referring to time scales where several measures are grouped together.

for certain musical characters over others, yet all of them have exactly the same length and proportion. The second rhythmic layer is the subdivision of the upper layer into basic unit groupings of smaller sizes, in this case groups of two and three eighth notes. These groupings have a more direct impact in the perception of pulse and regularity, pertaining length duration and rhythmic perception. The lower third layer proceeds to subdivide the binary and ternary groups in smaller values of one and two. In all cases the values fulfill the conditions of being prime numbers.

The three fold rhythmic micro-level is a hybrid between characteristics of additive and divisive rhythms. The aspect drawn from the additive rhythmic structures is the asymmetric characteristic present in its patterns. While from the divisive rhythmic structures the repetitive and regular character of rhythmic patterns is the one to be drawn.

One more aspect that constitutes a basic resource for rhythmic variation and development of rhythmic structures is the permutation in the order of durations of a given rhythmic pattern. The permutation in order of values allows cohesion in the rhythmic structure, as patterns share the same elements yet the order of the sequence allows a differentiation yet to not be perceived as repetition but assimilated as one that is related. It is important to mention that reference cues are important for the recognition of rhythmic patterns. These reference cues have the same purpose as those that the downbeat and upbeat have for the structure of meters found in prototypical meters in divisive rhythms. In the case of additive rhythms is important to achieve the same degree of recognizability in order to have the same effect seen with meter in divisive rhythms. Furthermore is important to mention that there is a higher level of complexity involved with additive rhythms, which makes their recognizability more difficult.

In a linear axis, repetition is a useful tool for reference cueing, but again repetitiveness weakens rhythmic development. The layering of rhythmic voices is an important resource to compensate an increasing level of uniformity that repetitiveness may present in a single layer. Though a single layer may proof repetitive, the layering of several of them may provide enough level of complexity and at the same time a high degree of recognizability, which is needed for the perception of a rhythmic structure. Based on the principle of layering, polyrhythmic textures are then common to find. Furthermore the principle may be extrapolated to the layering of single lines, each one of them related or associated to a different parameter, yet their interaction occurs in the same way as a choral or polyphonic texture would do. Just that in this case the lines are controlling parameters, all of them falling within the same timeframe and proportions yet independent in their temporal flow.

One more challenging aspect presented with additive rhythm is the balance between regularity and irregularity. As different pulse lengths may be contained in one rhythmic structure, the sense of regularity at higher levels than that of the subdivision of the pulse may become difficult. One resource to counterbalance that difficulty is to unify the pulse to one single tempo fulfilling the condition of regularity, while subdividing the pulse to different consecutive values then fulfilling the condition of irregularity. The consecutive values maintain flow in the rhythmic structure and the grouping of the subdivision sequence is treated in the same fashion, as an additive rhythm would be treated, by grouping values based on adding a basic unit. One example of that resource can be found in *On Tessellation*[4], where two simultaneous rhythmic layers each one of five pulses of length and adding a total of 23 attacks, can be subdivided in two different combinations: a.) 3+4+5+6+5 and b.) 5+4+5+4+5. Both layers have a level of irregularity contained in the subdivisions of the pulse, but also have a level of regularity in the uniform pulse they share.

One important detail to mention is that in spite the changes in the tempo flow the rhythmic patterns and character hold still recognizable. To achieve that characteristic is important to provide each pattern with proper cues that differentiate said pattern from others no matter the change of flow. Is in that sense that accentuations of different sorts are essential for that task. Accentuations on parameters of length, register, timbre and articulation are some of the ones that enable that differentiation, yet specific enough to give recognizable features to each independent pattern. This principle is applied to all linear additive rhythmic structures as they give clarity, unity and articulation to each pattern.

As a result of these conditions a sense of expansion or compression of rhythms is perceived as the pattern maintains its characteristic features with no sense of distortion. It is perceivable how these features are perceived closer when tempos are accelerated or perceived further away when the tempo is decelerated. And as it has been mentioned previously, two layers of tempo flows are achieved one regular that sustains the irregular subdivisions of the pulse while a second parallel layer sustains the additive rhythm groupings articulated by the accentuations. This layer also shares

[4] Percussion trio and multi-channel fixed media.

the regularity of the repetitive frequency of accentuations while the irregularity appears in the asymmetry of said repetitions.

As in the micro level, the same principle of dividing a total value in different combinations of values is applied to meso structural levels of rhythm. Is worth mentioning that density is a parameter of big relevance at this level. Levels and degrees of contrast of materials are controlled at this level. A section of the same duration may be divided in three, five or seven parts, determining the level of density and information for that given section. An example of this can be seen in *Rust*[5], the piece plays between two prototypical sections of contrasting densities. That is to say that both contrasting sections share the same total duration of 23 seconds, having the densest one divided in eleven events while the less dense one only divided in seven. One other factor that may reinforce or counterbalance the level of density is the tempo assigned for each section.

1.2 Timbre

Continuing with the modular thinking of musical elements, as mentioned in the introduction, one more universal element that is relevant to this document is timbre. This aspect has been mostly developed in the electronic pieces and fixed media components referenced in this document. The main approach and technique developed applies subtractive synthesis at an initial stage, this for generating unitary elements, which will be used later at a second stage as additive elements in a context of additive synthesis.

The main reason I was lead to subtractive synthesis lies on the need to use non-linear sources, as pure additive synthesis based on oscillators, lacked variability and

[5] Solo violoncello and eight-channel fixed media.

dynamic changes which were necessary for an interesting synthesis of timbre. My results with pure additive synthesis resulted in static timbres, that I didn't found interesting enough to keep on developing as primary timbre material. Subtractive synthesis on the other hand offered better results with fewer resources making it more effective and interesting. For mostly all the composed material involving a timbre approach, the filtering of white noise or pink noise was used, looking to fulfill the non-linear condition. And in some cases a second filter was added later to add complexity to the spectral content, mainly cases where non-pitched timbres were the goal.

Further stages for the synthesis of timbre deal with the shape or envelope of the timbre, either for each individual partial component or for the entire timbre. Individual partial enveloping offered the opportunity to highlight and develop variations of timbres already synthesized. In that sense envelopes became a major resource for timbre design.

Two more aspects for the synthesis of timbre relevant to this document are the placement of the timbre in a virtual space for it to resonate and the simulation of the material where the vibrations are produced to resonate. Some examples of this approach maybe heard in the fixed media of *On Tessellation* [6] were the primary compositional approach was to categorize acoustic and electronic sound material, to references of physical materials, those of vibrating: wood, membrane and metal. One more approach on the topic can be found on the piece *Surfaces* [7] where the gradual growth of the granular material[8] morphs into gradual instances of wooden and metallic

[6] Percussion trio and multi-channel fixed media.
[7] Eight-channel fixed media

timbre components. The intention of this timbre synthesis is to allude[9] to certain types of prototypical sounds not to recreate them or imitate them.

As part of the placement of the sound in a virtual space, delay lines contribute as an important factor to create or recreate a resonant space for the timbre that is been synthesized. The delay times on the delay lines used in the electronic material synthesized range mostly between 20 and 80 milliseconds. The shorter the delay time the narrower the width of projection of the sound is and more centered stereophonically. For a wider projection the delay time tends to higher numbers, as the interaural delay times are longer. Numbers higher than 80 milliseconds fall into the category of echoes. Relevant to this document, delay lines are very useful to highlight and replicate the non-linear character of the primary synthesis material. The layering of said delayed material adds complexity to an already complex texture of very active inner behavior, translating in interesting timbres.

The primary material of non-linear partial components is obtained by filtering white noise or pink noise through a band pass filter with very narrow cue factors isolating and focusing the output to the cutoff frequency of the filter. As mentioned before a prototypical bank of band pass filters is the initial step to compose a timbre with a collection of partials. Subtle factors like using the same or different noise generators for the partial components contribute to the complexity of the timbre. Envelopes and amplitude modulation of these timbres contribute also to the richness and dynamic activity of the timbre in its inner components. An example of amplitude

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[9] I take the concept of *spatial allusion* from Natasha Barrett and expand it to the notion of t*imbre allusion*, where the timbre alludes to some physical specific object.

Natasha Barrett. "Spatio-musical composition strategies". *Org. Sound* 7, 3 (December 2002), 313-323.

modulation applied to making a timbre more complex can be found in the fixed media of *Split Narrow* [10]and *Rust*[11]. In the case of *Split Narrow* [12]each partial component has its own amplitude modulation parameters, opening the possibility of a layered texture of AM [13]partial components that operate at different modulation rates. The texture is the resultant of the amount of partials used but also of the amount of simultaneous AM with different parameter settings. A polyrhythmic texture of amplitude-modulated set of partials highlights rhythmically, different shades of timbre variations based on the modulation patterns. Amplitude modulation is applied in *Rust* to the synthesized timbre to simulate the gesture of vibrato typically used in bowed strings, in this case applied to the timbre in question.

Basic principles of spectral composition techniques were applied for the synthesis of timbre in fixed medias of: *Pliegues*[14] and *Rust.* The basic approach resided in the layering of partials with the corresponding amplitude levels for each one of those partials, based on spectral measurements of acoustic instruments. Freer approaches based on that principle were also used for timbre variations and developments. At the same time derivations of those results generated tools, material and timbres for: *Surfaces* and *On Tessellation*. For these two cases, the derivation relied on adding a second stage of filtering to the initial subtractive/additive synthesis process. Mainly the second stage filtering was added looking for results of non-pitched timbres with allusions to percussive instruments.

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[10] Solo organ and eight-channel fixed media.
[11] Solo cellos and eight channel fixed media.
[12] See *code* example. Page xx.
[13] Amplitude modulation.
[14] 54.1 Fixed media.

The relationship between noise and pitch focus is a common ground that acoustic and electronic instances have shared in the works referenced in these document. The topic has been of specific interest in the pieces: *Blend* [15]and *Rus*t, but they are also present in the electronic works: *Fracture* and *Pull*. The topic has been recurrent from an acoustic approach by implementing and using extended techniques with high noise components. A common thread between the acoustic and electronic approaches was later found with the experiences of subtractive synthesis using noise (white or pink) as primary material. I believe that the sonic gesture of the two-way transition from noise to pitch owns a powerful musical expressivity, as it involves transitions from very complex textures thru dense harmonic components which finalize in focused pitched instances, having a wide range of shades between those transitions.

Linked to the relationship of noise and pitch, timbre can be found as one key element manifested thru lines or streams of sound, as the intention for those gestures is the transformation of the element from one characteristic to other. That is the principle behind the use of multiphonics, double stops, or techniques that involve a noise component with a complex sound structure and in opposition to purer pitch sound/timbres obtained by a touch harmonic on a bowed string. All these cases present an inner activity in their nature, internal dynamic changes within the boundary of a self-contained event or gesture. The occurrence may be characterized as the contrast between stable and unstable behaviors and a parallel may be done with the opposition between linear and non-linear stages. It could be said that the stability is provided by the sustained continuous flow of sound yet the instability comes from the

[15] Solo viola.

subtle changes happening within that sustained sound, i.e. the bright to dark timbre change of a long sustained pitch in a bowed string, resultant from the bow position change from bridge to finger board, this happening with no interruption of the sound flow. This type of gesture that blends stability/instability juxtapositions in one same line flow or event is found in the pieces: *Blend*, *Rust*, *On Tessellation* and *Split Narrow*.

One final aspect of timbre development that is transversal for three works referenced in the document is the blending effect in a physical space of timbre components that are projected discreetly while being spatially distributed in the physical space. In other words, the blending effect from complementary sources; acoustic instruments and fixed media, as they are assembled and understood as one only source or timbre of complex sounding nature. The first case can be found on *On Tessellation* where each reference material, vibrating; wood, metal and membrane have a parallel timbral version in both media; acoustic and electronic. Is important to mention that the intention is to achieve a blend through parallel streams of sound that resemble in timbre characteristics, relying in affinity to achieve a blending factor. A similar intention is found on *Split Narrow* and *Rust*, where both sound streams (acoustic and electronic) are present yet one depends on the other to achieve a total blending state.

A contrasting aspect can be found as the case of *On Tessellation* deals with non-pitched timbres, while *Rust* and *Split Narrow* deals with pitched timbres. It is in that sense that the parallelism for the non-pitched timbre streams is more constrained and self-contained due to the complexity and variety of the timbres, while the pitched timbre streams are more prone to be complementary, hence easier to blend in the physical space.

1.3 Space

The opportunity to work with multichannel speaker systems has provided a great experience in the creative side of designing and composing spatial narratives for musical pieces, either in stereo or multichannel formats and in mixed media formats. The opportunity to involve space as a musical element relies in my case in the intention of creating a surrounding and enveloping sound environment. It is in that sense that the intention tries to break away from the frontal source-sounding format into a circular two dimension format and deriving into a three dimensional format in some cases.

Two fixed media works and two mixed media works are aimed to the circular two dimensional spatial configuration: *Pull* and *Surfaces*, as fixed media, *Rust* and *Split Narrow* as mixed media. While *Pliegues*, and *On Tessellation* are intended for a tri-dimensional spatial configuration. The following section will present some transversal aspects of implementations and developments of spatial attributes focused on musical expressivity and technical applications.

The opportunity to work with flexible multichannel sound designing tools like SuperCollider[16] has enabled in my work an interesting pairing between rhythmic and spatial layouts. At the same time aspects of granular synthesis provided also useful concepts to apply to these developments. The piece *Pull* focuses on the idea of applying rhythmical patterns to spatial configurations in a circular eight-channel speaker system.

[16] SuperCollider is an environment and programming language for real time audio synthesis and algorithmic composition. http://supercollider.github.io

In that sense, regarding timing the spatial patterns may go to very detailed and narrow degrees of spatial distribution for a single musical event. This is done by assigning sequenced delayed outputs of the same source to the octophonic layout in pattern combinations of speakers. For the case of Pull the sequence is of consecutive numbering, having the delayed output follow in order the consecutive circular speaker numbering. The same principle of sequenced delayed outputs has also been applied in *Surfaces* and *Pliegues*, although in those cases in an extended version[17], as the delayed outputs were expanded not to a single but to a chain of delays. Therefore the main source usually in stereo format already including a delayed signal is replicated as a mix by delays that may be assigned to arbitrary speaker patterns depending on the mapping of the speaker system.

The interaction of fixed and moving sources is a main aspect of the mixed media works referenced in this document. In this sense the acoustic source is fixed in space while the electronic/electroacoustic component may be fixed or movable by effects of panning the source through the system. This configuration enables different possibilities for spatial gestures, narratives or choreographies. The pieces: *On Tessellation* and *Split Narrow* develop this idea, the first piece by distributing the sources (percussion sets) in a triangular pattern: 1.) front-right, 2.) middle-left and 3.) rear-right of the hall while the tri-dimensional speaker system counterbalances the fixed spatial configuration with movable gestures. For *Split Narrow*, the fixed location of the organ predetermines spatial patterns and distributions according to the spatial setting and location of the organ in the hall.

[17] See Appendix C, C.2 and C.2.1

One more implementation of timbre distributed in space is applied in the pieces *Rust* and *Split Narrow*, said implementation inspired on ideas surrounding the concept of *spectromorphology*[18] and *spectral space* [19], by Denis Smalley. As mentioned earlier the goal is to achieve a blending timbre between different sources located in different places, yet the blend is achieved within the physical space. The most used case is the layering of partials, each one of them projected to the space from a different source aiming to create the timbre by the summation of the sources in the hall or space. In that sense the objective is not to objectify or contain the timbre to one specific spatial location, but rather to expand or magnify it in a detailed manner by spreading it out through the space. Both pieces apply this concept in some degree of variation. It is important to mention also that in both cases the goal is to compose timbre from an abstract point of departure not aiming to reference their acoustical counterparts, but to complement or contrast those with allusions or illusions of affined timbres.

[18] Denis Smalley, "Spectromorphology: explaining sound-shapes". *Org. Sound, 2, 2,* (August, 1997), 107-126

[19] Denis Smalley, "Spaceform and the acousmatic image". *Org. Sound, 12*, 1, (April 2007), 35-58

Chapter 2

Portfolio Description and Summary

2.1 Liso (2012)

Summary Description

Solo prepared piano using John Cage's Sonatas and Interludes Piano Preparation. Although this is a short/small piece, I consider it important, as it is one of the pieces that encompass a large portion of the techniques I have developed, incorporated and used for composing the pieces referenced in this document. The compositional process of *liso* involved a categorization of timbre attributes that could be found in Cage's piano preparation. The categorization of sound types was based on analysis[20] on the types of sounds and their corresponding classification, as follows; type 1) normal sounding unprepared piano timbre, type 2) prepared piano timbres with a strong pitch-focus, type 3) prepared piano timbres with traces of pitch-focus, type 4) prepared piano timbre with undetermined pitch-focus. A subdivision of these categories was made, since the material for preparing the string determines the characteristic of the sound. In the case of bolts and screws, a resonant quality could be added to their description, though each one affects differently the sound of the string. For the cases of rubber and plastic materials, a damped sound of the string is the resultant. Also each one affects differently the sound of the string. One last case of damped sound was available for the preparations involving nuts and bolts or nuts and screws, both cases characterized by noisy un-pitched timbre sounds. Hybrid cases of having damped or resonant pitches

[20] Huettenrauch, Tina. "Three Case Studies In Twentieth-Century Performance Practice" [Ph.D. diss., Louisiana State University, 2005. http://digitalcommons.lsu.edu/gradschool_dissertations/547. 60-71

were possible thanks to soft pedal shifting of the strings enabling only one of the strings of the mechanism to be played. From this large classification I used as parameters for categorization the preparations materials combined to levels of dryness or wetness in the sound. Eight different kinds of timbres were obtained, which were used to structure the piece, having timbre as the main focus of development for the musical discourse.

Regarding the rhythmic attributes of the piece, the technique of expansion and compression of timelines was predominantly used as a key complementary musical gesture for the piece. It was the initial intention for the piece, to make extensive use of flexible rhythmic lines that would accelerate and decelerate in speed in an organic fashion. As mentioned earlier in order to achieve this behavior a two-fold layer of superposed rhythmic structures took place. A first layer with a steady pulse, subdivided in consecutive irregular subdivisions for each beat[21]. A second layer incorporated rhythmic patterns of additive rhythmic character focusing very closely in the relationship between accentuated and weak subdivisions. Degrees of compression and expansion are possible by increasing or decreasing the level of subdivisions of the pulse. Density is also implicit by the periodicity and regularity of appearances of the accentuations from the additive rhythmic patterns.

2.2 Fracture (2014)

Summary Description

Stereo fixed media. The material for the piece was collected from a set of patch improvisations recorded at UCSB Varese Studio with the CREATE Modular Rack Synthesizer. Said improvisations were centered on generating streams of rhythmic

[21] See score. Page 1

impulses that were subject to different envelope shaping, so to manipulate their timbre. LFO's and random generators dynamically changed the envelope shapes in order to achieve different contrasts and shades of the same patching, which resulted in gradual timbre morphing and timbre accentuations. The improvisations added up to closely two hours of recorded sound from where that material was gathered. The material offered a wide range of variety in frequency range, type of articulations and attacks and timbre qualities.

A second stage was developed for curating the material, which entailed in one stage the use of the material for sampling purposes, having the samples organized and sequenced through midi control[22]. The reorganization of the material had as purpose to narrow down the variability in contrast of the initial material, so to have more repetitive and rhythmic streams of sound. On the other hand, as a contrast to that sort of structured sequencing, fragments of the improvisation with no editing involved were also used to counterbalance the layered texture.

It was important to provide an spatial character to all of the material so a third stage of extensive processing involving different degrees of delayed signals was carried out to the final clips, loops and bites that were selected and used. Three main processes were carried out. One involving very short time delays[23], causing comb filtering that would alter the initial timbre. Another process involving longer time delays as to provide the material with a reverberant space and panoramic localization[24]. And a third

[22] I used ACToolbox, for preparing and programming the MIDI sequencing and MIDI information. http://www.actoolbox.net

[23] Ranges between 5 – 10 milliseconds.

[24] Ranges between 20-60 milliseconds.

process involving delay times long enough to be categorized as echoes.[25] The three types of processed material were then used to structure the spatial narrative of the piece that focused on proximity and distance of sound events. Proximity was associated to centering the events to a central stereo sweet spot with short delay times while distance was associated to panning movements of events due to longer delay times and echoing, caused by long interaural time delays which translated to a wider stereo width.

2.3 **Blend** (2015)

Summary Description

Solo viola. This piece is also representative of techniques and resources later employed and developed in pieces of larger scale. The piece is centered in the development of timbre attributes focusing on the transitioning stages from clean/pure timbres to noise-component timbres. Within the piece the noise-component timbres are associated with bowing techniques, bow pressure and positioning of the bow, all of these elements altering the sound of the instrument. The combination of these variables enables a range of levels of timbres with different degrees of noisiness. It is important to mention that the factor of noisiness is intended to be subtle aiming for a smooth transitioning from noisy to clean states.

Regarding the clean timbres these are solely characterized by occurrences of double stops on combinations of open string and touch harmonics or touch harmonics only. It is important to mention that the chosen intervals/double stops play with different degrees of mixture or blending and it is one important parameter for the structure of the piece. The wide spread/distance of the large intervals from

[25] Ranges between 80-120 milliseconds.

combinations of open strings and touch harmonics makes difficult the perception of two discrete pitches sounding together. It rather tends to a perception of one only complex tone with high and low shelf frequency blend. As for smaller and narrow intervals the blending effect rely more in the harmonic complexity of the interval, where flat consonant intervals like perfect fifths, or dissonant intervals likes minor seconds blend easier, while intervals like major or minor thirds are difficult to perceive as one only tone.

A general trend for the piece focuses on vertical density as a parameter for a linear event. That is to say the density levels for a line or stream of sound. Hence the extensive use of double stops through most of the duration of the piece. Other occurrences of the trend are visible on the intermediate transitioning bridges between both types of timbres, pure/clean and noise-component. Both gestures maintain the density of double stops but increase the level of inner activity by articulation of tremolos or trills on the double stopped intervals.

Three stages of timbre attributes have been referenced in the previous paragraphs. These three stages are the layout for the main gesture or thematic gesture of the piece, which is the morphing from one stage to other through a bridged transition. As referenced before the initial or ending stages are those of noise-component timbres or clean/pure timbres. The contour or arch of this morphing process describes the phrases and gestures that occur in different sorts of variations through out the piece.

2.4 Pull (2015)

Summary Description

Electronic eight-channel fixed media. All the material was generated with SuperCollider[26] having as principle for the generation subtractive synthesis techniques. The code was designed for generating material of granular type, with a two-segment envelope of fast decaying exponential curves (80 milliseconds) and semi-sharp attack curve times (10 milliseconds). The subtractive synthesis involves filtering white noise through a two-stage filtering process, the initial one using a band pass filter tuned to a randomly triggered cutoff frequency ranging between 49 Hz. and 880 Hz. and controlled cue factor which narrows or widens the bandwidth of the filter. The second stage of the process is a resonant filter configured to the same settings. The sounding result of one grain is then a narrow random frequency focused grain with a narrow random frequency resonance.

The spatial attributes come in to play with the replication of the same instrument on a chain of delayed triggers, each delayed triggers assigned to one of the outputs of the octophonic speaker system. It is important to stress that each instance is provided with its own random generator so the frequencies will be different for each delayed instance. The time delay for the triggers is of 100 milliseconds between them, meaning that one complete eight-speaker cycle of delayed triggers will have a total duration of 800 milliseconds. A second layer of density is controlled by the rate of grain triggers per second, which controls at the same time the triggering of the chain of delayed triggers. There is a temporal/rhythmic relationship between the main trigger and the chained triggers making necessary to synchronize the total time delays with the initial trigger. In order to achieve that synchronization the basic formula used was:

---

[26] See code, Appendix C.3.

Trigger rate = 1 second/ Total time of delayed triggers

For Pull, that formula applies with the following values:

1.25 (trigger rate) = 1 second (1 cycle)/0.8 (0.1 time delay * 8 instances)

Density in the layering of cycles is obtained by multiplying the trigger rate to increasing factors. In the case of Pull, the sustained texture is achieved by using a triggering rate of 10 cycles per/second, meaning that 8 simultaneous cycles of the same iteration are being layered together.

Dynamic accentuations are due to happen on coincidences between the resonant and band pass filter cutoff frequency ranges. High dynamic ranges are obtained when frequencies in both filters are in proximity, the closer they are the more resonant the frequencies will be and the louder they will get. That is to explain the dynamic nature of accentuations in one cycle. Yet at the same time the rhythmic attributes are narrowly tied to the density factor of the layering cycles, since the phenomenon gets replicated for each layered cycle that is added to the texture. In the case of Pull, eight of those cycles are taking place, so we could argue that eight levels of dynamic accentuations are obtainable from the texture. It is important to highlight that the accents are bound to happen in any of the eight-speaker outputs since the frequency coincidence is random. So the spatial patterns originated by the dynamic accentuations are very dynamic in nature.

An intention of controlling the timbre attributes with very narrow q factors was predetermined since the pre-compositional stage of the code/instrument design. The degrees of dampness of the filters were always pointed to obtain pitch-centered results with some noise component attached to it. Yet the random selection of cutoff frequencies was decided after several tests, understanding that the non-pitched timbres were more interesting than a pool of fixed frequencies. As a result the timbre attributes were defined and controlled mainly by the combination of q factors from both filters.

2.5 On Tessellation (2015)

Summary Description

Percussion trio with multichannel fixed media. As mentioned in the previous chapter, the main focus of the piece is centered on developing timbre attributes of live and electronic sources. A second focus centers on the spatial distribution and attributes of the material and sources developed within the timbre attributes. In that sense the choice for the percussion instrumentation relied upon the type of resonant vibrating material of the percussion instruments, classified in: metallic, wooden and membrane[27]. Those materials also served as reference for the generated synthesized sound for the fixed media component.

The rhythmic attributes employ the same principle of compression and expansion of timelines and rhythmic patterns. It is important to mention that said technique is applied to both live instruments and fixed media components. In that sense a prototypical texture of the piece is the over-layering of independent rhythmic lines synched by the same pulse, while each of those pulses is subdivided to a different but consecutive factor than the previous one. For the fixed media, a variation of that same texture is developed, bounded by the same pulse yet by not the same continuity. The fixed media poses a counterbalance of discontinuity though maintaining the same levels

[27] See instrumentation list, score On Tessellation, Appendix A, A.3.

of pulse subdivisions only to a fragmented broken timeline that is distributed spatially around the hall.

Two types of contrasting gestures are used on the piece. One of them focuses on the polyrhythmic aspect of the layering of sources, while a second one focuses on the spatial movement and narrative of timbre along the physical space of the hall. A common thread between both is that the focus on vibrating materials as structural articulator for the piece is maintained. So the structure of the piece plays with different combinations and pairing of the materials. For some sections all three percussionist and fixed media are sharing the same material as timbre attribute, while in other sections each source is its own independent timbre development. An example of uniform timbre among sources may be found in section *0:34* [28]of the score where the tam-tam sustained durations is bound to blend with fixed media panning movements through the speakers. An opposite example is presented on section *2:06*[29], where each source is presenting its own timbre development.

In the previously mentioned cases, the spatial attributes are of main importance as they reinforce the timbre attributes that are being played on the piece. In both cases the fixed point of the acoustic sources highlight either the continuity or discontinuity of timbre in the physical space. Is in that sense that through out the piece the interaction between fixed media and live sources is always thought of complementary, where the concept of an enveloping/surrounding extended hyper-instrument of complex construction (timber and spatial-wise) is always understood. And the different inner interaction of its components constitutes the main core of the spatial attributes of the

[28] See score On Tessellation, page 2
[29] See score On Tessellation, page 4

piece. The fixed media drives the main spatial gestures of the piece due to the surrounding and enveloping characteristics of the multichannel setting. In this sense the spatial distribution of the players responds also to that layout, locating them in front, side and rear of the hall.

The timbre attributes of the fixed media are complementary to the selected instrumentation for the percussion. In that sense the aim for the synthesis of timbres was focused on obtaining those that could reference or allude the materials also used by the percussion: wood, metal and membranes. All the generation of sound was done using SuperCollider tools. To obtain percussive timbres with those characteristics, UGens implementations of drum membrane waveguide were used[30]. The same subtractive synthesis process was used to feed said UGen. Yet for obtaining different types of timbres, it was necessary to use several different kinds of resonant filters.

2.6 **Pliegue**s (2016)

Summary Description

Multichannel fixed media electronic piece designed for the UCSB Allosphere[31]. The structure of the piece is centered on the material of the final section of the piece, which was composed before any other material used in the piece. A derivation of that material was later used for the first and second section, in the granular textures that gradually introduce the primary material fully presented in the last section.

The initial focus of the piece relied on the development of the timbre attributes of the material. Spectral composition principles were applied for synthesizing the

[30] See Appendix C, C.4.

[31] The speaker layout of the UCSB Allosphere comprehends a tri-dimensional set-up of three rings; an upper and lower ring holding 12 speakers and a middle ring holding 30 speakers

timbres, as the values of the amplitudes for the measurement of a sustained E1 = 83 Hz. from a violoncello were used as initial values for the parameters of the amplitudes of each partial needed for the additive synthesis layout. As explained in the previous chapter of the document, each individual partial was obtained by subtractive synthesis of filtered white noise. The process of the instrument is continued through a five-stage filter process that includes a delay, comb and all pass filtering[32].

Inevitably the spatial attribute of the piece took over due to the scale of the multichannel system, and said attributes are focused on three implementations; the first one is a discreet assignment of sources to specific subsets of the speaker system, the second one a division of the entire speaker system to two vertical hemispheres and a third one using instances of VBAP. In the first and second case the basic layout for outputs of the instrument is the same one referenced in the previous section where the outputs of the instrument are assigned to three different bus outputs, the first two for a stereo signal and a third bus for a delayed signal of the mix of the first two. For the first implementation with the use of one of the sequencing tools of SuperCollider; the Routine Class, [33]several instances of the instrument were sequenced in a multichannel recording session of six or eight outputs[34], which later were remapped to the 54.1 speaker layout of the Allosphere in different spreads. Several sorts of distributions of the recorded multichannel material were made, mainly to accentuate the width and span of the panning gestures of said events, translated to speed and distance of the panning gesture of the sound event. In that sense the events could be grouped in

[32] See Appendix C, C.5.
[33] See Appendix C, C.5.1
[34] Six for fixed or semi fixed bus assignments, eight for randomized assignment of buses.

compact form to consecutive speakers on a horizontal axis for either of the three rings, or spread wider by mapping each output to non-consecutive speaker sequences, that could involve both horizontal and vertical axes.

For the second implementation, the routine sequences were also used to record sessions of simultaneous instances of the same instrument assigned to separate output busses, which later would be remapped to the one of the vertical hemispheres of the Allosphere. It is important to mention that in my experience groupings of three speakers were the most symmetrical, divisible and modular unit fitting the speaker configuration of the Allosphere. Is in that sense that nine instances of the instrument would result in a multichannel recording session of 27 channels[35], equal to one vertical hemisphere of the sphere. The principal that lead me to this pattern was that of thinking of an expanded tridimensional binaural format that simulates an expanded stereo configuration.

The third implementation of spatial attributes is centered on VBAP, as three simultaneous instances of the technique were applied for the last section. All three instances were two-dimensional VBAP, each one of them assigned to each ring of the sphere. The intention was to have an over-layering of continuous panning motion at the three levels of elevation. Each of the panning motions had its own independent trajectory, regarding speed and direction, which were controlled by variable LFO's. The control rates of the LFO's were mapped to the VBAP azimuth parameter determining

[35] Nine instances of three bus outputs

panning speed through the oscillating frequency value of the LFO and direction by the mapping of the LFO output values to the azimuth adjustable range parameters[36].

2.7 Surfaces (2016)

Summary Description

Eight-channel fixed media and smart device interactivity. The main core of the piece is the use of granular material that transits through different degrees of non-pitched timbre material. Is in that sense that for compositional purposes the timbres were associated as reference with physical materials such as metal, stones, glass and bells. Due to the granular approach and nature of the timbre all the articulations and types of attacks were predetermined as only percussive. It was also important to develop different spatial environments for the different kinds of materials, mainly reinforcing the resonant aspect of those, so preference for reverberant spaces were given, taking into consideration contrasting elements of more dry sounding nature as counterbalance, for enriching the spatial perspective of the sounding environment.

The initial instrument designed for the piece applies the same technique of subtractive synthesis of noise for the initial individual components, while an additive synthesis component mixes all the elements to be then processed through a chain of delays and reverberations.[37] The narrow band pass filtered frequency components were randomly determined within fixed bandwidth; i.e. one instance for metallic timbres used a bandwidth between 800 Hz. – 1200 Hz., one other instance for shaken seeds timbre used a bandwidth of 12,000 Hz. – 12,500 Hz. Each of the randomly selected frequency components was later modulated by the same modulating LFO mapped to

[36] Parameters adjustable to a range between -180 degrees to 180 degrees

[37] See Appendix C, C.6.

adjustable ranges, so each of the initial random frequency values would dynamically increase and decrease based on the ranges and frequency rate change for the LFO. To illustrate with one example, an initial frequency of 12,357 Hz. is randomly chosen from a bandwidth of 12,000-12,500 Hz. The LFO will modulate that initial frequency by adding the range of mapped values from the LFO output values, i.e. if the LFO has control rate of 0.1 Hz. and the value range to be mapped to the initial frequency is adjusted between 1 and 2000, the initial frequency in a span of 10 seconds will increase and decrease from 12,357 Hz. up to 15,357 Hz and back to 12,537 Hz. The same process is replicated for every individual component of the additive instrument.

By programming those types of processes the possibility of expanding and multiplying the procedure to large scales becomes very easy. It is in that sense that the additive synthesis instrument that was created, added and mixed eight individual components/processes, into one only mixed instrument and at the same time several instances of the same instrument could be sequenced and called to create a thicker more complex timbre or texture. The development of timbre for the instruments was determined by the combination of fixed bandwidths of the individual components and the adjustable ranges of the modulating LFO. The bandwidth combinations spanned from mixtures of low, medium and high, frequency bandwidths to focusing on certain specific frequency bandwidth range. As for the LFO modulations ranges of added values, these were generally used between ranges of 1 to 500, 1000, 2000, and 3000 Hz. The results of these combinations were fully determining the type of timbre qualities and characteristics obtained for the different granular materials.

2.8 Split Narrow (2017)

Summary Description

Solo Organ and eight-channel fixed media. The concept of the piece borrows from the idea of extrapolating the principle of additive synthesis of adding partials to synthesize a timbre and applying it to an acoustic context. In this case the context being a concert hall carrying an organ and an octophonic speaker system. From that starting point, the piece intends to focus on details of tuning and timbre that the organ owns inherently and tries to expand them through the support of the fixed media. One more important feature for the piece is to highlight through spatial attributes the spectral components of the piece.

As part of the timbre attributes the piece revisits the idea of sound stream. Understanding that the nature of the gesture is a long sustained sound event with dynamic changes internally, those changes related to density in activity at the vertical and horizontal axes. Though the behavior and typology is very similar in description to the sustained texture that will be mentioned later in the document, I find there is an important difference between them as for the latter (sound stream) there is no noise component involved. The timbres heard though out the piece tend to be very clean and transparent, due to the nature of the acoustic instrument that is involved. Regarding the sustained texture, the noise component is determinant for the sound quality, which may be described as rugged, granular or jagged, very dynamic in its structure. In opposition, the sound stream for our case may be characterized as smooth and flat, yet the density conditions are valid still, just without the characteristics provided by the noise components.

As mentioned previously the piece focuses on aspects of timbre and tuning of the *organ*. An initial gesture then that the piece elaborates is the use of *"equisonance",* understood as one equal pitch that is played by different sources or mediums. For the case of the organ the two manuals and pedals allows the instrument to play exactly the same pitch, yet each of the instances will sound subtly different due to the changes in timbre for each corresponding source. The same instance of *"equisonance"* may be found in many other instruments[38], yet the Organ offers a much more flexible use of the resource since all three keyboards in all their extension are available for applying it.

It is important to mention that the pitch material for the organ is derived entirely from the pitches found in the overtone series with C1 = 65.41 Hz. as fundamental. In some cases the interval of the partial is maintained, but for the most part the partials are collapsed to a shorter interval so they can fit idiomatically to the organ playability and performance. As counterpart, the fixed media does maintain the intervals and exact frequencies of the series. Having said that, the fixed media functions in the first section on one hand as a resonator for the partials being played by the organ and on the other as complement by introducing other partials that will be present later in the piece. It is important to mention that two tunings will sound simultaneously, the just intonation from the overtone series will be played by the fixed media, while the equal tempered tuning will be played by the organ. The degree of deviation between them is the factor that determines the articulation and structuring of the sequence and selection of pitches.

[38] String instruments, mainly by playing the same pitch in open and stopped string(s). One more example can be found on wind instruments, by using alternative fingerings to play the same pitch.

The second section maintains the principle of complementation, making the fixed media and organ blend into one only instrument that when played its timbre highlights a collection of overtones, which are distributed through the hall by the eight-channel speaker system. For the second section also, the function of the fixed media is more consolidated as its purpose of resonator becomes more stable by blending the pitches of the overtone series in C1 with the corresponding closest pitches found in the equal tempered tuning. In that sense the purpose of the fixed media is to reinforce both tunings, the equal tempered tuning of the organ and the just intonation of the overtone series being played.

2.9 Random is not that Random (2017)

Summary Description

Stereo fixed media. The piece is a result of code improvisations made with iterations of the same code/instrument. Only two parameters of the instrument were varied per iteration, the first one related to rhythmic attributes of the piece being that the periodicity of triggering of the random number generator. While the second parameter is related to timbre attributes, as the timbre is determined by an array of partials multiplied by the same factor. The multiplying factors used were mainly 4, 5, 7, 9, 10 and 11, for array sizes of 20 partials[39]. The instrument design is based on the same subtractive and additive compounded synthesis system, yet the difference in this case besides the partial array component resides in the two stage filtering process of the instrument, where the second stage uses a ringing filter. That is to say that the *q* factor

[39] An example of an array for factor 5 would be: [5,10,15,20,25,30, 35…100]

in the ringing filter functions as a decay damper as the damping increases at lower values.[40]

For the control of the remaining parameters of the instrument, the same random generator mapped to different adjustable ranges was used to control their outputs. As mentioned previously the improvisations were focused on defining the multiplying factor for the partials and the level of density for the triggering of the random generator. The patterns resulting from running the code several times were surprising, as there was a fair balance between the degree of regularity and the rate of change, that translated to a balance between continuity and discontinuity. One more appealing aspect was the morphing characteristics of the instrument, ranging from different sorts of materials and attack modes. Some allusions and references can be made to gamelan instruments, plucked percussive instruments and materials like glass and bottles, yet their interesting aspects rely on the blend and hybrid nature of each of those timbres.

2.10 **Rust** (2017)

Summary Description

Solo violoncello and eight-channel fixed media. The piece takes as starting point some of the aspects and attributes that were developed in Blend. It revisits the idea of creating timbre gestures that are focused on two-way transitions from clean/pitch-focused timbres to noise-component timbres. And it recapitulates also the idea of sound streams with different levels of inner activity and density. These two ideas constitute the core development of the piece, making it focused totally on timbre attributes. Some

[40] See Appendix C, C7

aspects of spatial attributes are relevant but mostly related to the fixed media eight-channel setting.

Is important to mention that the main gesture or motif for the cello part throughout the piece is one of sustained textures, to the reach and potential of what a cello may achieve in that sense. The textures are characterized with degrees of density based on the level of activity that sustains that texture. The degree of activity can involve: pitch density, articulation, and noise components. To determine the levels of pitch density, the use of double and triple stops along with multiphonics, function as resources. As for articulation, the use of normal bowing, trills and tremolos determine also levels of activity. For the noise-components[41], bow pressure and bow positioning are the ones that determine those levels. It is important to mention that density can be observed in the horizontal axis; thru trills or tremolos, and in the vertical axis; thru multiphonics or pressure bowing on the bridge. It is in that sense the density may swell in both axes alternatively or simultaneously. Most of the elements I have mentioned previously are combinable between them, allowing flexible flows of transformations for the gestures.

As contrast to this material, brief sections of rhythmic developments are contrasted to the sections of sustained textures. These sections also take the contrasting factor as motif for development. That is to say that the two main gestures developed in these sections are: the contrast between pitch and non-pitched rhythmic phrases and contrasts between clean articulated attacks and noise-component attacks. The schemes

[41] See score Rust, general remarks section for explanations on relevant techniques.

for the rhythmic phrases are additive in the same fashion they have been used in previous cases for previous pieces.

The function of the fixed media is mainly of support to the voloncello part, is in that sense that the piece aims for building a hyper-instrument. Its only in very few instances that the two sources function as a duo, in most cases the fixed media functions as an extension of the violoncello and mostly focused on the timbre attributes of the violoncello. Three timbres and its variations were chosen as bridging reference to connect the timbre attributes between fixed media and cello part. All three were thought to be representative of the cello material while also being idiomatic for the fixed media. Multiphonics being one of the chosen timbres, referenced aspects of pitch density and noisiness, while flautato bowing being also chosen, referenced mainly aspects of noisiness. Touch harmonics, being the third timbre, referenced aspects of clean/pitch-focused timbres. It is important to mention that the categorization tends to be ambiguous as all three timbres carry to certain extent aspects of noisiness and pitch, yet they still proved to be helpful as reference for the design of the fixed media instruments. Three main instruments were designed for the fixed media. All three instruments used the prototypical subtractive/additive structure, but for each case a different filtering process was used for shaping the type of timbre obtained. For the case of the flautato timbre, in order to provide a noise component as the one the bowing carries, the instrument design had assigned envelopes to control the bandwidth of the band pass filter enabling subtle degrees of noisiness for pitch-focused timbres. For the touch harmonic timbres, a 12dB state variable filter was used, with high notch filtering to isolate the frequency and obtain a pitch-centered timbre of very clean characteristics, yet sufficiently unstable or non-linear for a dynamic additive component.

Appendix A

Scores

A.1

Format: Score

Liso (2012)

for solo prepared piano

liso

liso

for prepared piano

Fernando Rincón Estrada

liso employs the same piano preparation
that John Cage created and used for his piece
Sonatas and Interludes for Prepared Piano.

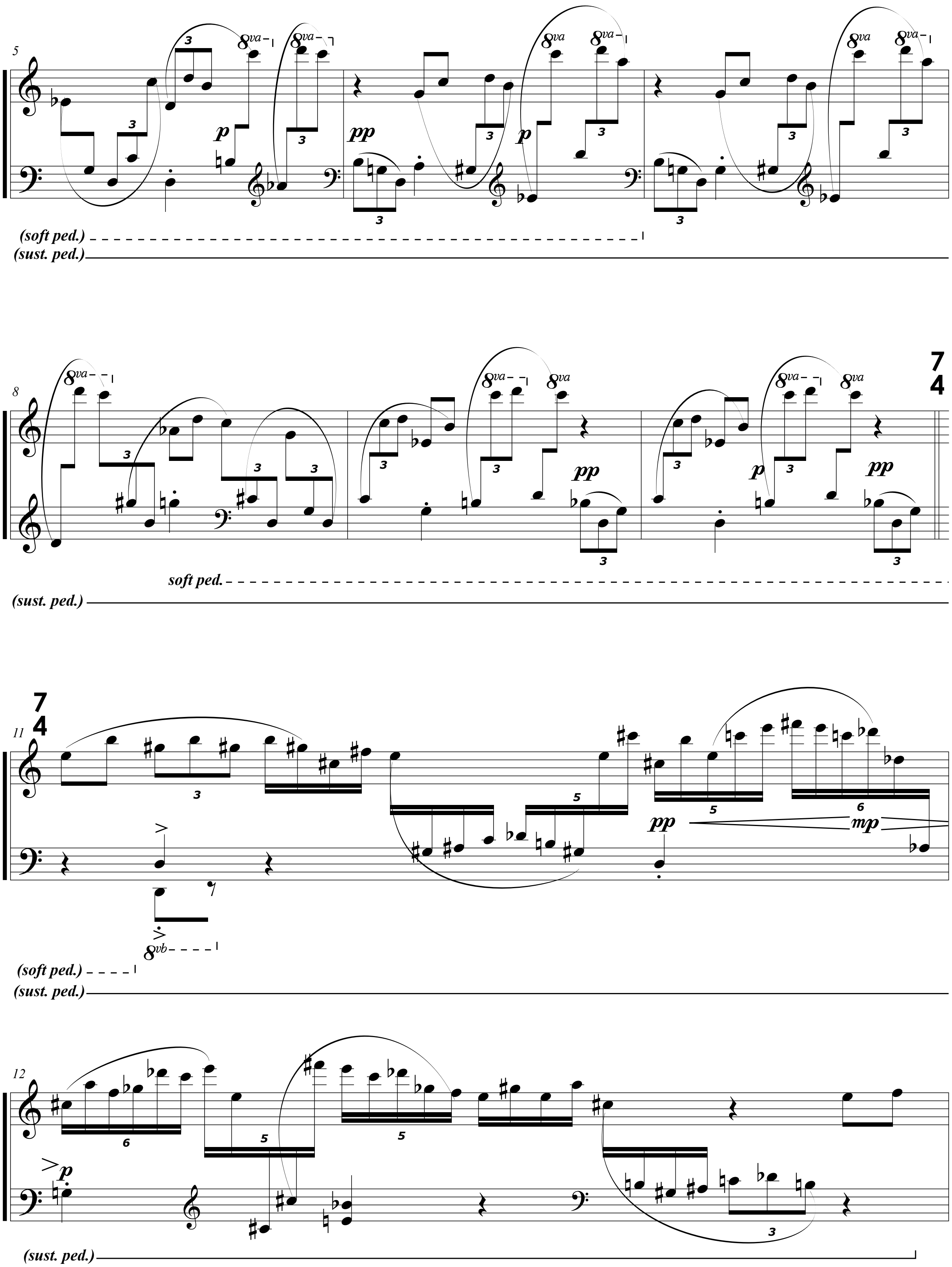
liso

(for Susana)

Fernando RINCÓN ESTRADA
(2012)

* Slurs serve as an indication of pitches that belong together in groupings, while there is no intention for ***legato*** phrasing, there is an intention

** Accidentals alter pitches for the entire measure. Courtesy accidentals are placed at certain parts for sake of specificity.


5
8va
p
pp
(soft ped.)
(sust. ped.)
8
soft ped.
7
4
11
8vb
mp
12


13
8vb
14
pp
8va
15
8va
16
pp
8va
mp
pp
p
8vb
pp
soft ped.
sust. ped.

A.2

Format: Score

Blend (2015)

for solo viola

Blend

Fernando Rincón Estrada

Blend

for Jordan Warmath

Solo Viola

Performance Notes

Bow Position

n. – normal, ordinario
s.t – sul tasto – soft airy sound from playing close to the fingerboard
s.p – sul ponticello – bright sound from playing close to the bridge
x.s.p. – as close as possible to the bridge, enough as to maintain a blending sound between pitch and a high contents of noise.
x noteheads – on the bridge, mostly noise content is expected

Bow Pressure

press. – high amount of pressure, enough as to maintain pitch in a blending sound of high contents of noise.
ord. – ordinario, normal pressure
flaut. – flautando

Bow Attack

batt. – col legno battuto – percussive attack with wood of bow

Harmonics

All harmonics used are *natural*.
(diamond) notehead – indicates the touching node for the natural harmonic, the sounding pitch is not notated.
trills - the trill between the two pitches on the same string is produced by touching lightly the notated node and the open string to which the node belongs. The string number in parenthesis indicates the string to which the node belongs. The node used for the trill is also notated in parenthesis.

Tempi

The general tempo oscillates within the specified range at the initial tempo marking.
Tempo changes are possible between measures always within the range.
No tempo changes are expected inside the measures.

Articulation

A flow of sound is intended through out the piece. It is important to maintain the sound articulated with the least number of interruptions.
Resonating and vibrating strings are used as general articulator between measures.
Pause duration for breath marks is determined by the ring continuance of strings.
One bow is expected for all durations, except tremolos.

Dynamics

Crossed circle – dal niente, no attack is perceived.

The overall dynamic range of the piece is intentional for a soft intimate environment. Having that in mind all details of the piece should be present and audible. A louder scale of dynamics is possible if the performer feels is necessary for achieving better projection of sound and details

General Remarks

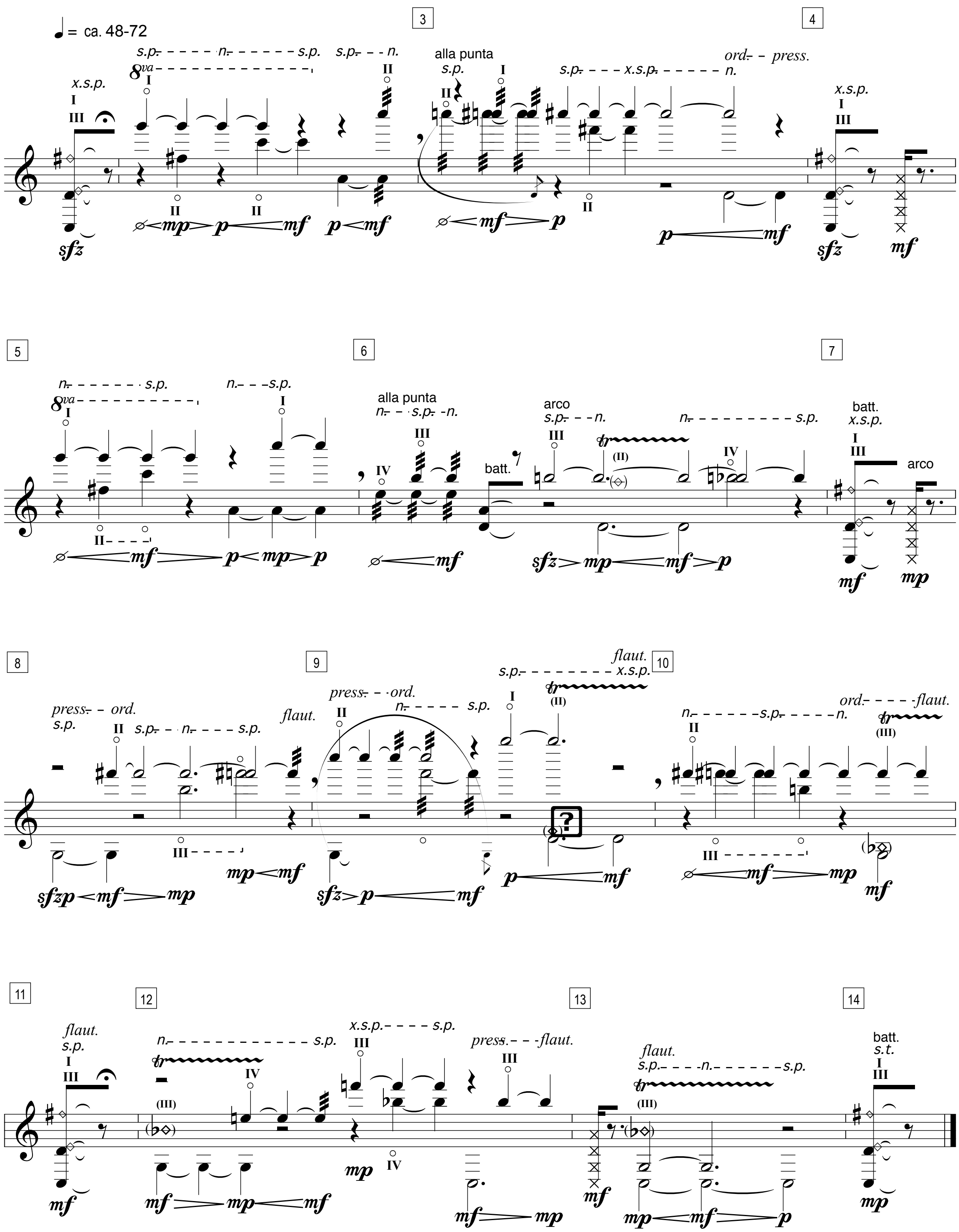
Transition between bow positions or pressures are connected by horizontal dotted lines.

Other indications are notated directly in the score.

Blend

for Jordan Warmath

Fernando Rincón Estrada
2015



A.3

Format: Score

On Tessellation (2015)

for percussion trio and multi-channel fixed media

On Tessellation

for Percussion Trio, live electronics
and Fixed Media

On Tessellation

for Percussion Trio, live electronics and Fixed Media

Fernando Rincón Estrada

On Tesellation (2015)

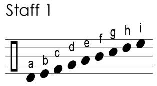
Fernando Rincón Estrada

Instrumentation

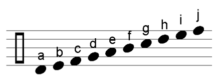
Percussion 1

Staff Notation

Staff 1



Staff 2



Staff 3

Instrumentation Set 1

Low range
Water drums (set of 2) [index (1,2)]
Bass drum (large) [index (a)]
Tam - tam (large - medium) [index (b)]

Middle range
Temple block (set of 2, lowest range available) [index (3,4)]
Bongos (set of 2, lowest range available) [index (f,g)]
Cow bells (set of 2 or 3 if possible, low range dark sound is preferable) [index (c,d)]
Temple Bell (low-mid range) [index (e)]

High range
Wood block (set of 3) [index (5,6,7)]
Roto-toms (set of 3) [index (h,i,j)]
Crotales (set of 6 pitches, low octave, *see staff 3*)

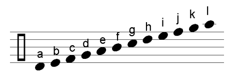
Beaters

Medium hard mallets
Hard mallets
Super ball (2)
Wooden drumsticks
Soft rubber mallet
Rubber mallet
Plastic mallet
Brushes (metallic are preferable)
Heavy beater

Percussion 2

Staff Notation

Staff 1



Staff 2

Instrumentation

Low range
Marimba (5 octaves)
Bass drum (large - medium) [index (a)]
Tam - tam (large) [index (b)]

Middle range
Bongos (set of 2, different to set of percussion 1) [index (f,g)]
Temple Bell (set of 2, low-mid range) [index (c,d)]
Cow-bell (1, low range dark sound is preferable) [index (e)]

High range
Wood block (set of 3, different to set of percussion 1) [index (j,k,l)]
Tom-toms (set of 2, hi range) [index (h,i)]
Crotales (set of 6 pitches, low octave, *see staff 2*)

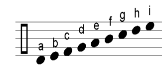
Beaters

Medium hard mallets
Hard mallets
Super ball (2)
Wooden drumsticks
Soft rubber mallet
Rubber mallet
Plastic mallet
Brushes (metallic are preferable)
Heavy beater

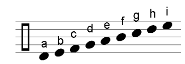
Percussion 3

Staff Notation

Staff 1



Staff 2



Staff 3

Standard notation staff for vibraphone

Instrumentation

Low range
Water drum (set of 2, different size/sound to percussion 1) [index (1,2)]
Taiko (low sounding) [index (a)]
Tam-tam (large - medium, different to Percussion 1 and Percussion 2) [index (b)]

Middle range
Wood block (set of 2, lowest range is preferable) [index (3,4)]
Tom - tom (set of 2, low to medium range) [index (f,g)]
Temple Bell (1, low to medium range) [index (c)]
Vibraphone

High range
Temple block (set of 3) [index (5,6,7)]
Tom -tom (set of 2, medium to high range) [index (h,i)]
Cow bells (set of 2, dark sounding) [index (d,e)]

Beaters

Medium hard mallets
Hard mallets
Super ball (2)
Wooden drumsticks
Soft rubber mallet
Rubber mallet
Plastic mallet
Brushes (metallic are preferable)
Heavy beater

Beater indications

General Remarks

Special Strokes

Super ball – friction over surface of instrument, sound should be stable and rich in harmonic components. Resonance and prolonged decays are important. A crossed notehead is used for the notation of the friction stroke. (*see mm. 18)*

Friction speed:

slow – long articulation with very slow motion that maintains steady sound, no sudden movements. Similar to articulation of pedal notes on bowed strings.

fast – constant quick movement with a regular rhythm. Similar to normal bow speed on strings.

irregular – mixture of both, slow and fast motion. Strong contrasts and sudden changes are encouraged.

Surface pressure:

low – enough pressure to allow smooth vibration on the surface.

high – stress on surface that tends to distort and interrupt sound emission. Usually loud dynamics are only possible.

Brushes – circular motion is suggested graphically on the score as in standard practice/technique for brushes, friction on surface aims to variations in tone-color and timbre of the instrument.

Striking surfaces

As a general remark for the performance of long or repeating passages, it is encouraged to find variations of color and tone on the surfaces being played. (e.g. tam-tam or bass drum)

Tam-tam

on edge – striking point within the edge to center of the surface of the instrument. Change in harmonic, color and timbre are expected.

to edge – transition of striking position from middle/center to edge of the instrument.

Articulation

Unmeasured *irregular* tremolos are indicated with a Z over the notated stem duration. *Irregular* referring to a fluctuation on the speed of the "*tremolando*". The fluctuation in speed is understood as subtle with no strong contrast on speeds. *(see mm. 132)*

Tempo Modulations

Equivalences are indicated under the standard that the first value corresponds to the new duration of the notated value while the second one indicates the previous equivalent old duration.

Time Stamps

Enclosed time stamps indicate time length of particular individual sections as well as an accumulative count of the elapsed time of the piece. This time stamps are markers and references for corresponding events from the live-electronics processes and fixed media playback.

For Performers and performance

Resonance, long decays and vibrating/ringing instruments are encouraged for slow, long passages. Continuity of sound is the priority for these sections.

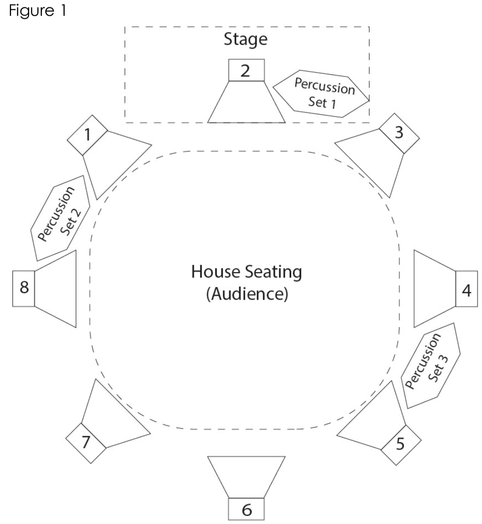
The timbre quality and character, along with the possible shades in the variations of those are an important goal for the piece; it is encouraged in that sense to make this intention as explicit as possible in the performance.

Beater indications are suggestions for the performers. All indications are based on the type of color, sound quality or timbre intended for the corresponding notated section.

Staging Distribution – from the audience listening point an enveloping spatial distribution of the percussion sets is preferred. Aiming to expand the localization of the acoustic live sources from not only a frontal axis but also including lateral and rear axes

An illustration on one of the many alternative distributions is given in figure 1.

Figure 1



Other indications are done directly in the score.

Live Electronics

Patch Versions

Two versions of live electronics are available for the piece.

1. Standalone sequenced patch version that needs a running laptop and sound interface connected to the amplification system of the concert hall. This version requires a once only on/off switch activation for initiating the patch. This sequenced version entails parameter automation that reflects on a more static live electronics interaction with performers and fixed media.

2. Live-electronics performance interacting version, that enables a dynamic live electronics setup by having the live electronics performer interact with the percussion trio. Control and adjustments of the live electronic parameters are dynamic and subject to the performers criteria.

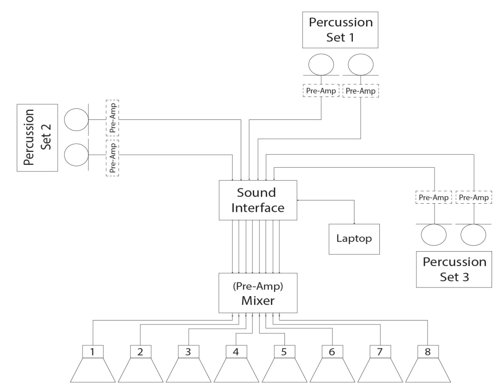
Technical Requirements and Setup

Two condenser microphones (hyper-cardioids preferred) are suggested for each of the percussion sets. Overhead stereo placement is optimal.

If available pre-amplification is ideal for each microphone either provided by a mixer or pre-amplifier.

Figure 2 illustrates the signal flow and connections for each percussion set and amplification system.

Figure 2



Fixed Media

Functions as counterpart for the live-acoustic sources.

Dynamic level and balance between acoustic and electronic sources intends to be equally proportioned at all times (ca. 50% fixed media/50% acoustic sources). Nevertheless nuances of unbalance between sources are expected to happen. In the case the nuances from one of the sources overpowers the other, adjustments to dynamic levels should be made to find a proportional equal balance between both sources.

It is suggested that sound checks for balance levels of fixed media as well as fixed media and percussion are carried out to anticipate any possible disparities.

Three versions of fixed media are available:

- 43-speaker arrangement
- 8-speaker arrangement
- Stereo arrangement

Time synchronization between fixed media and live performers is flexible.

Fixed media sections may be understood more as floating sections of variable durations and lengths due to approximations of the tempi indicated on the score. For this approach entrance cues with pickup measures can be provided to each performer via click tracks. Metronomic click tracks may be used as well for tempi referencing.

Alternative Versions

Six alterative versions are available for the performance of the piece:

- Percussion trio and fixed media (43/8/2/ speaker arrangement)

- Percussion trio, live electronics and fixed media (43/8/2/ speaker arrangement)

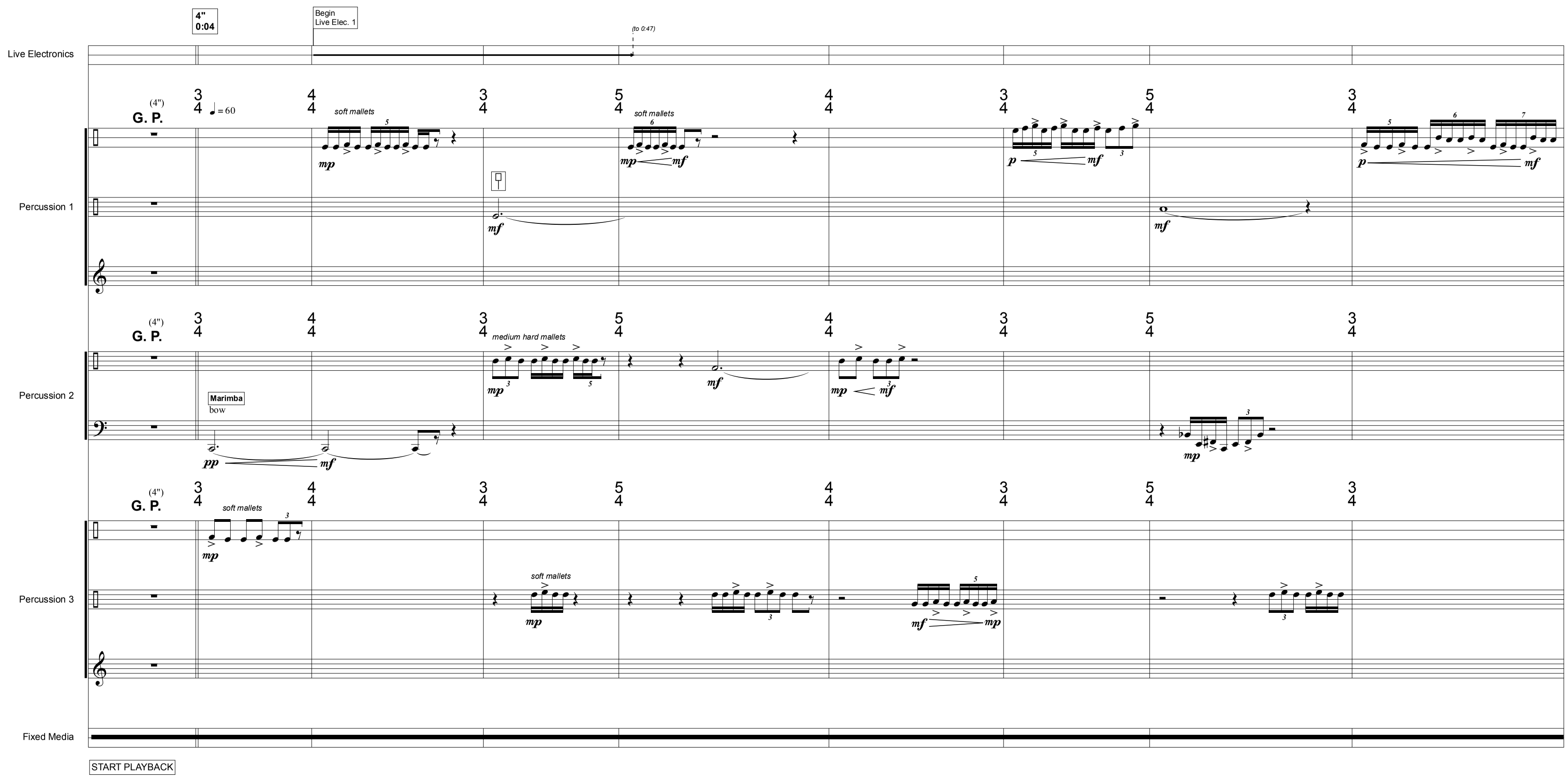
All fixed media sound files and live-electronics patches in all versions are available from the composer at the following address:

fernandorinconestrada@gmail.com

The percussion trio and fixed media (43-speaker) version of the piece was premiered on November 26, 2015 with performance of the Trio Kai at the ZKM-Kubus in Karlsruhe, Germany, within the inSonic Festival 2015.

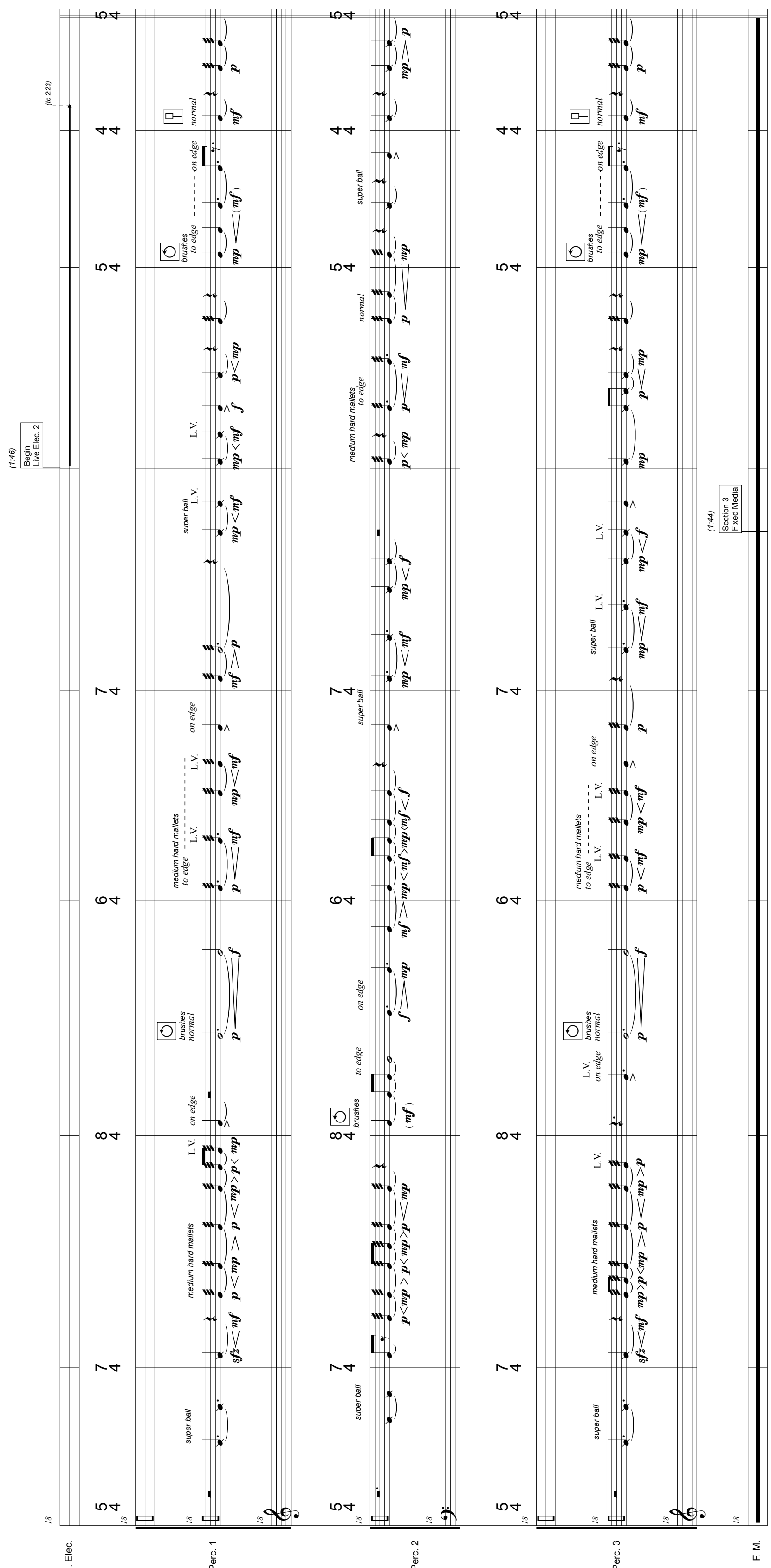
On Tessellation

Fernando RIncón Estrada
2015



* Let playback run throughout performance.

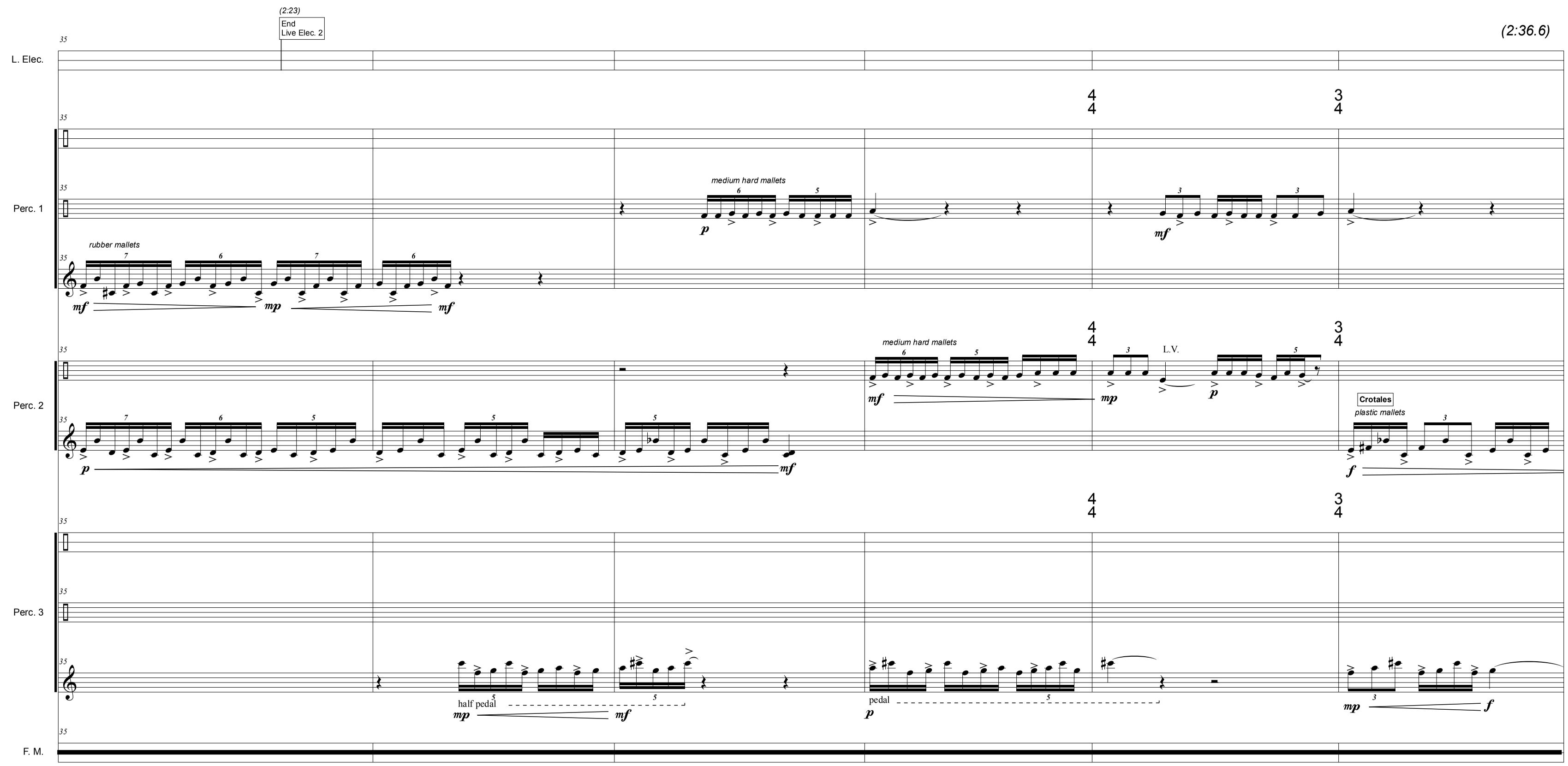

(0:47)
37"
0:41
End
Live Elec. 1
13"
0:54
(1:12)
L. Elec.
Perc. 1
Perc. 2
Perc. 3
F. M.
medium hard mallets
soft mallets
L.V.
on edge
normal
bow
(1:03)
Section 2
Fixed Media


L. Elec.
Perc. 1
Perc. 2
Perc. 3
F. M.
(1:46)
Begin Live Elec. 2
(to 2:23)
(1:44)
Section 3 Fixed Media
super ball
medium hard mallets
brushes
normal
to edge
on edge
L. V.

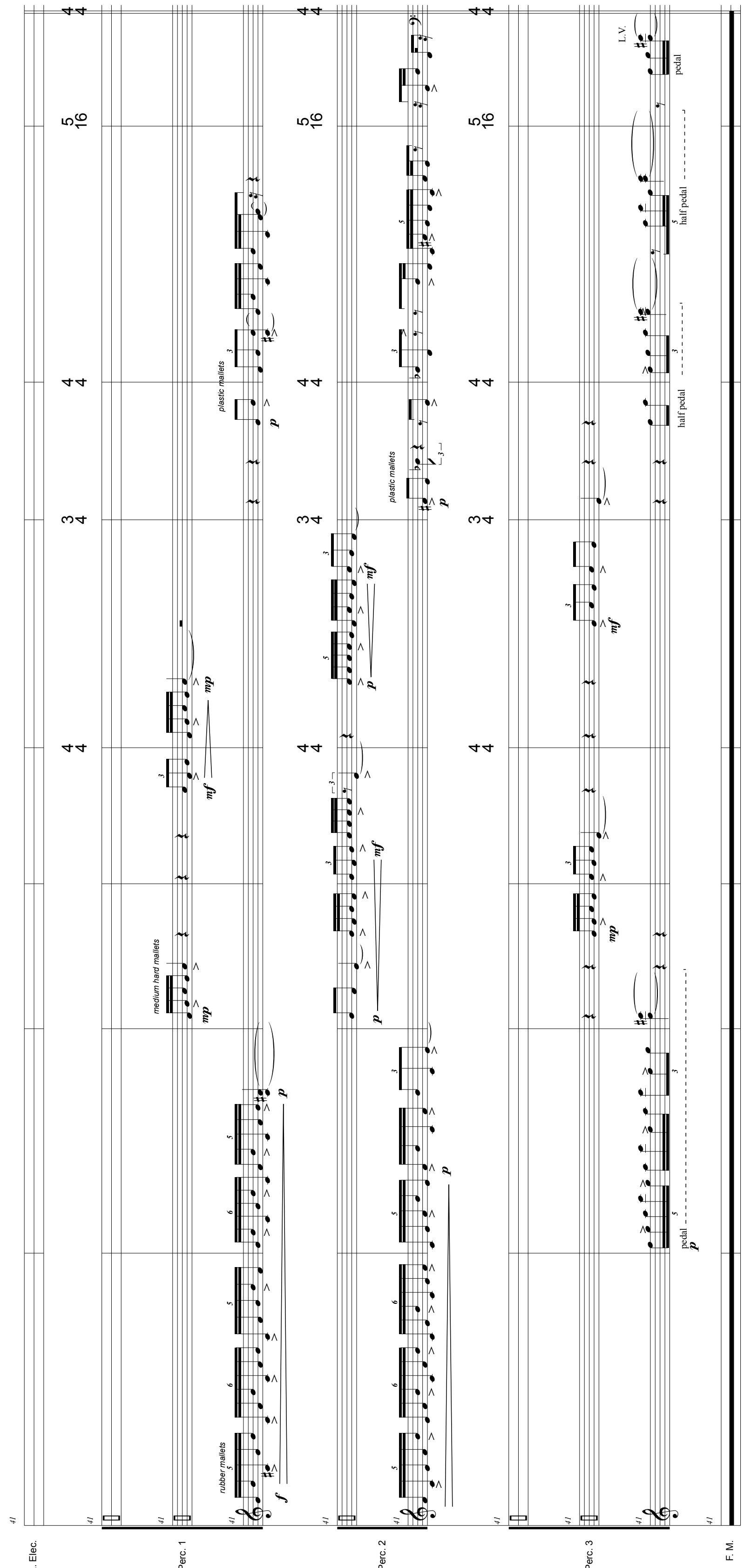
- 3 -

67"
2:01
5"
2:06
♩ = 75
13"
2:19
L. Elec.
Perc. 1
Perc. 2
Perc. 3
F. M.
medium hard mallets
Crotales
rubber mallets
soft mallets
half pedal
L.V.
(2:02)
Section 4
Fixed Media
(2:06)
Section 5
Fixed Media

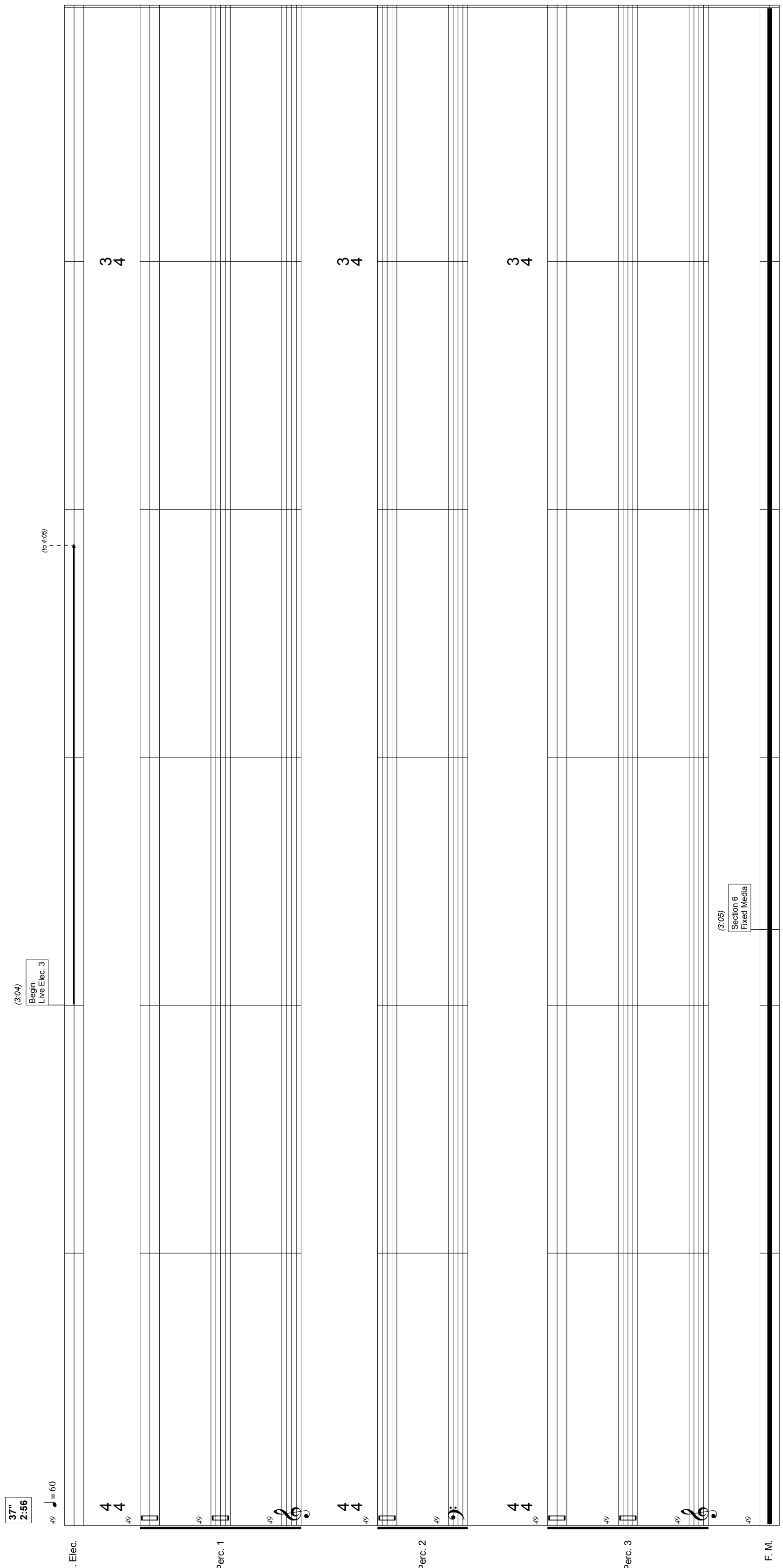
- 4 -



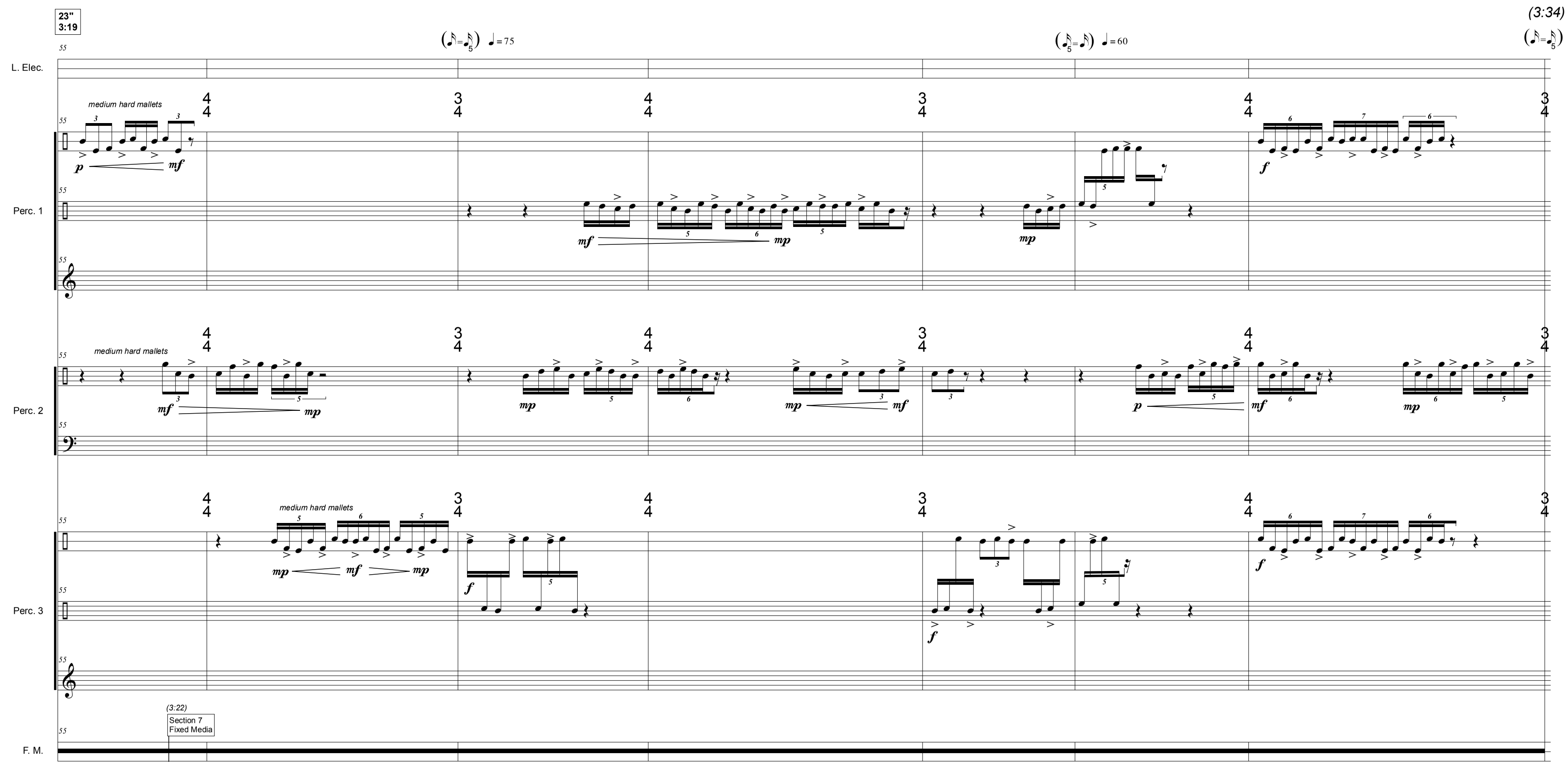
(2:23)
End
Live Elec. 2
(2:36.6)
L. Elec.
Perc. 1
rubber mallets
medium hard mallets
Perc. 2
medium hard mallets
L.V.
Crotales
plastic mallets
Perc. 3
half pedal
pedal
F. M.

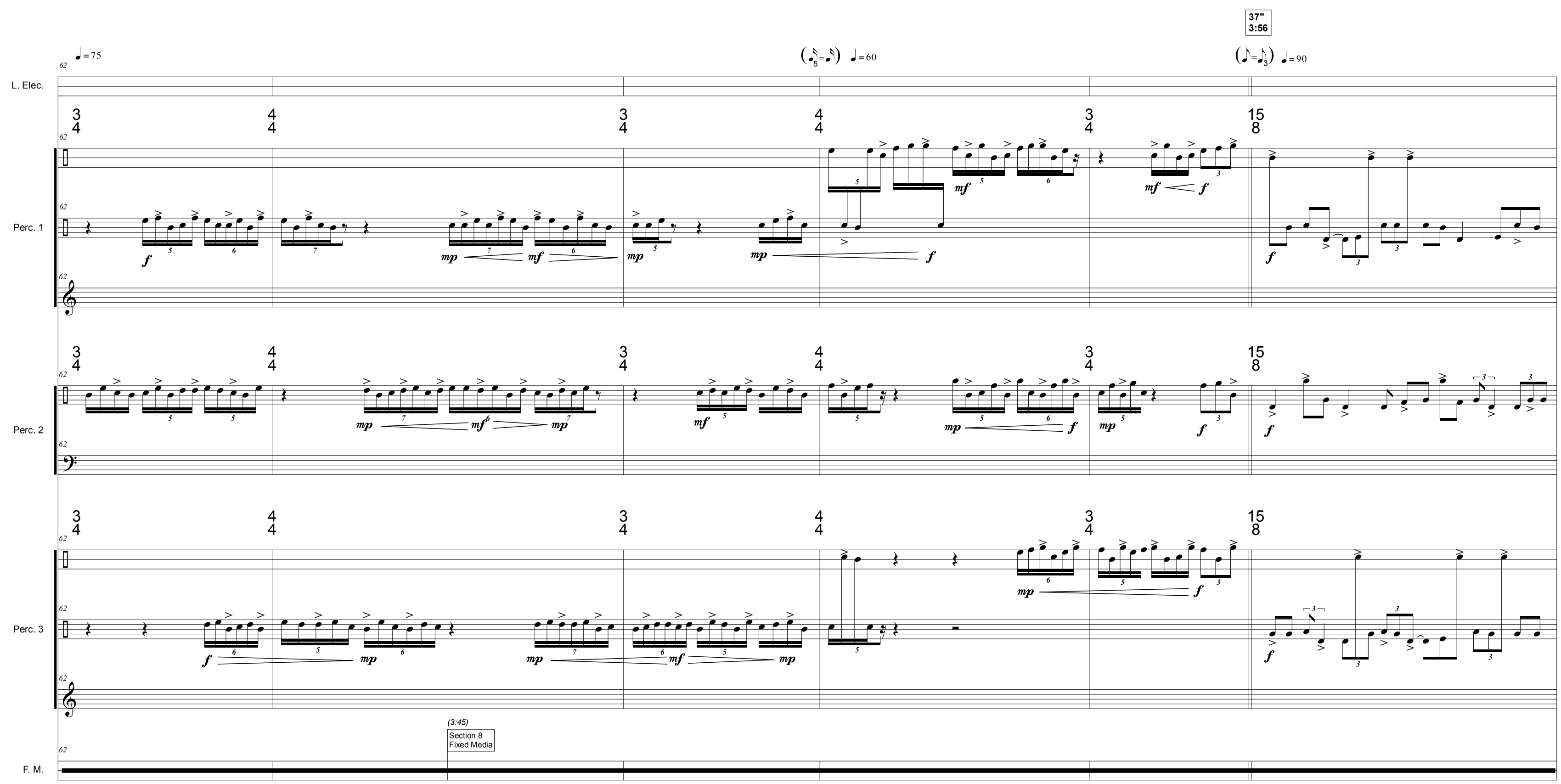

L. Elec.
Perc. 1
Perc. 2
Perc. 3
F. M.
rubber mallets
medium hard mallets
plastic mallets
plastic mallets
pedal
half pedal
half pedal
pedal
L. V.

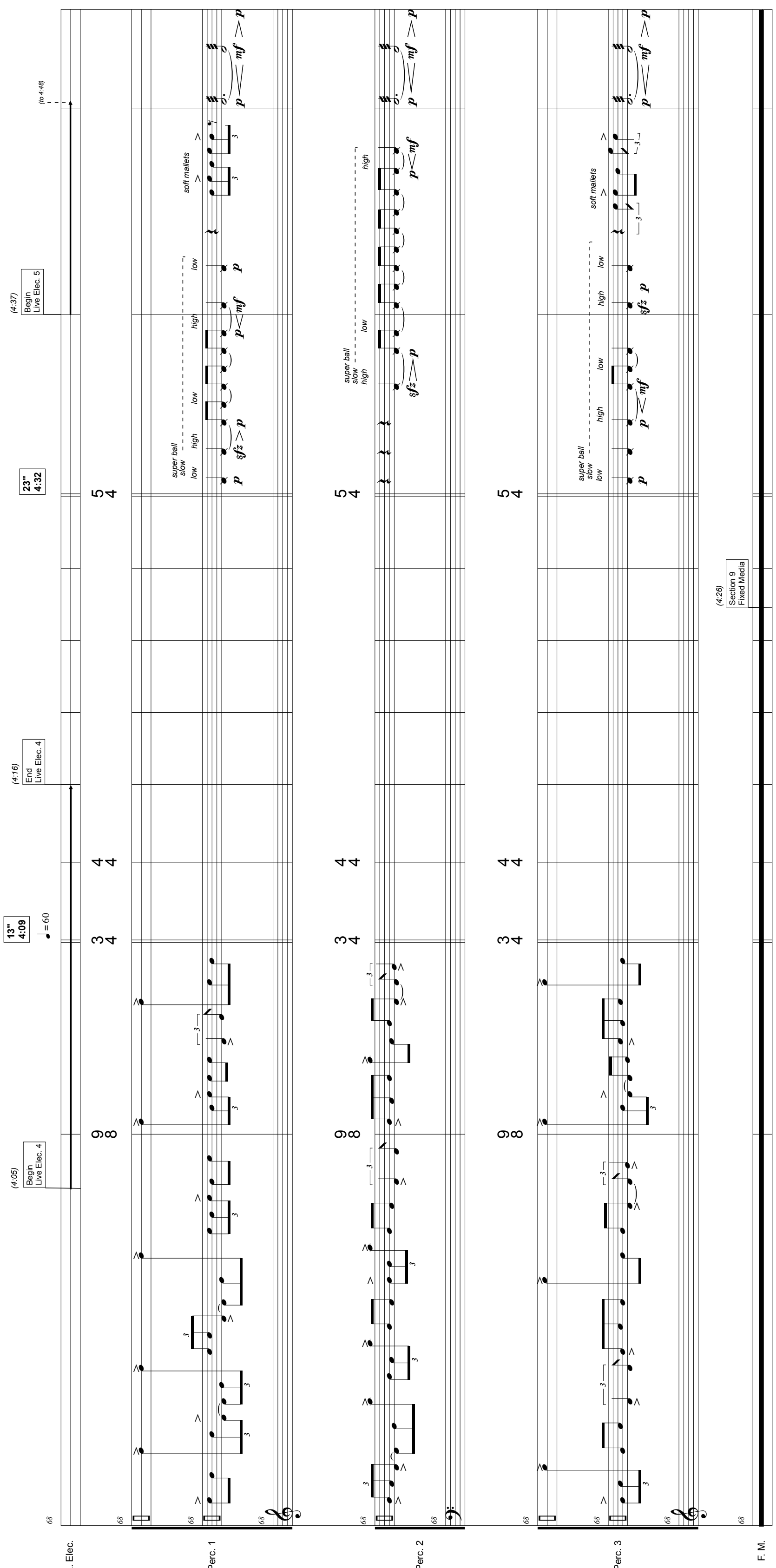
- 6 -


37"
2:56
♩= 60
L. Elec.
Perc. 1
Perc. 2
Perc. 3
F. M.
(3:04)
Begin
Live Elec. 3
(to 4:05)
(3:05)
Section 6
Fixed Media

- 7 -


23"
3:19
L. Elec.
Perc. 1
Perc. 2
Perc. 3
F. M.
medium hard mallets
(3:22)
Section 7
Fixed Media
♩ = 75
♩ = 60
(3:34)

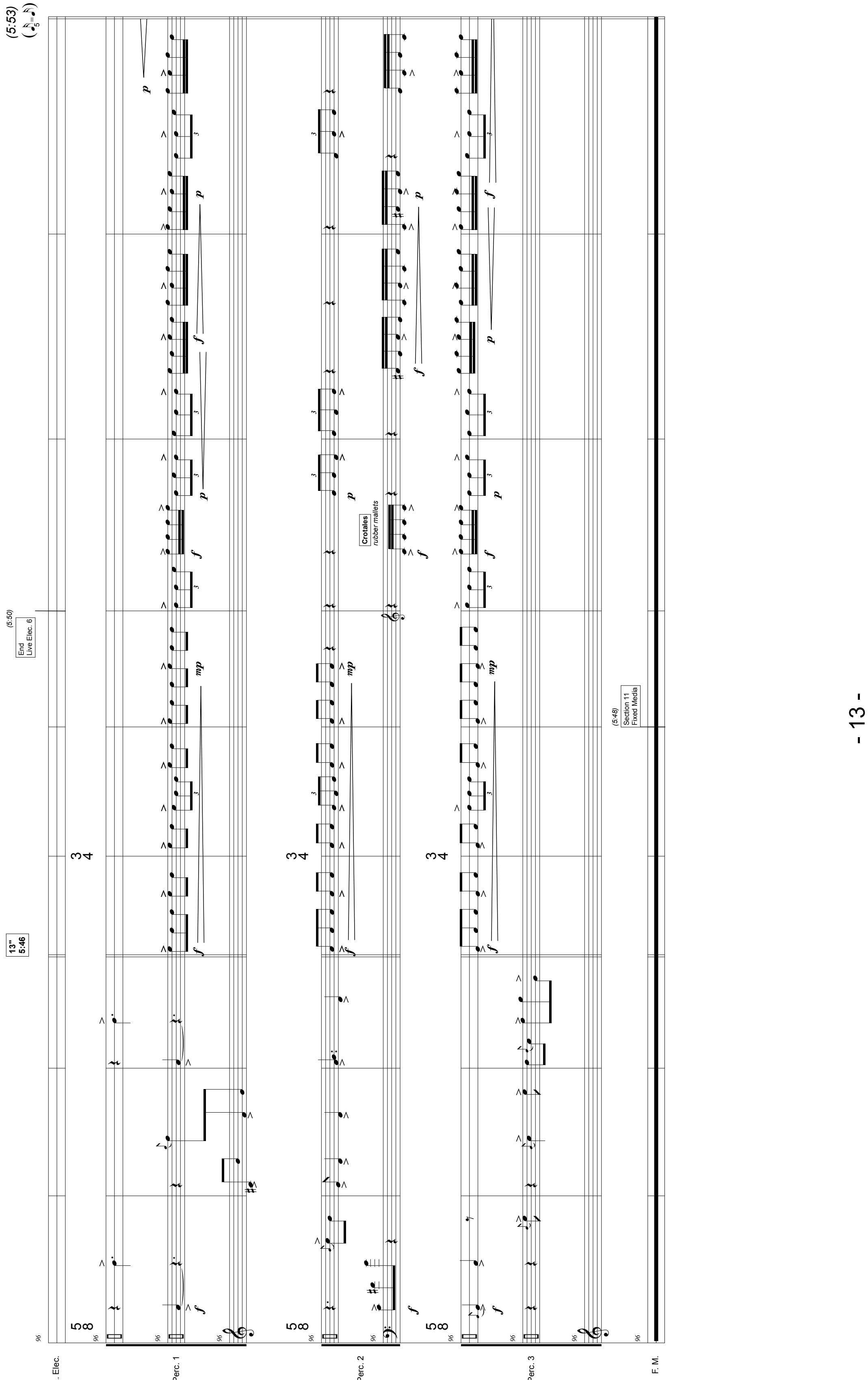

37"
3:56
L. Elec.
Perc. 1
Perc. 2
Perc. 3
F. M.
(3:45)
Section 8
Fixed Media

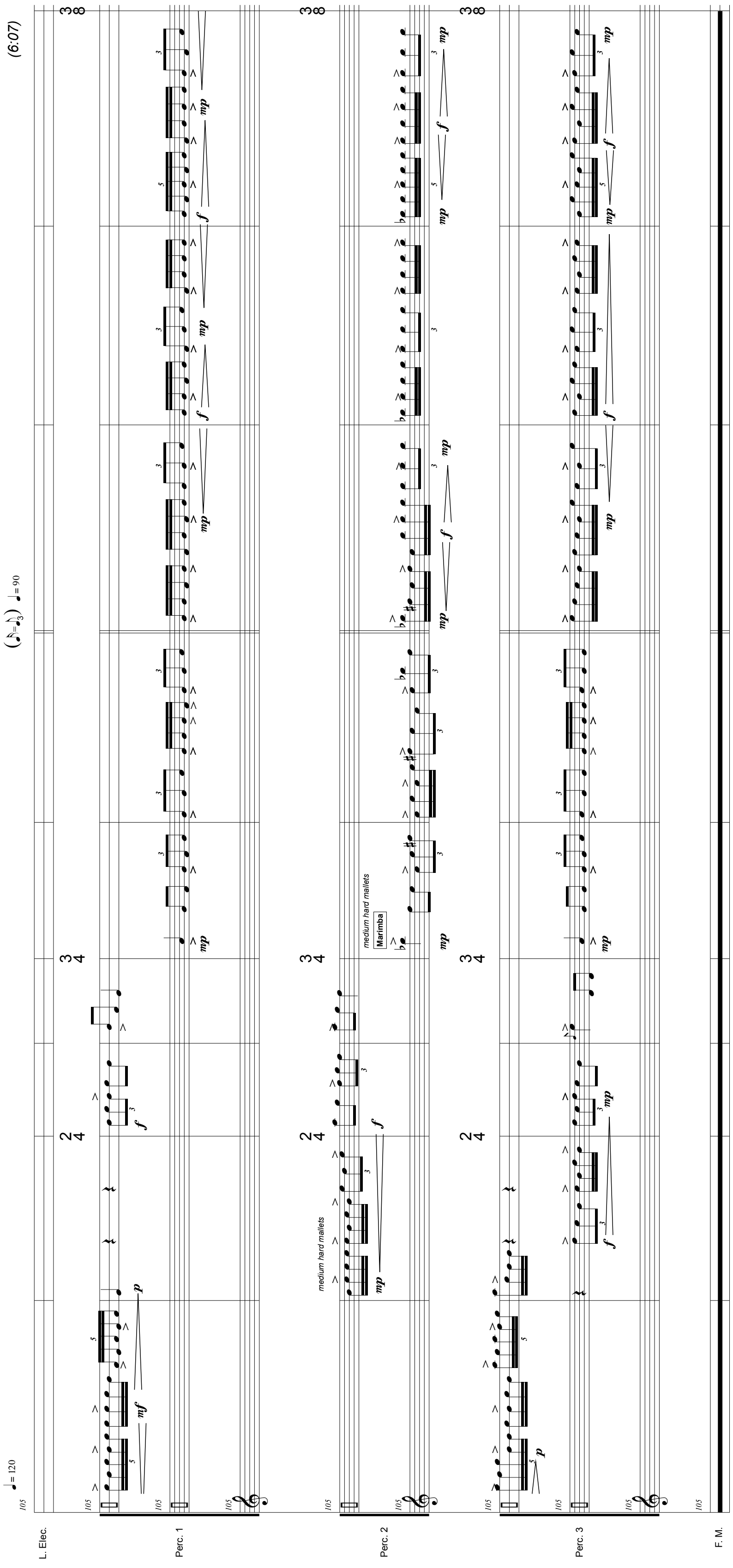

L. Elec.
Perc. 1
Perc. 2
Perc. 3
F. M.
(4:05)
Begin
Live Elec. 4
13"
4:09
♩= 60
(4:16)
End
Live Elec. 4
(4:26)
Section 9
Fixed Media
23"
4:32
(4:37)
Begin
Live Elec. 5
(to 4:48)
super ball
slow
low
high
soft mallets

- 10 -


(4:48)
Begin
Live Elec. 6
(to 5:49)
(5:43)
L. Elec.
Perc. 1
Perc. 2
Perc. 3
F. M.
super ball
slow
low
high
irreg.
fast
mid
medium hard mallets
soft mallets
(5:25)
Section 10
Fixed Media

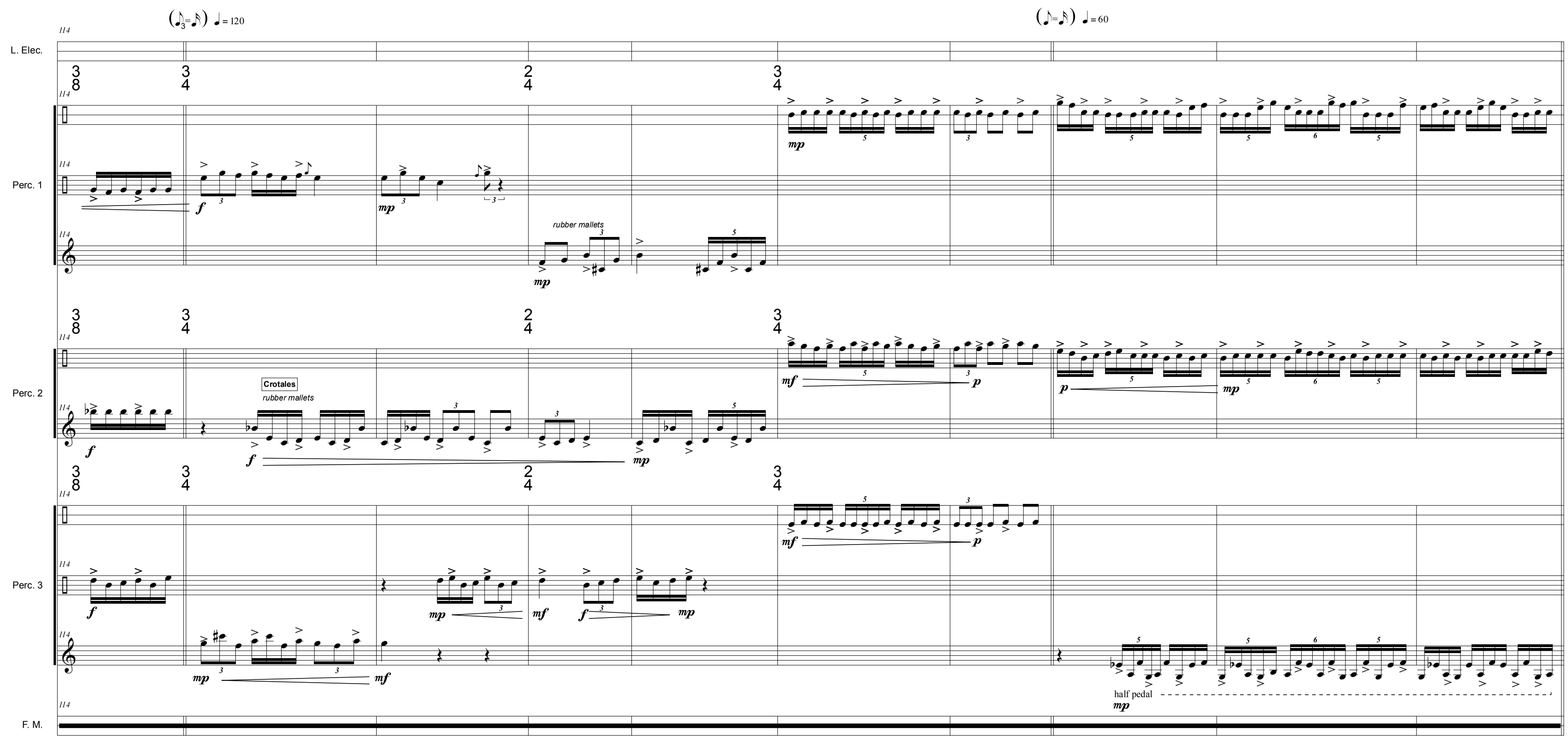

61"
5:33
♩= 150
(5:43)
L. Elec.
Perc. 1
Perc. 2
Perc. 3
F. M.
hard mallets
Marimba

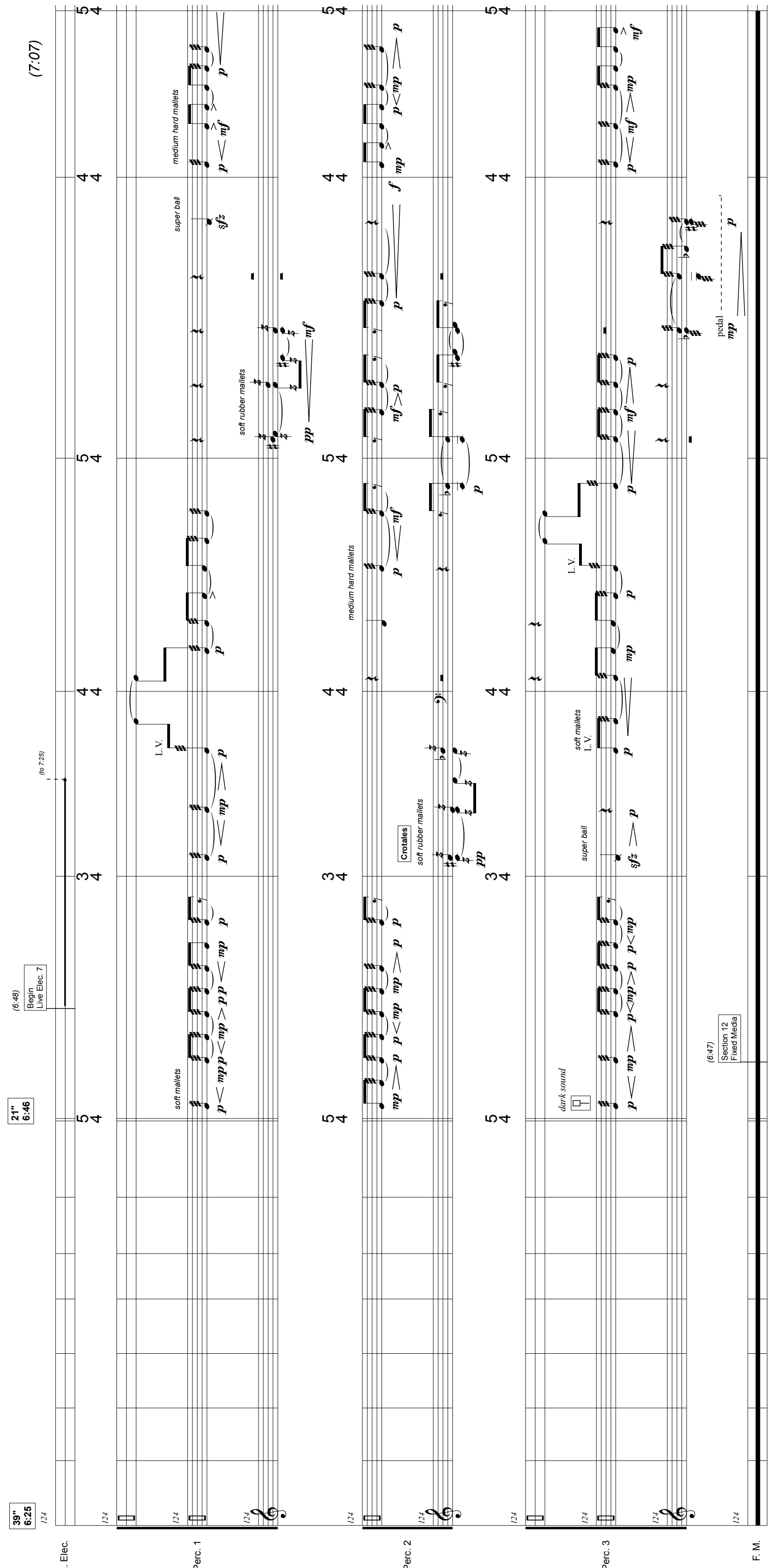

L. Elec.
Perc. 1
Perc. 2
Perc. 3
F. M.
13"
5:46
(5:50)
End
Live Elec. 6
(5:48)
Section 11
Fixed Media
Crotales
rubber mallets
(5:53)
- 13 -



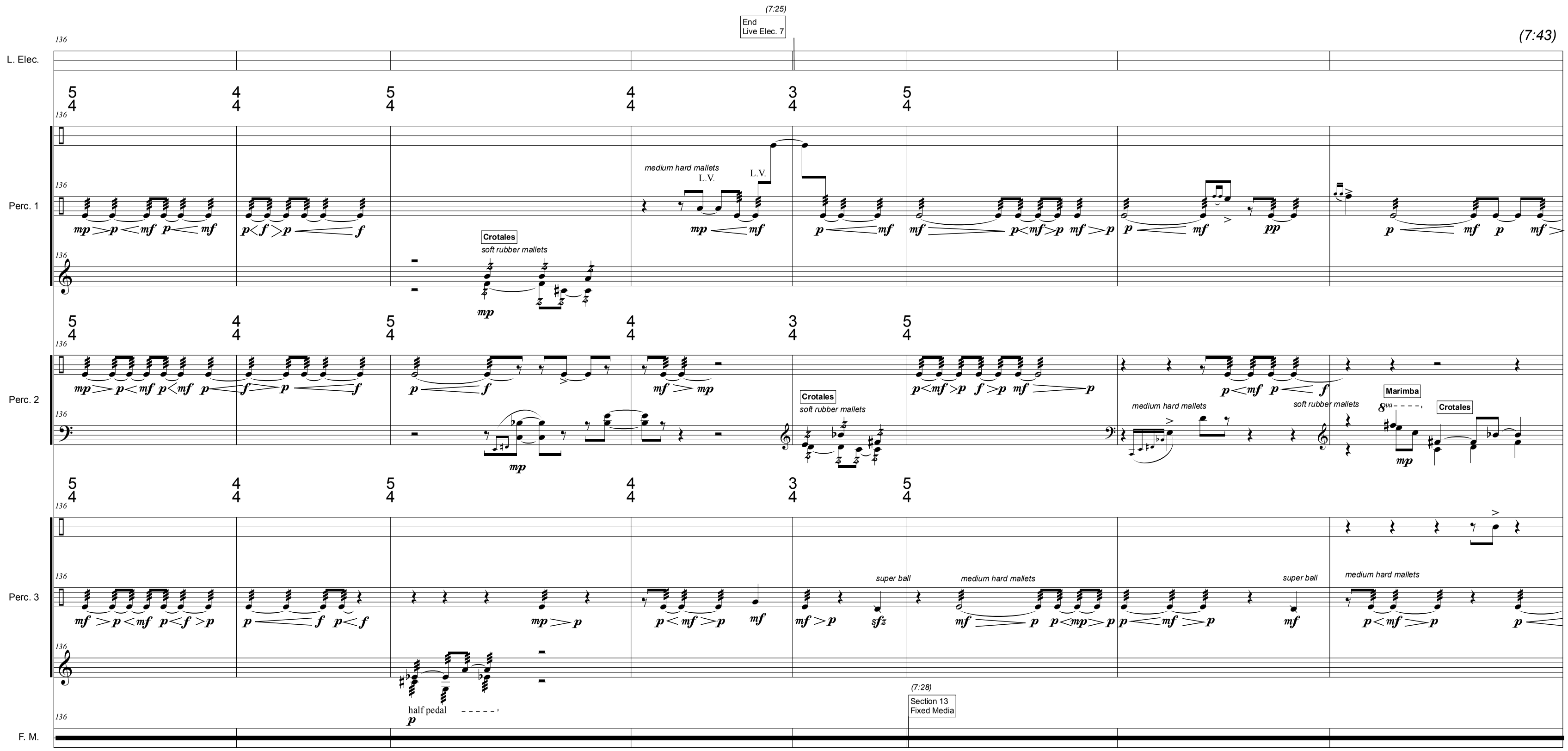
L. Elec.
Perc. 1
Perc. 2
Perc. 3
F. M.
♩= 120
♩= 90
(6:07)
medium hard mallets
Marimba

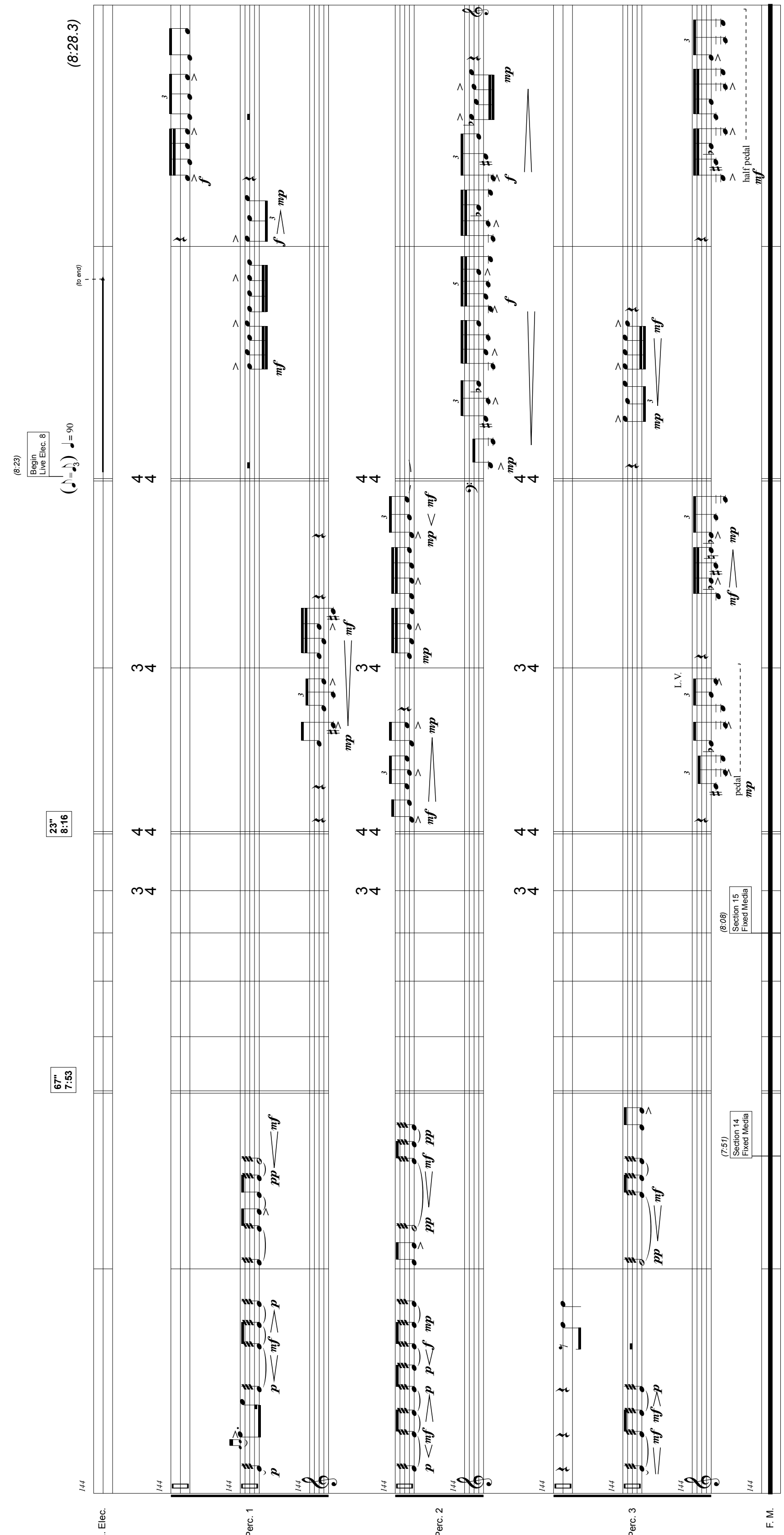
- 14 -

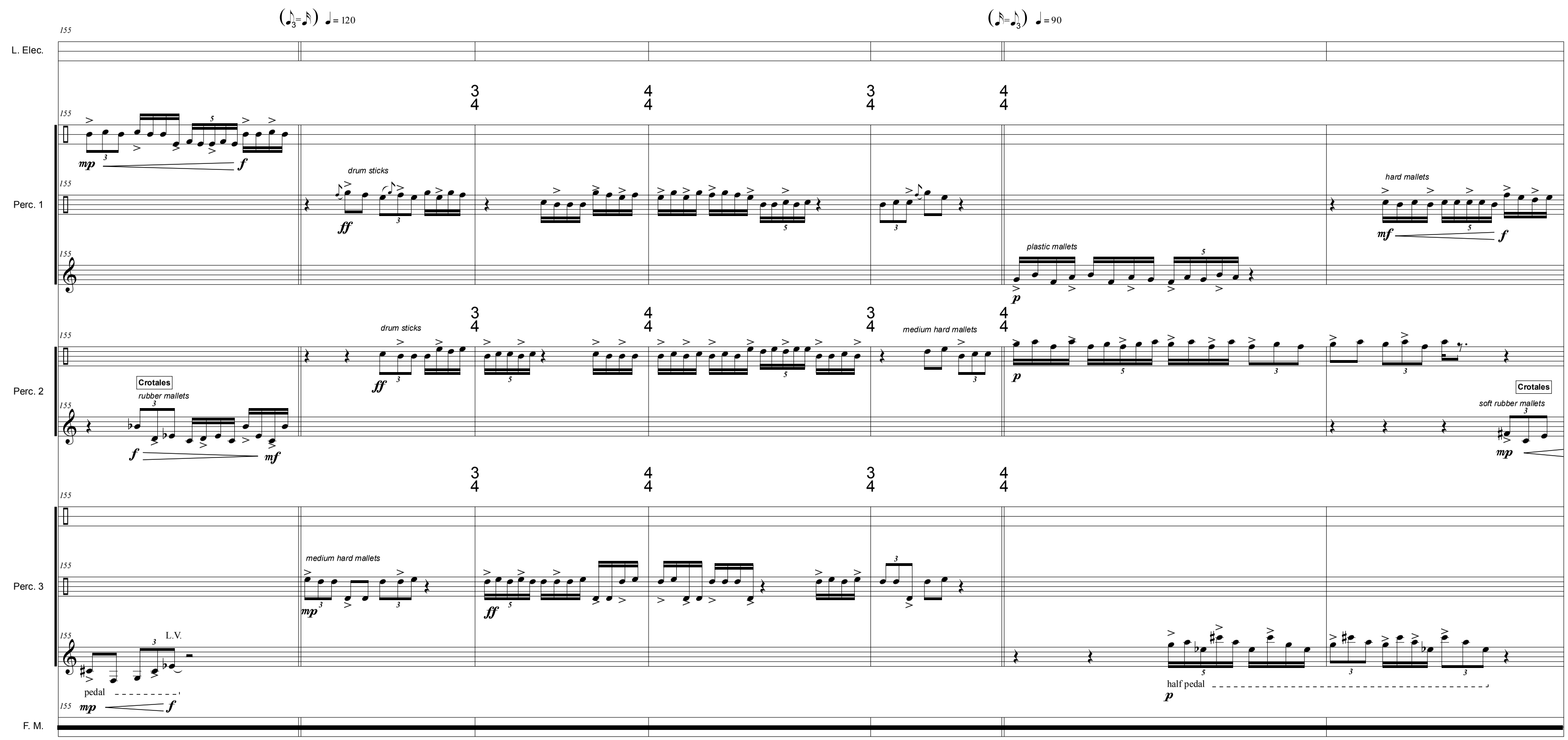

= 120
= 60
L. Elec.
Perc. 1
Perc. 2
Perc. 3
F. M.
rubber mallets
Crotales
rubber mallets
half pedal

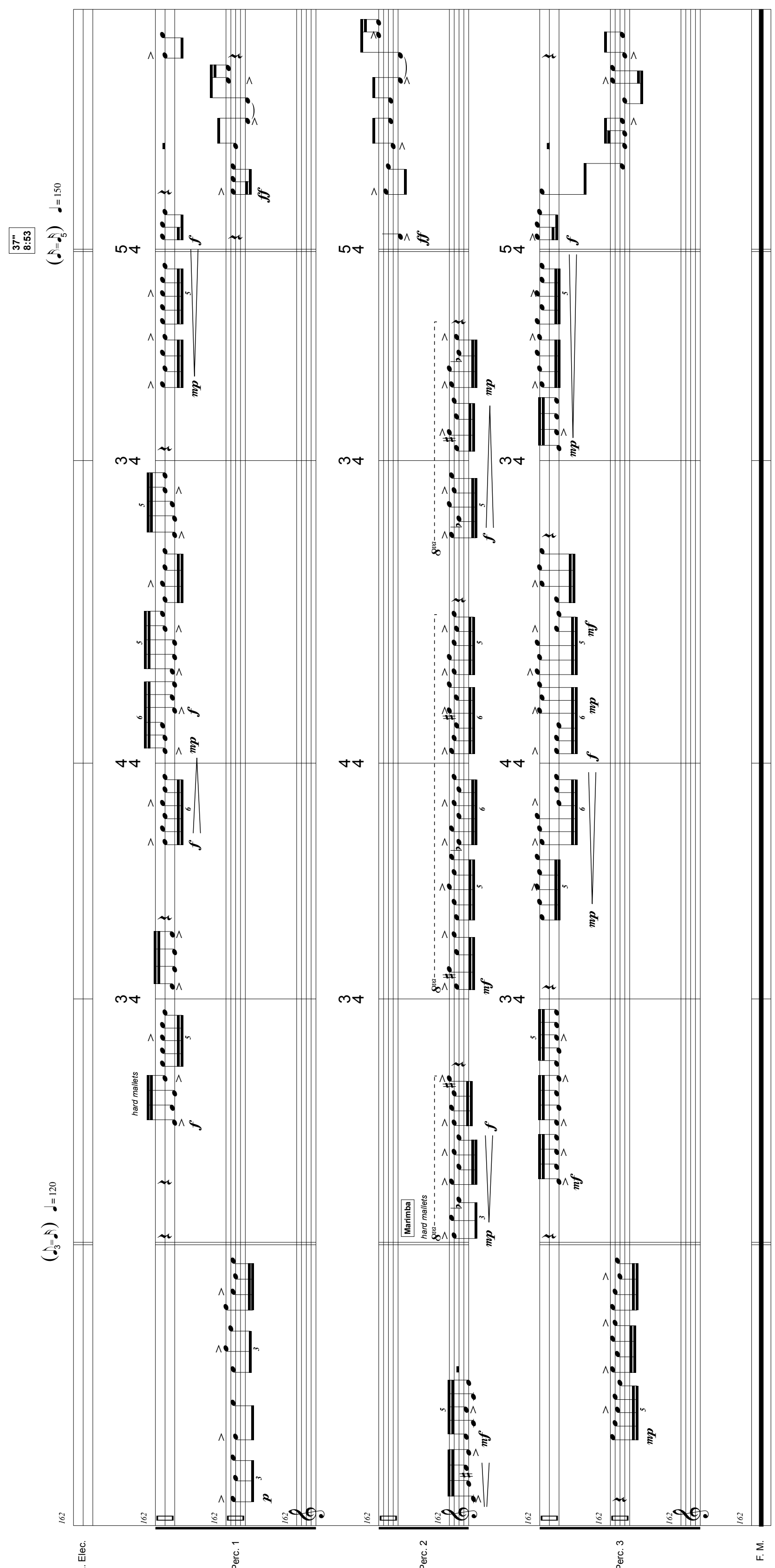


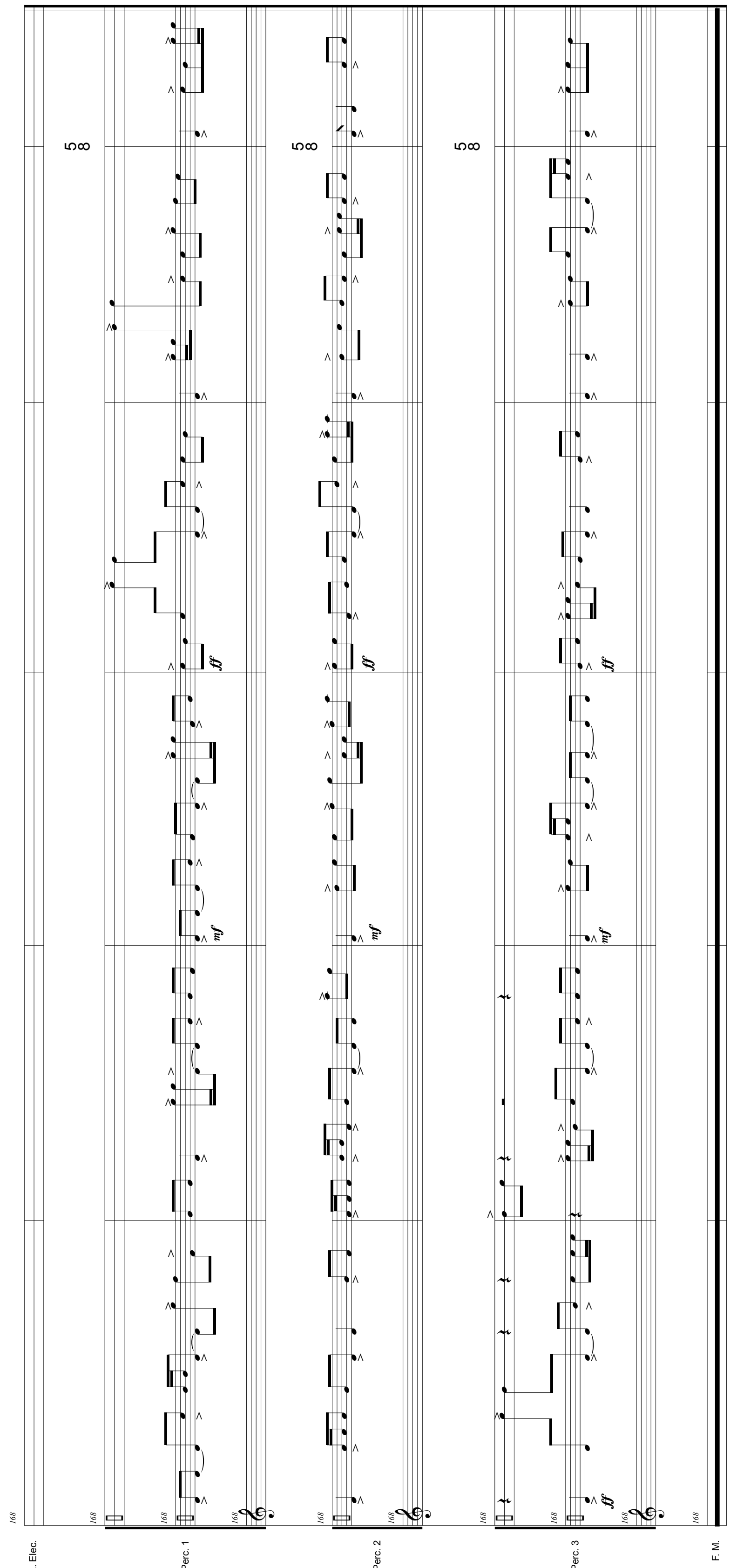
39"
6:25
21"
6:46
(6:48)
Begin
Live Elec. 7
(to 7:25)
(7:07)
L. Elec.
Perc. 1
Perc. 2
Perc. 3
F. M.
soft mallets
L. V.
super ball
medium hard mallets
soft rubber mallets
Crotales
dark sound
pedal
(6:47)
Section 12
Fixed Media


(7:25)
End
Live Elec. 7
(7:43)
L. Elec.
Perc. 1
Perc. 2
Perc. 3
F. M.
Crotales
soft rubber mallets
medium hard mallets
L.V.
Marimba
super ball
half pedal
(7:28)
Section 13
Fixed Media


(8:28.3)
(8:23)
Begin
Live Elec. 8
♩ = 90
(to end)
23"
8:16
67"
7:53
L. Elec.
Perc. 1
Perc. 2
Perc. 3
F. M.
(7:51)
Section 14
Fixed Media
(8:08)
Section 15
Fixed Media
pedal
L.V.
half pedal


♩ = 120
♩ = 90
L. Elec.
Perc. 1
Perc. 2
Perc. 3
F. M.
drum sticks
hard mallets
plastic mallets
medium hard mallets
Crotales
rubber mallets
soft rubber mallets
L.V.
pedal
half pedal


37"
8:53
♩=120
♩=150
L. Elec.
Perc. 1
Perc. 2
Perc. 3
F. M.
hard mallets
Marimba
hard mallets


L. Elec.
Perc. 1
Perc. 2
Perc. 3
F. M.
168
mf
ff
5
8

A.4

Format: Score

Split Narrow (2017)

for solo organ and eight-channel fixed media

Split Narrow

for organ
and fixed media

Split Narrow

for organ
and fixed media

Fernando Rincón Estrada

Split Narrow (2017)
Fernando Rincón Estrada

Instrumentation

Solo Organ
Fixed Media (Eight channels)

Fixed Media

Functions as counterpart for the live-acoustic source.

Dynamic level and balance between acoustic and electronic sources intends to be equally proportioned at all times (ca. 50% fixed media/50% acoustic sources). Nevertheless nuances of unbalance between sources are expected to happen. In the case the nuances from one of the sources overpowers the other, adjustments to dynamic levels should be made to find a proportional equal balance between both sources.

It is suggested that sound checks for balance levels of fixed media as well as fixed media and instrument are carried out to anticipate any possible disparities.

Two versions of fixed media are available:

- 8-speaker arrangement
- Stereo arrangement

Time synchronization between fixed media and live performer is flexible.

Fixed media sections may be understood more as floating sections. Entrance cues with pickup measures can be provided to the performer via click track. Metronomic click track may be used as well for tempo referencing.

Split Narrow

Fernando Rincón Estrada
(2017)

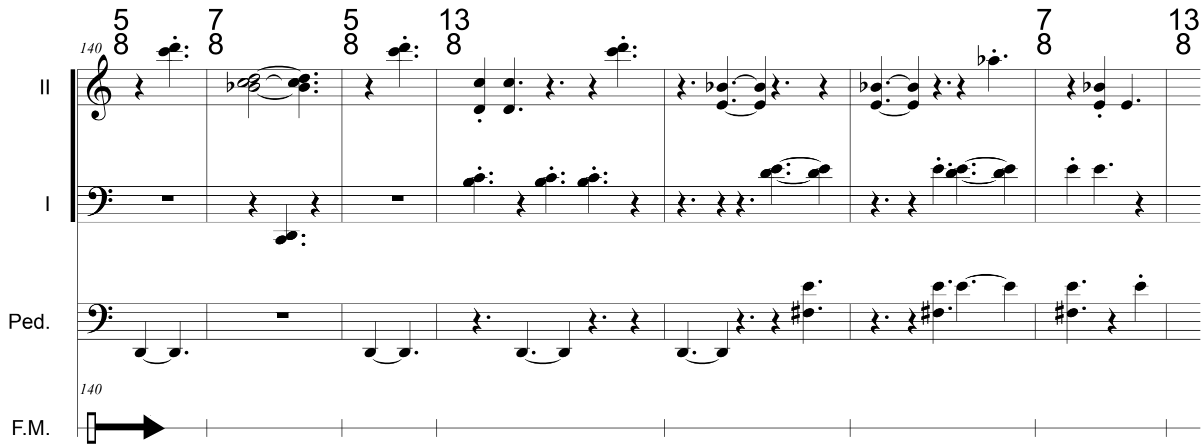

II
I
Ped.
F.M.

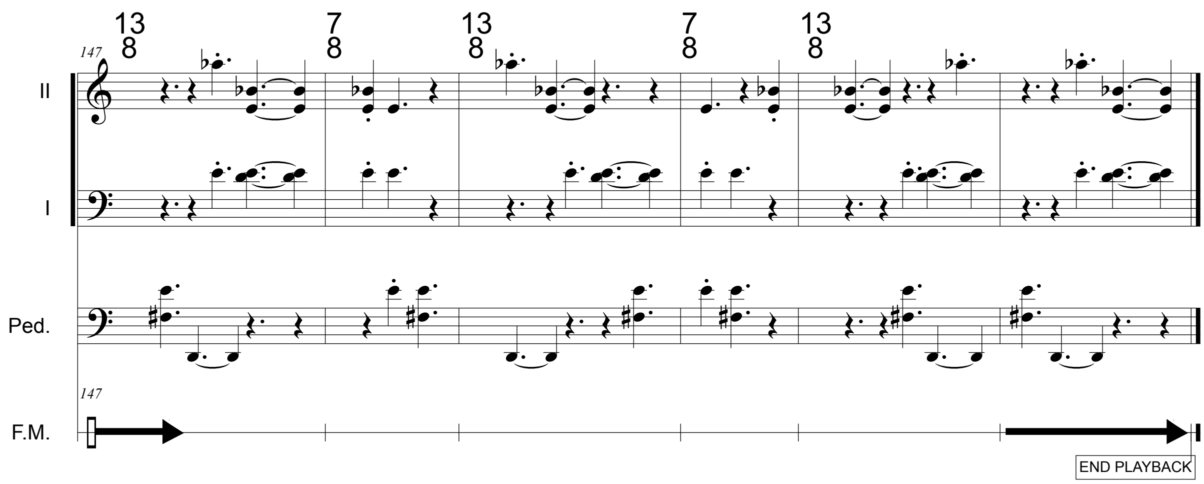

43
II
I
Ped.
F.M.
51
59


68
II
I
Ped.
F.M.
77
88


94
II
I
Ped.
F.M.
102
109


II Mixture
II/I 8'+4' P 16'+8'
II
I
Ped.
F.M.
117
124
132


140
II
I
Ped.
F.M.


147
II
I
Ped.
F.M.
END PLAYBACK

A.5

Format: Score

Rust (2017)

for solo violoncello and eight-channel fixed media

Rust

for solo violoncello
and fixed media

Rust

for solo violoncello
and fixed media

Fernando Rincón Estrada

Rust (2017)

Fernando Rincón Estrada

Instrumentation

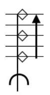
Amplified Violoncello
Fixed Media (Eight channels)

General Remarks

Bow Position

Transition between positions are indicated by dashed lines. Positions are maintained until a change of position is indicated.

ord. – normal position
sul tasto – close to the fingerboard
sul pont. – close to the bridge
x.s.p. – as close as possible to the bridge, enough as to maintain a blending sound between pitch and a high contents of noise.
crini+legno – half hair and half wood stick
flautato – low pressure bowing, airy sound production



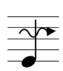
Bow between left hand and nut – diamond noteheads indicate string, pressure of touch is the same as for harmonics, while the arrow indicates high sounding partials.

Rotating bowing – circular motion shifting the bow between three strings, the sounding result aims to achieve a continuous "triple stop" sound. For long durations a rhythmic notation between the shifting double stops is specified. For short notes the effect is similar to a rolled chord, but maintained through the repetition of the motion for the short duration specified.

Bow Pressure

Levels of pressure are indicated by filled increasing or decreasing hairpins. The notation is applied to degrees of overpressure when bowing. Degrees go from low level with high content of partials and some noise to high level with high content of noise and low of partials

Left Hand



Pitch oscillation – narrow mictronal fluctuations on the notated pitch. Narrowness is not fixed; the goal is to obtain a complex sound by beating and tuning deviation. For long durations, trills are specified and they may vary in speed and regularity. For shorts, the gesture behaves more similar to mordents or ornamental contour patterns.

Harmonic glissandi – the notation specifies the string for the glissando with the first diamond notehead. The reaching endpoint of the glissando is notated with a (diamond notehead) specifies the node on the fingerboard.

Open string/natural harmonic trill – open string vibrates while a trill with the notated sounding harmonic is produced. Sounding harmonic is notated with a (diamond notehead)

x notehead – (pitched) light pressure touching the string enough to produce a blended sound of pitch and bow friction.

x notehead – (unpitched) light pressure touching the string but damping enough to cut any pitch from the string. Sound is produced by the friction of the bow.

For long sustained notes, the goal of the sound is similar or analog to flautando sound production, possibly with a rougher noisy sound result.

Multiple Sounds

Multiphonics – indicated on the score with a diamond notehead accompanied of the key "Multi." Partial content and string are indicated also.

Split-tone – written key is notated on the score, the sounding result is a two or multiple part sound from playing the bow very close to the bridge.

½ harm. – written key notated on the score, the sounding result is a the sounding harmonic and the fundamental of the string where the harmonic is sounding.

Tempo Modulations

Equivalences are indicated under the standard that the first value corresponds to the new duration of the notated value while the second one indicates the previous equivalent old duration.

Fixed Media

Functions as counterpart for the live-acoustic source.

Dynamic level and balance between acoustic and electronic sources intends to be equally proportioned at all times (ca. 50% fixed media/50% acoustic sources). Nevertheless nuances of unbalance between sources are expected to happen. In the case the nuances from one of the sources overpowers the other, adjustments to dynamic levels should be made to find a proportional equal balance between both sources.

It is suggested that sound checks for balance levels of fixed media as well as fixed media and instrument are carried out to anticipate any possible disparities.

Two versions of fixed media are available:

- 8-speaker arrangement
- Stereo arrangement

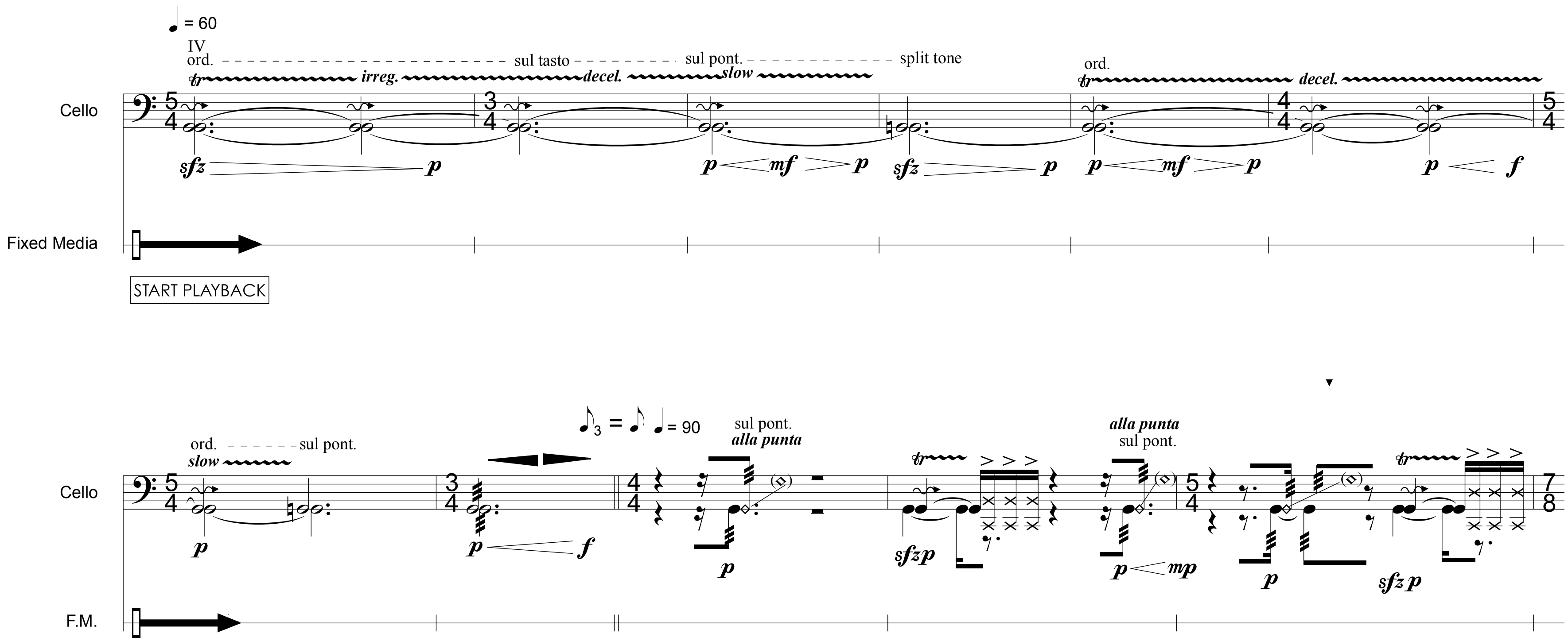
Time synchronization between fixed media and live performer is flexible.

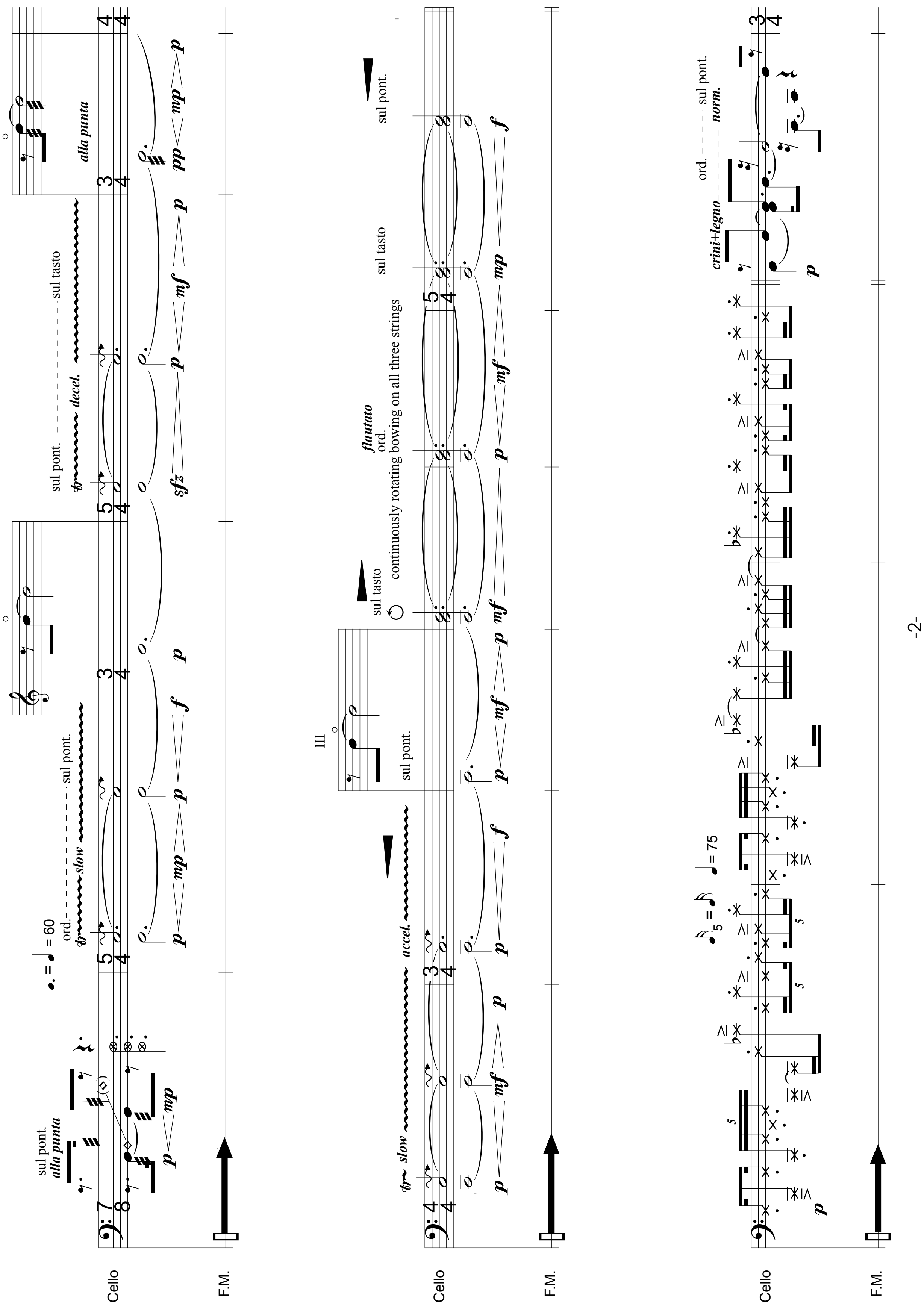
Fixed media sections may be understood more as floating sections of variable durations and lengths due to approximations of the tempi indicated on the score. For this approach entrance cues with pickup measures can be provided to the performer via click track. Metronomic click track may be used as well for tempi referencing.

Rust

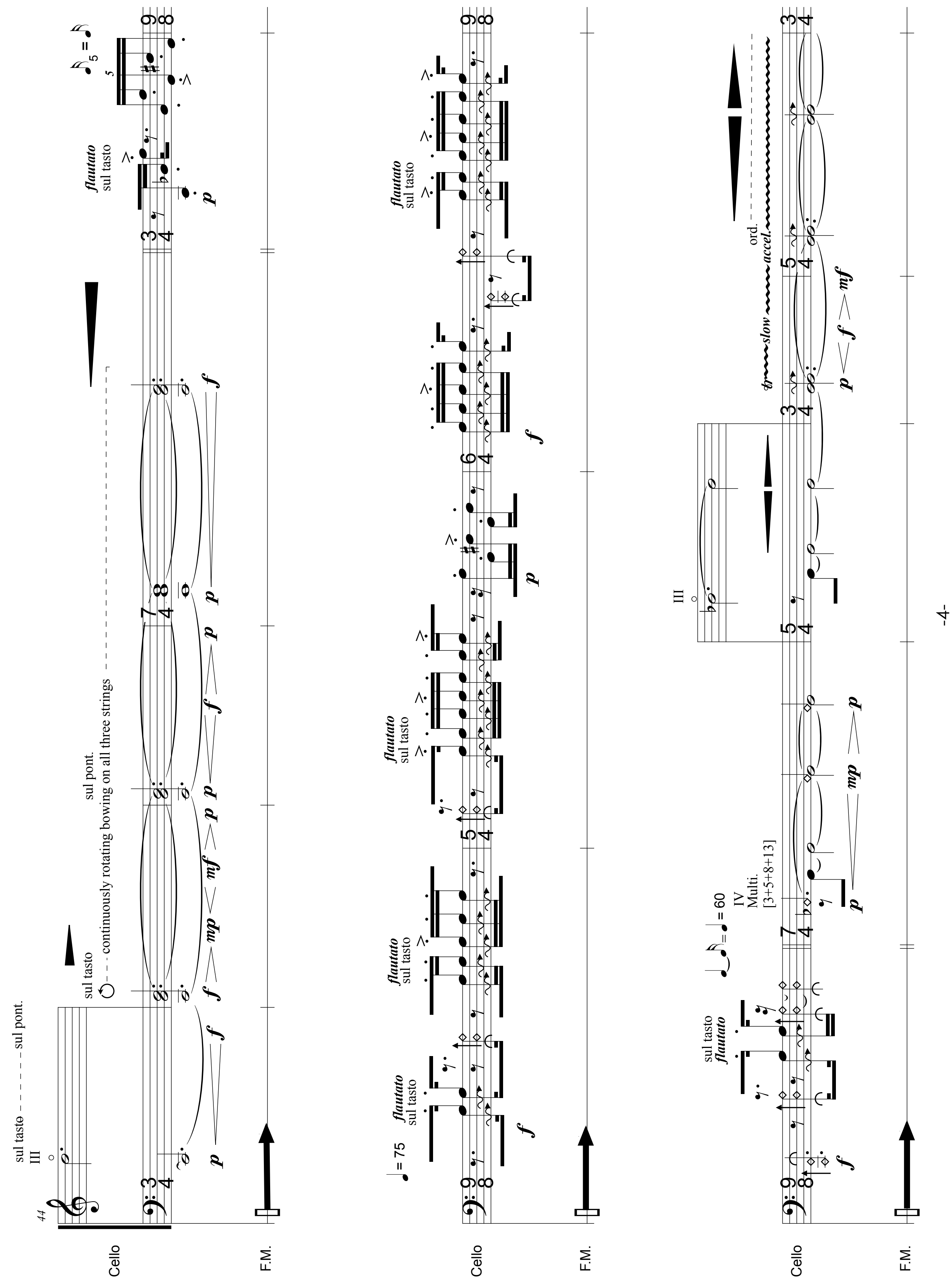
for Jennifer Bewerse

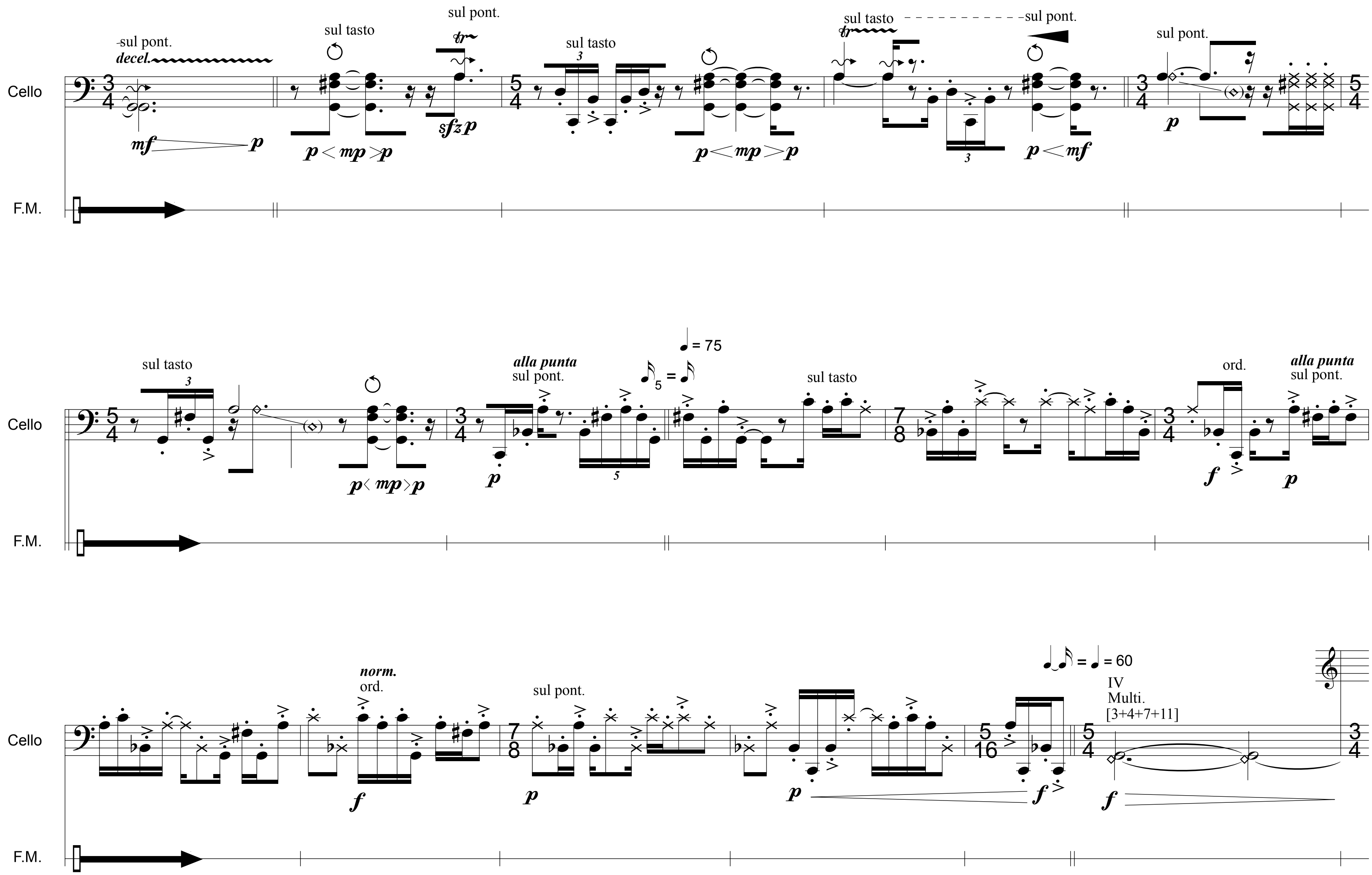
Fernando Rincon Estrada
2017

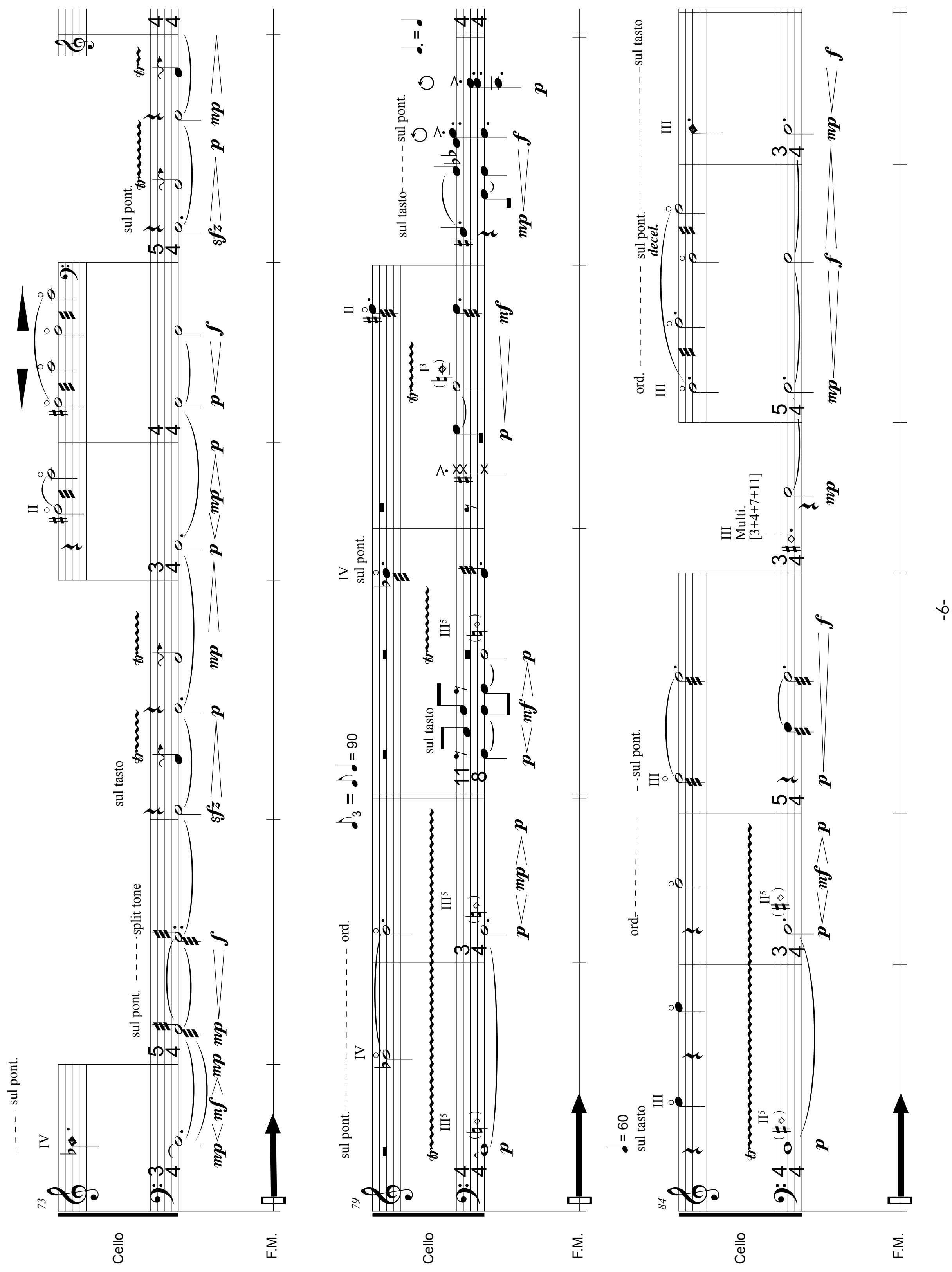



Cello
F.M.
sul pont.
alla punta
ord.
slow
sul pont.
decel.
sul tasto
III
accel.
flautato
ord.
continuously rotating bowing on all three strings
sul tasto
sul pont.
crini+legno
norm.
-2-


Cello
F.M.
crini+legno
ord.
III II
ord.- - - - - sul pont.
normal
crini+legno
= 60
ord. - - - - - - - - - - - - - - - -sul pont.
Multi.
[3+5+8+13]
32
III
ord. - - - - - - - - - - - - - - - - - - sul pont.
slow
accel.
= 90
ord.
flautato- - - - - - - - - - normal
alla punta
sul pont.
ord.
flautato- - - - - - - - - - - - normal
sul tasto
= 60
sul pont.
decel.
III
sul pont.- - - - sul tasto
slow
III
Multi.
[3+4+7+11]

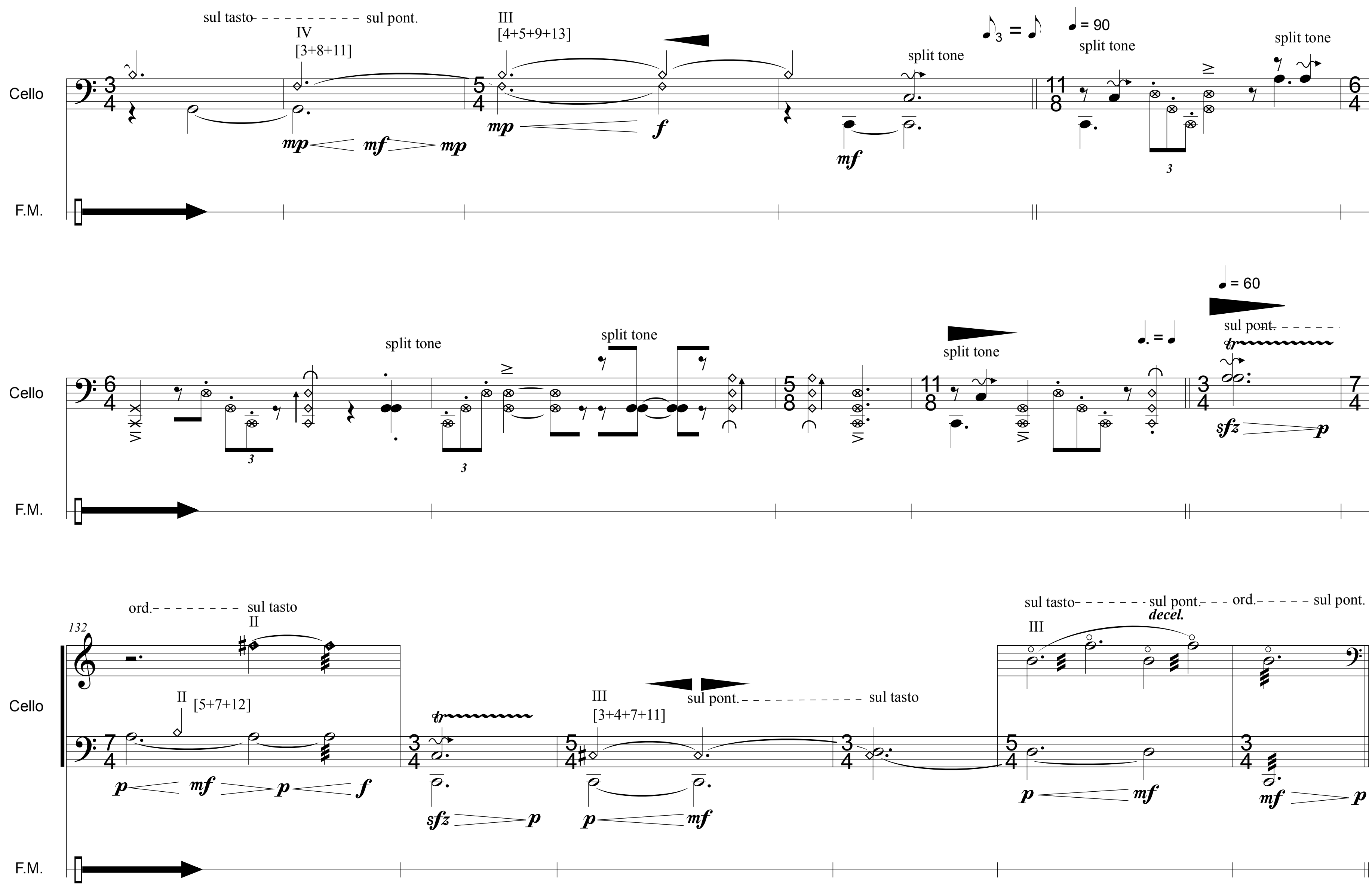

Cello
F.M.
sul tasto
sul pont.
III
continuously rotating bowing on all three strings
flautato
♩ = 75
IV
Multi.
[3+5+8+13]
♩ = 60
ord.
slow
accel.
-4-

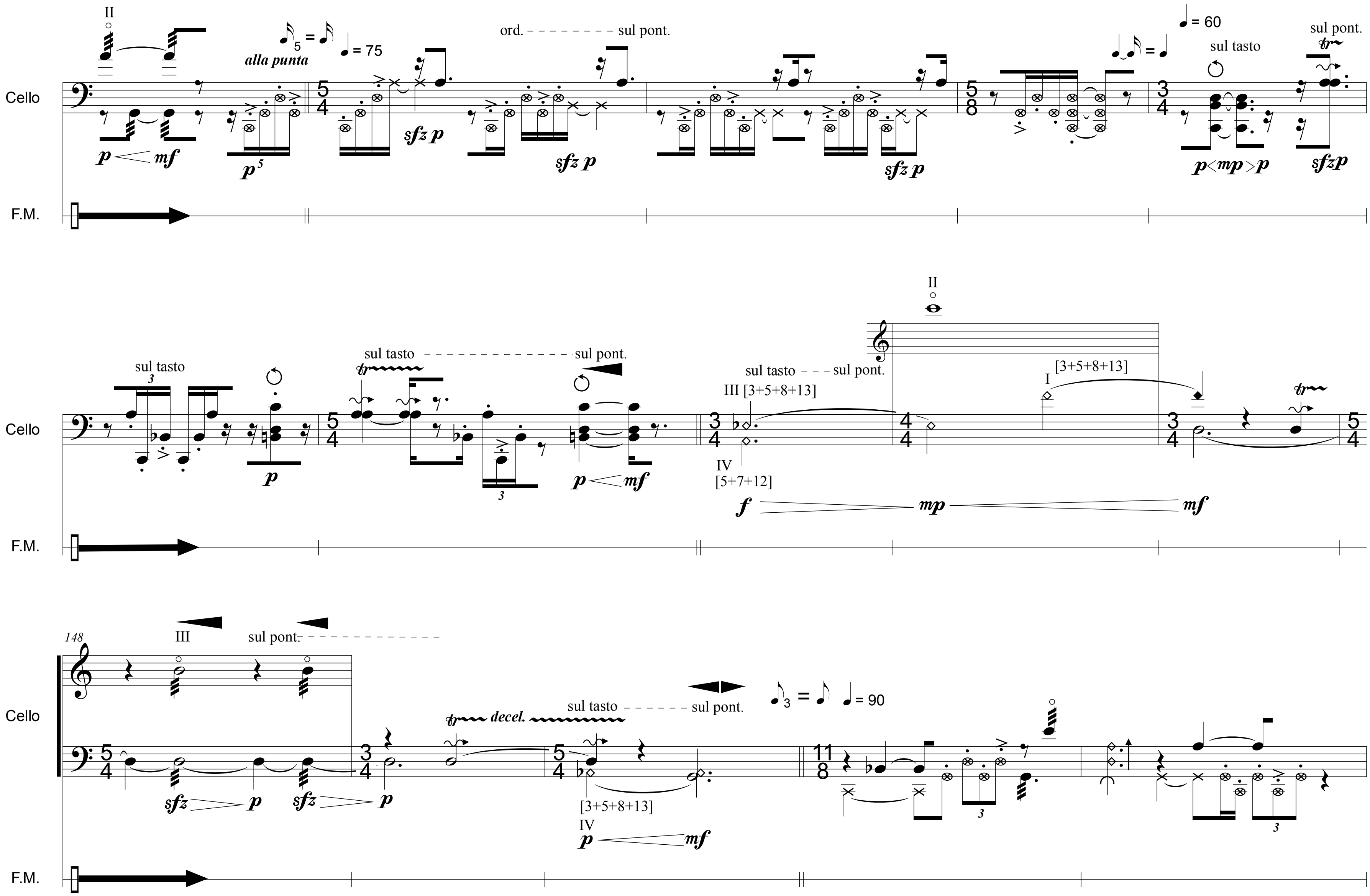

-sul pont.
decel.
sul tasto
sul pont.
sul tasto
sul tasto
-sul pont.
sul pont.
Cello
F.M.
sul tasto
alla punta
sul pont.
= 75
sul tasto
ord.
alla punta
sul pont.
norm.
ord.
sul pont.
= 60
IV
Multi.
[3+4+7+11]


Cello
F.M.
sul pont.
IV
split tone
sul tasto
II
ord.
III
Multi.
[3+4+7+11]
decel.
= 90
= 60
-6-


Cello
F.M.
sul pont.
= 75
sul tasto
sul pont.
= 60
sul pont.
IV
Multi.
[3+5+8+13]
ord. sul tasto
IV
II
Multi.
[3+7+10+13]
sul tasto
sul pont.
ord.
sul pont.
II
Multi.
II [3+5+8+13]
II
sul pont.
II
II
sul tasto
II
decel.


Cello
F.M.
IV
Multi.
[3+5+8+13]
sul tasto - - - - sul pont.
alla punta
= 90
sul tasto
sul pont.
alla punta
IV
sul tasto
flautato
pizz.
arco
sul pont.
pizz.
mp mf p
p f p mf
p
sfz p
mp
p
arco
= 60
sul pont.
= 75
f
p
= 60
ord.- - - - - - - - - - sul pont.
decel.
III
Multi.
[3+5+8+13]
ord.
sul pont.
sul tasto
II
[3+5+8+13]
ord.- - - - - - - - - - sul tasto
I
[3+4+7+11]
p mp p mf mp
sfz p
p mf mp


Cello
F.M.
sul tasto
sul pont.
IV
[3+8+11]
III
[4+5+9+13]
split tone
= 90
ord.
sul tasto
II
[5+7+12]
III
[3+4+7+11]
sul pont.
decel.
= 60
132


Cello
F.M.
II
alla punta
= 75
ord. - - - - - - - - sul pont.
= 60
sul tasto
sul pont.
p < mf
p 5
sfz p
sfz p
sfz p
p < mp > p
sfz p
sul tasto
sul tasto - - - - - - - - - - - - - sul pont.
sul tasto - - - sul pont.
III [3+5+8+13]
IV [5+7+12]
I [3+5+8+13]
p
p < mf
f
mp
mf
148
III
sul pont.
decel.
sul tasto - - - - - - sul pont.
= 90
[3+5+8+13]
IV
sfz p
sfz p
p mf


Cello
F.M.
sul pont.
sul tasto
II
[4+5+9+13]
sul pont.
ord.
= 60
[4+5+9+13]
IV
sfz p
mf
p
mf
II
mf
f
ord.
sul pont.
sul pont.
sfz
ord.
III
[3+5+8+13]
IV
[5+7+12]
p
sul tasto
sul pont.
p
mf
p
sul tasto
sul pont.
decel.
sfzp
irreg.
mp
pp
END PLAYBACK

Appendix B

Audio Fixed Media

B.1

Format: Audio

Fracture (2012)

Stereo fixed media

Duration: 4:48

B.2

Format: Audio

Pull (2015)

Eight-channel fixed media

Stereo Version, Duration: 5:35

B.3

Format: Audio

Pliegues (2016)

54.1 fixed media

Stereo Version, Duration: 9:56

B.4

Format: Audio

Surfaces (2016)

Eight-channel fixed media

Stereo Version, Duration: 7:02

B.5

Format: Audio

Random is not that Random (2017)

Stereo fixed media

Duration: 12:35

Appendix C

Examples Code SuperCollider

C.1

Example Code for Split Narrow, instrument with amplitude modulation

```
(
SynthDef(\testOrganSwellDel, { |freq, freqAmp, loAmp, hiAmp|
    var pink, ampMod, rand, rand2, in, del;
    pink = PinkNoise.ar(2.0);
    ampMod = SinOsc.kr(freqAmp);
    rand = LFNoise0.kr(4);
    rand2 = LFNoise0.kr(0);
    in = BBandPass.ar(pink, freq, 0.0008, ampMod.range(loAmp, hiAmp));
    del = DelayC.ar(in, 0.12, rand2.range(0.02, 0.08), rand2.range(0.4, 0.8));
    OffsetOut.ar(0, Pan2.ar(in, (ampMod*0.4).range(-1.0, 1.0)));
    OffsetOut.ar(0, Pan2.ar(del, (ampMod*0.4).range(-1.0, 1.0)))
}).add;
)
```

C.1.1

Example Code for Split Narrow, layering of instances of the same instrument

playing together

```
(
a = Synth(\testOrganSwellDel, [\freq, 65.41*5,    \freqAmp, 6,  \loAmp, 0.2, \hiAmp, 0.8 ]);
b = Synth(\testOrganSwellDel, [\freq, 65.41*22,  \freqAmp, 7,  \loAmp, 0.2, \hiAmp, 0.4 ]);
c = Synth(\testOrganSwellDel, [\freq, 65.41*28,  \freqAmp, 8,  \loAmp, 0.2, \hiAmp, 1.0 ]);
d = Synth(\testOrganSwellDel, [\freq, 65.41*72,  \freqAmp, 9,  \loAmp, 0.2, \hiAmp, 0.6 ]);
/*e = Synth(\testOrganSwellDel, [\freq, 65.41*5,  \freqAmp, 10, \loAmp, 0.2, \hiAmp, 0.8 ]);
f = Synth(\testOrganSwellDel, [\freq, 65.41*6,  \freqAmp, 11, \loAmp, 0.2, \hiAmp, 1.0 ]);
g = Synth(\testOrganSwellDel, [\freq, 65.41*7,  \freqAmp, 12, \loAmp, 0.2, \hiAmp, 1.2 ]);
h = Synth(\testOrganSwellDel, [\freq, 65.41*8,  \freqAmp, 13, \loAmp, 0.2, \hiAmp, 0.8 ]);
i = Synth(\testOrganSwellDel, [\freq, 65.41*9,  \freqAmp, 14, \loAmp, 0.2, \hiAmp, 1.2 ]);
j = Synth(\testOrganSwellDel, [\freq, 65.41*10, \freqAmp, 15, \loAmp, 0.2, \hiAmp, 1.0 ]);
k = Synth(\testOrganSwellDel, [\freq, 65.41*11, \freqAmp, 16, \loAmp, 0.2, \hiAmp, 1.2 ]);
l = Synth(\testOrganSwellDel, [\freq, 65.41*12, \freqAmp, 17, \loAmp, 0.2, \hiAmp, 1.0 ]);
m = Synth(\testOrganSwellDel, [\freq, 65.41*13, \freqAmp, 18, \loAmp, 0.2, \hiAmp, 0.8 ]);
n = Synth(\testOrganSwellDel, [\freq, 65.41*14, \freqAmp, 19, \loAmp, 0.2, \hiAmp, 1.0 ]);*/
)
```

C.2

Example Code for Pliegues, instrument design delayed outputs

```
(
SynthDef(\glissRHPFAllosphereVer2, {|fund = 55, partialS = 1, partialE = 12, levEnv = 1, rise = 12, sust = 4, dur =
20, rateAmp = 12, delT = 0.05, busL = 0, busR = 1|
    var osc, env, sig, delay, mix, amp, line, in;
    osc = LFNoise0.kr(8);
    env = EnvGen.kr(Env([0,0.9,1.0,0], [rise/dur, sust/dur, (dur-(rise+sust))/dur]*dur, [4,1,-5]), 1, levEnv,
doneAction:2 );
    amp = SinOsc.kr(rateAmp).range(0.93, 1.0);
    line = XLine.kr((fund*osc.range(0.99, 1.01))*partialS, ((fund*osc.range(0.987, 1.02))*partialE), rise*0.99);
    in = BBandPass.ar(PinkNoise.ar(0.05), line, osc.range(0.0001, 0.0002));
    sig = RHPF.ar(in,line,1/line, amp)*env;
    delay = DelayL.ar(sig, 0.12, delT, 0.75);
    mix = Mix.new([sig, delay]);
    OffsetOut.ar(busL, FreeVerb.ar(mix, 0.3));
    OffsetOut.ar(busR, FreeVerb.ar(DelayL.ar(mix, 0.1, 0.03, 0.75), 0.3, mul:0.75))
    //OffsetOut.ar(2, FreeVerb.ar(DelayL.ar(Mix.new([mix,delay]), 0.1, 0.04, 0.75), 0.3, mul:0.75))
}).add;
)
```

C.2.1

Example Code for Pliegues, delayed output sequence

```
(
~routGlissAllosVer4 = Routine({
    var busL, busR;
    busL = [0,2,4];
    busR = [1,3,5];
    3.do{
        var durArray, dur1, dur2, dur3, rise1, rise2, rise3, sust1, sust2, sust3, partialE1, partialE2, partialE3, levEnv,
rateAmp, delT;
        durArray = (20..40);
        dur1 = durArray.choose;
        rise1 = dur1*(55..70)*0.01;
        sust1 = (20..25)*0.01*dur1;
        dur2 = durArray.choose;
        rise2 = dur2*(55..70)*0.01;
        sust2 = (20..25)*0.01*dur2;
        dur3 = durArray.choose;
        rise3 = dur3*(55..70)*0.01;
        sust3 = (20..25)*0.01*dur3;
        partialE1 = (13..17);
        partialE2 = (19..23);
        partialE3 = (11..13);
        levEnv = (70..100)*0.01;
        rateAmp = (12..18);
        delT = (1..7)*0.01;
        Synth(\glissRHPFAllosphereVer2, [\dur, dur1.postln, \rise, rise1.choose.postln, \sust, sust1.choose.postln, \partialE,
partialE1.choose, \levEnv, levEnv.choose, \rateAmp, rateAmp.choose, \delT, delT.choose, \busL, busL.at([0]), \busR,
busR.at([0])]);
        rrand(0.008, 0.06).yield;
        Synth(\glissRHPFAllosphereVer2, [\dur, dur1.postln, \rise, rise1.choose.postln, \sust, sust1.choose.postln, \partialE,
partialE1.choose, \levEnv, levEnv.choose, \rateAmp, rateAmp.choose, \delT, delT.choose, \busL, busL.at([0]), \busR,
busR.at([0])]);
        ((dur1/rrand(5,7))*0.3).yield;
        "pass 1".postln;
        Synth(\glissRHPFAllosphereVer2, [\dur, dur2.postln, \rise, rise2.choose.postln, \sust, sust2.choose.postln, \partialE,
partialE2.choose, \levEnv, levEnv.choose, \rateAmp, rateAmp.choose, \delT, delT.choose, \busL, busL.at([1]), \busR,
busR.at([1])]);
        rrand(0.008, 0.06).yield;
        Synth(\glissRHPFAllosphereVer2, [\dur, dur2.postln, \rise, rise2.choose.postln, \sust, sust2.choose.postln, \partialE,
partialE2.choose, \levEnv, levEnv.choose, \rateAmp, rateAmp.choose, \delT, delT.choose, \busL, busL.at([1]), \busR,
busR.at([1])]);
        ((dur2/rrand(3,5))*0.3).yield;
        "pass 2".postln;
```

C.3

Example Code for Pull, example instrument design

```
(
SynthDef(\BPFRezonsDec, { | trigRate = 10, attT = 0.01, decT = 0.08, levWhite = 1.8, rateFreqBPF = 16, loFreqBPF = 49, hiFreqBPF =
880, bwBPF = 0.01, ampBPF = 1.8, rateRes = 8, loFreqRes = 49, hiFreqRes = 880, bwRes = 0.001, ampRes = 1.2, delTrig0 = 0.1,
delTrig1 = 0.2, delTrig2 = 0.3, delTrig3 = 0.4, delTrig4 = 0.5, delTrig5 = 0.6, delTrig6 = 0.7, delAll = 0.05, decAll = 0.5 |
var trig, in0, in1, in2, in3, in4, in5, in6, in7/*, bwBPF, bwRes*/;
    trig = Impulse.ar(trigRate);
    //bwBPF = LFNoise0.kr(16).range(0.001, 0.1);
    //bwRes = LFNoise0.kr(16).range(0.001, 0.1);
    in0 = Decay2.ar(trig, attT, decT, Resonz.ar(BPF.ar(WhiteNoise.ar(levWhite), LFNoise0.kr(rateFreqBPF).range(loFreqBPF,
hiFreqBPF), bwBPF, ampBPF), LFNoise0.kr(rateRes).range(loFreqRes, hiFreqRes), bwRes, ampRes));
    in1 = Decay2.ar(TDelay.ar(trig, delTrig0), 0.01, 0.08, Resonz.ar(BPF.ar(WhiteNoise.ar(levWhite),
LFNoise0.kr(rateFreqBPF).range(loFreqBPF, hiFreqBPF), bwBPF, ampBPF), LFNoise0.kr(rateRes).range(loFreqRes, hiFreqRes), bwRes,
ampRes));
    in2 = Decay2.ar(TDelay.ar(trig, delTrig1), 0.01, 0.08, Resonz.ar(BPF.ar(WhiteNoise.ar(levWhite),
LFNoise0.kr(rateFreqBPF).range(loFreqBPF, hiFreqBPF), bwBPF, ampBPF), LFNoise0.kr(rateRes).range(loFreqRes, hiFreqRes), bwRes,
ampRes));
    in3 = Decay2.ar(TDelay.ar(trig, delTrig2), 0.01, 0.08, Resonz.ar(BPF.ar(WhiteNoise.ar(levWhite),
LFNoise0.kr(rateFreqBPF).range(loFreqBPF, hiFreqBPF), bwBPF, ampBPF), LFNoise0.kr(rateRes).range(loFreqRes, hiFreqRes), bwRes,
ampRes));
    in4 = Decay2.ar(TDelay.ar(trig, delTrig3), 0.01, 0.08, Resonz.ar(BPF.ar(WhiteNoise.ar(levWhite),
LFNoise0.kr(rateFreqBPF).range(loFreqBPF, hiFreqBPF), bwBPF, ampBPF), LFNoise0.kr(rateRes).range(loFreqRes, hiFreqRes), bwRes,
ampRes));
    in5 = Decay2.ar(TDelay.ar(trig, delTrig4), 0.01, 0.08, Resonz.ar(BPF.ar(WhiteNoise.ar(levWhite),
LFNoise0.kr(rateFreqBPF).range(loFreqBPF, hiFreqBPF), bwBPF, ampBPF), LFNoise0.kr(rateRes).range(loFreqRes, hiFreqRes), bwRes,
ampRes));
    in6 = Decay2.ar(TDelay.ar(trig, delTrig5), 0.01, 0.08, Resonz.ar(BPF.ar(WhiteNoise.ar(levWhite),
LFNoise0.kr(rateFreqBPF).range(loFreqBPF, hiFreqBPF), bwBPF, ampBPF), LFNoise0.kr(rateRes).range(loFreqRes, hiFreqRes), bwRes,
ampRes));
    in7 = Decay2.ar(TDelay.ar(trig, delTrig6), 0.01, 0.08, Resonz.ar(BPF.ar(WhiteNoise.ar(levWhite),
LFNoise0.kr(rateFreqBPF).range(loFreqBPF, hiFreqBPF), bwBPF, ampBPF), LFNoise0.kr(rateRes).range(loFreqRes, hiFreqRes), bwRes,
ampRes));
    OffsetOut.ar(0, AllpassC.ar(in0, 0.2, delAll, decAll));
    OffsetOut.ar(1, AllpassC.ar(in1, 0.2, delAll, decAll));
    OffsetOut.ar(2, AllpassC.ar(in2, 0.2, delAll, decAll));
    OffsetOut.ar(3, AllpassC.ar(in3, 0.2, delAll, decAll));
    OffsetOut.ar(4, AllpassC.ar(in4, 0.2, delAll, decAll));
    OffsetOut.ar(5, AllpassC.ar(in5, 0.2, delAll, decAll));
    OffsetOut.ar(6, AllpassC.ar(in6, 0.2, delAll, decAll));
    OffsetOut.ar(7, AllpassC.ar(in7, 0.2, delAll, decAll));
    OffsetOut.ar(7, in0);
    OffsetOut.ar(6, in1);
    OffsetOut.ar(5, in2);
    OffsetOut.ar(4, in3);
    OffsetOut.ar(3, in4);
    OffsetOut.ar(2, in5);
    OffsetOut.ar(1, in6);
    OffsetOut.ar(0, in7);
}).add;
)
```

C.4

Example Code for On Tessellation, example instrument design

```
(
SynthDef(\membCircleFormlet, { |bus1 = 0, bus2 = 1, gate = 1, decay = 5, whiteAmp = 0.03, freq = 200, rq = 0.4,
tension = 0.01, loss = 0.99999, delT = 0.06, delAmp = 0.5|
    var trig, envAtt, envIn, in;
    trig = Demand.kr(Impulse.kr(0), 0, Dwhite(0,1, inf));
    envAtt = EnvGen.ar(Env([0,1,0], [0.001, decay], [2, -8]), gate, doneAction:2);
    envIn = EnvGen.ar(Env([0,1,0], [0.001, decay*1.05], [2, -8]),  gate, doneAction:2);
    //envIn = EnvGen.ar(Env([0,1,0], [0.03, decay], [2, -8]),  gate, doneAction:2);
    //in = MembraneCircle.ar(RHPF.ar(WhiteNoise.kr(whiteAmp)*envAtt, freq.poll, rq), tension, loss, trig.range(0.3,
0.6))*envIn;
    in = MembraneCircle.ar(Formlet.ar(PinkNoise.ar(whiteAmp)*envAtt, freq, rq), tension, loss, trig.range(0.2,
0.5))*envIn;
    OffsetOut.ar(bus1, in);
    OffsetOut.ar(bus2, DelayC.ar(in, 0.1, delT, delAmp));
}).add;
)
```

C.5

Example Code for Pliegues, example instrument design

```
//// upper ring trios
~upRingTrioTri = [[1,2,6], [3,4,11], [7,8,0], [9,10,5]];
~upRingTrioTri2 = [[1,2,8], [3,4,9], [6,7,0], [5,10,11]];
~upRingTrioCon = [[0,1,2], [3,4,5], [6,7,8], [9,10,11]]

~midRingTrioCon = Array.series(10, [16,17,18], 3);

~loRingTrioTri = [[1,2,6], [3,4,11], [7,8,0], [9,10,5]]+49;
~loRingTrioTri2 = [[1,2,8], [3,4,9], [6,7,0], [5,10,11]]+49;
~loRingTrioCon = [[0,1,2], [3,4,5], [6,7,8], [9,10,11]]+49;

(
SynthDef(\violoncelloInstEnv, { |decay = 0.6, durLine = 20, multPink = 1, fund = 83, parts =
#[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21], devFreq = 8, bw = 0.0001, amps =
#[1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1], scaleAmp = 20, bwF1 = 200, ampF1 = 0.02, bwF2 = 400, ampF2 = 0.02, bwF3 =
420, ampF3 = 0.002, bwF4 = 1000, ampF4 = 0.002, cutOffFreq = 5000, decDel = 5, decPar = 1, level = 1, busPar = 0, busIn
= 2|
    var scale, env, in, delay, parallel;
    scale = SinOsc.kr(Dust.kr(0.2).range(0.1, 0.3)).range(0, 0.2);
    env = EnvGen.kr(Env([0, 1.0, decay, 0], [durLine*0.16, durLine*0.42, durLine*0.41], [4, 0, -5]), 1, doneAction: 2);
    in = LPF.ar(Mix.new([Mix.new(BBandPass.ar(PinkNoise.ar(multPink), fund*parts*LFNoise0.ar(devFreq).range(0.999,
1.001), 0.0001, amps*scaleAmp)), Formant.ar(fund, fund*3, bwF1, ampF1*scale), Formant.ar(fund, fund*5, bwF2,
ampF2*scale), Formant.ar(fund, fund*9, bwF3, ampF3*scale), Formant.ar(fund, fund*13, bwF4, ampF4*scale)]), cutOffFreq);
    delay = DelayN.ar(in, 0.06);
    parallel = CombL.ar(delay, 0.1, LFNoise1.kr(0.1.rand, 0.04, 0.05), decDel);
    4.do({parallel = AllpassN.ar(parallel, 0.05, [0.05.rand, 0.05.rand], decPar)});
    OffsetOut.ar(busPar, LeakDC.ar(parallel, 0.995, 1*level)*env);
    OffsetOut.ar(busIn, LeakDC.ar(in, 0.995, 0.75*level)*env);
}).add;
)

// never forget this!!!!!
(
~fundvcE1 = 83;
~partsvcE1 = (1..21) * ~fundvcE1;
~ampsvcE1 = ([14, 30, 19, 20, 12.5, 8, 13.5, 22, 15, 16, 10.2, 8.7, 8, 10, 5.5, 2, 1, 3, 2, 4.5, 1]-30).dbamp;
)
```

C.5.1

Example Code for Routine Pliegues, (excerpt)

```
(
~routGrainVCBuf = Routine({
    var durLine, delta, densAccum, grPos, changeGr, mix, room, damp, ampDel, delT, rate, bus1, bus2, deltaDel;
    //densAccum = rrand(0.1, 0.2);
    densAccum = (10..20)*0.01;
    grPos = (6..12);
    changeGr = (40..50)*0.01;
    //bus1 = (0..26);
    bus1 = (0..7);
    bus2 = (0..7);
    //bus2 = (0..26);

3.do{
    delta = rrand(2,5);
    durLine = rrand(3, 7);
    mix = rrand(0.3, 0.6);
    room = rrand(0.2, 0.8);
    damp = rrand(0.4, 0.8);
    ampDel = rrand(0.6, 0.8);
    delT = rrand(0.04, 0.06);
    rate = rrand(0.95, 1.05);
    deltaDel = rrand(0.025, 0.055);

    Synth(\bufGrainVCInst, [\envbufnum, ~x, \sndbuf, ~buf3, \durLine, durLine, \densAccum, densAccum.choose, \grPos,
grPos.choose, \changeGr, changeGr.choose, \mix, mix, \room, room, \damp, damp, \ampDel, ampDel, \delT, delT, \rate, rate,
\bus1, bus1.choose, \bus2, bus2.choose]);
    deltaDel.yield;
    Synth(\bufGrainVCInst, [\envbufnum, ~x, \sndbuf, ~buf2, \durLine, durLine, \densAccum, densAccum.choose, \grPos,
grPos.choose, \changeGr, changeGr.choose, \mix, mix, \room, room, \damp, damp, \ampDel, ampDel, \delT, delT, \rate, rate,
\bus1, bus1.choose, \bus2, bus2.choose]);
        delta.yield;

        Synth(\bufGrainVCInst, [\envbufnum, ~x, \sndbuf, ~buf3, \durLine, durLine, \densAccum, densAccum.choose, \grPos,
grPos.choose, \changeGr, changeGr.choose, \mix, mix, \room, room, \damp, damp, \ampDel, ampDel, \delT, delT, \rate, rate,
\bus1, bus1.choose, \bus2, bus2.choose]);
    deltaDel.yield;
    Synth(\bufGrainVCInst, [\envbufnum, ~x, \sndbuf, ~buf2, \durLine, durLine, \densAccum, densAccum.choose, \grPos,
grPos.choose, \changeGr, changeGr.choose, \mix, mix, \room, room, \damp, damp, \ampDel, ampDel, \delT, delT, \rate, rate,
\bus1, bus1.choose, \bus2, bus2.choose]);
    deltaDel.yield;
    Synth(\bufGrainVCInst, [\envbufnum, ~z, \sndbuf, ~buf2, \durLine, durLine, \densAccum, densAccum.choose, \grPos,
grPos.choose, \changeGr, changeGr.choose, \mix, mix, \room, room, \damp, damp, \ampDel, ampDel, \delT, delT, \rate, rate,
\bus1, bus1.choose, \bus2, bus2.choose]);
        delta.yield;
```

C.5.2

Example Code for VBAP Implementation Pliegues, (excerpt middle ring)

```
(
SynthDef(\violoncelloInstEnvVBAPAllosMid, { |decay = 0.6, durLine = 20, multPink = 1, fund = 83, parts =
#[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21], devFreq = 8, bw = 0.0001, amps =
#[1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1,1], scaleAmp = 20, bwF1 = 200, ampF1 = 0.02, bwF2 = 400, ampF2 = 0.02, bwF3
= 420, ampF3 = 0.002, bwF4 = 1000, ampF4 = 0.002, cutOffFreq = 5000, decDel = 5, decPar = 1, level = 1, busPar = 0,
busIn = 2, bufnumV|
    var scale, env, in, delay, parallel, mix, azi, mixAll;
    //azi = MouseX.kr(-180, 180, lag: 0.02).poll(label: \azi);
    scale = SinOsc.kr(Dust.kr(0.2).range(0.1, 0.3)).range(0, 0.2);
    //env = EnvGen.kr(Env([0, 1.0, decay, 0], [durLine*0.16, durLine*0.42, durLine*0.41], [4, 0, -5]), 1, doneAction:
2);
    env = EnvGen.kr(Env([0,1,0.9,0], [durLine*0.5, durLine*0.05, durLine*0.44], [5, -8, -4]), 1, doneAction:2);
    in = LPF.ar(Mix.new([Mix.new(BBandPass.ar(PinkNoise.ar(multPink), fund*parts*LFNoise0.ar(devFreq).range(0.999,
1.001), 0.0001, amps*scaleAmp)), Formant.ar(fund, fund*3, bwF1, ampF1*scale), Formant.ar(fund, fund*5, bwF2,
ampF2*scale), Formant.ar(fund, fund*9, bwF3, ampF3*scale), Formant.ar(fund, fund*13, bwF4, ampF4*scale)]),
cutOffFreq);
    delay = DelayN.ar(in, 0.06);
    parallel = CombL.ar(delay, 0.1, LFNoise1.kr(0.1.rand, 0.04, 0.05), decDel);
    4.do({parallel = Mix(AllpassN.ar(parallel, 0.05, [0.05.rand, 0.05.rand], decPar))});
    //mixAll = Mix([Mix(AllpassN.ar(parallel, 0.05, [0.05.rand, 0.05.rand], decPar)), Mix(AllpassN.ar(parallel, 0.05,
[0.05.rand, 0.05.rand], decPar)), Mix(AllpassN.ar(parallel, 0.05, [0.05.rand, 0.05.rand], decPar))]);
    mix = Mix([LeakDC.ar(parallel, 0.995, 1*level)*env, LeakDC.ar(in, 0.995, 0.75*level)*env ]);
    //OffsetOut.ar(0, VBAP.ar(8, mix, bufnumV, azi, 0, 0));
    //OffsetOut.ar(0, VBAP.ar(8, mix, bufnumV, SinOsc.kr(0.1).range(-180, 180), 0, SinOsc.kr(0.05).range(20,50)));
    OffsetOut.ar(0, VBAP.ar(30, mix, bufnumV, SinOsc.kr(Dust.kr(0.5).range(0.1, 0.4)).range(-179, 180).poll, 0,
SinOsc.kr(0.05).range(20,50)));
}).add;
)
```

C.6

Example Code for Surfaces, example of instrument design

```
// ringZtransf1
//take 1 room size big, rev time small, room size 15, 20, rev time 2, 1.5, density max 6
//take 2 room size small, rev time long, room size 3, 1.5, rev time 20, 15, density max 6
//take 3 room size small, rev time long, room size 3, 1.5, rev time 40, 30, density max 6
//take 4 room size small, rev time long, room size 1, 0.5, rev time 30, 30, density max 8
//take 5 room size small, rev time long, room size 0.5, 1.0, rev time 40, 30, impulse train, multWhite 0.1,
maxDensity 16, decayAllpass 0.15, 0.5, freq.rand Modulation 300
//take 6 room size small, rev time long, room size 1.5, 1.0, rev time 40, 30,impulse train, multWhite 0.1, maxDensity
20, decayAllpass 0.15, 0.5, freq.rand Modulation 300
//take 7 room size small, rev time long, room size 1.5, 1.0, rev time 60, 40, impulse train, multWhite 0.1,
maxDensity 20, decayAllpass 0.15, 0.5, freq.rand Modulation 300
{  var in, parallel, revPar, revIn, mult;
    //mult = Mix.new(BBandPass.ar(WhiteNoise.ar(20), [400.rand+800, 400.rand+800, 400.rand+800, 400.rand+800,
800.rand+400, 800.rand+400, 800.rand+400, 800.rand+400], [0.0005.rand+0.0005, 0.0005.rand+0.0005,
0.0005.rand+0.0005], [0.3.rand+0.4, 0.3.rand+0.3, 0.3.rand+0.2, 0.3.rand+0.1, 0.3.rand+0.4, 0.3.rand+0.3,
0.3.rand+0.2, 0.3.rand+0.1]));
    /*mult = Mix.new(Ringz.ar(WhiteNoise.ar(0.1), [400.rand+800, 400.rand+800, 400.rand+800, 400.rand+800,
800.rand+400, 800.rand+400, 800.rand+400, 800.rand+400]+350, [0.0005.rand+0.0005, 0.0005.rand+0.0005,
0.0005.rand+0.0005], [0.3.rand+0.4, 0.3.rand+0.3, 0.3.rand+0.2, 0.3.rand+0.1, 0.3.rand+0.4, 0.3.rand+0.3,
0.3.rand+0.2, 0.3.rand+0.1]));*/
    /*mult = Mix.new(Ringz.ar(WhiteNoise.ar(0.1), [600.rand+1200, 600.rand+1200, 600.rand+1200, 600.rand+1200,
1200.rand+600, 1200.rand+600, 1200.rand+600, 1200.rand+600]+SinOsc.kr(0.1).range(1, 300), [0.0005.rand+0.0005,
0.0005.rand+0.0005, 0.0005.rand+0.0005], [0.3.rand+0.4, 0.3.rand+0.3, 0.3.rand+0.2, 0.3.rand+0.1, 0.3.rand+0.4,
0.3.rand+0.3, 0.3.rand+0.2, 0.3.rand+0.1]));*/
    mult = Mix.new(Ringz.ar(WhiteNoise.ar(0.1), [600.rand+200, 600.rand+200, 600.rand+200, 600.rand+200,
200.rand+600, 200.rand+600, 200.rand+600, 200.rand+600], [0.0005.rand+0.0005, 0.0005.rand+0.0005,
0.0005.rand+0.0005], [0.3.rand+0.4, 0.3.rand+0.3, 0.3.rand+0.2, 0.3.rand+0.1, 0.3.rand+0.4, 0.3.rand+0.3,
0.3.rand+0.2, 0.3.rand+0.1]));
    //in = Decay2.ar(Dust.ar(SinOsc.kr(0.1).range(0.1, 8)), 0.0008, LFNoise0.kr(16).range(0.001, 0.005), mult);
    in = Decay2.ar(Impulse.ar(SinOsc.kr(0.05).range(0.1, 20)), 0.0008, LFNoise0.kr(16).range(0.001, 0.005), mult);
4.do({parallel = AllpassC.ar(in, 0.2, [0.02.rand+0.065, 0.04.rand+0.12], LFNoise0.kr(8).range(0.15, 0.5),
[0.2.rand+0.6, 0.2.rand+0.4])});
    revPar = LeakDC.ar(FreeVerb.ar(parallel, 0.2, 0.2));
    revIn = LeakDC.ar(FreeVerb.ar(in, 0.3, 0.3, 0.5, 0.6));
    Out.ar(0, GVerb.ar(revIn, 1.5, 60));
    Out.ar(2, GVerb.ar(revPar, 1.0, 40))
}.play;
s.prepareForRecord("/Users/fernandorincon/Music/SuperCollider
Recordings/March11/unPitchedMetalRingzFormlet/ringZtransf1_take7.aif");
s.record;
s.stopRecording;
```

C.7

Example Code for Random is not that Random, example of two instances of the instrument

```
{
    var rand, freq, even, levels, sig, delay, array;
    rand = LFNoise0.kr(5);
    freq = 55*Array.series(20, 1, 4);
    //freq = 55*(1..20);
    //even = 440*Array.series(20, 0, 2);
    //freq = even.insert(0, 440);
    levels = (1..20).normalizeSum.reverse;
    array = Array.fill(20, 1*1);
    sig = Ringz.ar(BPF.ar(WhiteNoise.ar(3), rand.range(0.98, 1.02)*freq, rand.range(0.001, 0.005),
EnvGen.kr(Env.perc(0.001, rand.range(0.03, 0.05)), rand, rand.range(0.9, 1.1)*levels)), freq*4, rand.range(0.05,
0.1), rand.range(0.5, 1.0));
    delay = DelayC.ar(sig, 0.12, array*rand.range(0.02, 0.06), array*rand.range(0.6, 0.9));
    OffsetOut.ar(0, Pan2.ar(Mix(sig), rand.range(-1.0, -0.5)));
    OffsetOut.ar(0, Pan2.ar(Mix(delay), rand.range(0.5, 1.0)));
}.play;

{
    var rand, freq, even, levels, sig, delay, array;
    rand = LFNoise0.kr(2);
    //rand = Impulse.kr(20);
    freq = 55*Array.series(20, 1, 3);
    //freq = 55*(1..20);
    //even = 440*Array.series(20, 0, 2);
    //freq = even.insert(0, 440);
    levels = (1..20).normalizeSum.reverse;
    array = Array.fill(20, 1*1);
    sig = Ringz.ar(BPF.ar(WhiteNoise.ar(3), rand.range(0.98, 1.02)*freq, rand.range(0.001, 0.005),
EnvGen.kr(Env.perc(0.001, rand.range(0.03, 0.05)), rand, rand.range(0.9, 1.1)*levels)), freq*5, rand.range(0.1, 0.3),
rand.range(0.25, 0.5));
    delay = DelayC.ar(sig, 0.2, array*rand.range(0.02, 0.06).poll, array*rand.range(0.6, 0.9));
    //delay = DelayC.ar(sig, 0.2, 0.06, array*rand.range(0.6, 0.9));
    OffsetOut.ar(0, GVerb.ar(Pan2.ar(Mix(sig), rand.range(-0.5, -1.0))));
    OffsetOut.ar(0, GVerb.ar(Pan2.ar(Mix(delay), rand.range(0.5, 1.0))));
}.play;
```