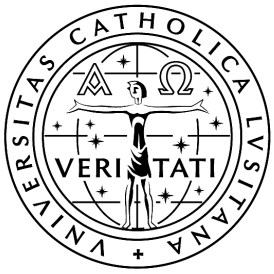


UNIVERSIDADE CATÓLICA PORTUGUESA

THE GESTURE'S NARRATIVE

Contemporary Music for Percussion

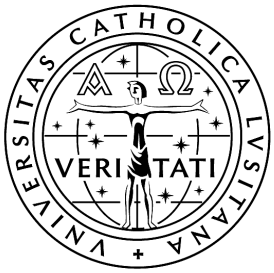
Tese apresentada à Universidade Católica Portuguesa
para obtenção do grau de Doutor em Ciência e Tecnologia das Artes.

por

Nuno Mendes Moreira Aroso

ESCOLA DAS ARTES

Março de 2014



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Sob orientação de Professora Doutora Sofia Lourenço da Fonseca (orientadora) e
Professor Doutor Paulo Ferreira-Lopes (co-orientador)

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To António Mendes Moreira

Abstract

Musical performance gestures are recognized by the majority of theoreticians as a critical factor of a musical performance.

The aim of the musical performance may consist in not only communicating the musical signs that form a musical piece, but conveying the meaningful succession of gestures, facial expressions and body movements. This meaningful succession, or otherwise the "gesture´s narrative" is assumed to be quite important for the process of directing the audience towards the intended interpretation.

Recording music allowed audiences to listen to music without having to go to a musical event for this purpose. On the one hand, this made the listening experience more intense, allowing to concentrate on the aural information exclusively, but, on the other hand, it also imposed restrictions on people's perception, as the syncretic listening and seeing experience became separated into constituents.

Gestures can be considered as operating features of a person's perception-action system. It presupposes significance of a meaning that involves more than just a physical movement. Movements can be subdivided into specific patterns and conceptualized. Conceptualized gestures are kept in people's minds as single units, and the subdivision operations are carried out both by performers and the audience. Musical communication through gestures is therefore not about movement only, it should be viewed as structured interactions.

For this research, solo percussion contemporary music performance will be analyzed. Overall, percussive music performance is extremely wide, and is accompanied by bright visual images provided by musicians themselves. From this perspective, observation over percussionists' playing manner and it´s audience provides the researcher an opportunity to understand a narrative ability of music through musicians' gestures. The quantitative research design divided in three experiments was chosen for the purpose of this study, which can be referred to as the description of the objective reality by using numbers in order to construct

meaningful models reflecting various relationships between objects or phenomena. These numerical entities are not the reality itself, but a way of representing it.

Moreover, the chosen experimental design gives an opportunity to not only establish the existence of certain effects of one variable on the other one, but also study the magnitude of these effects, considering the major two research questions:
Is it possible to detect a percussive gesture's narrative ?
How does the percussive gesture influences the perception of musical narrative?

Resumo

Os gestos que produzem o som são reconhecidos pela maioria dos teóricos como um factor determinante da performance musical e da sua percepção. A conexão entre os gestos, sons e percepção de determinado discurso musical foi já abordada por um amplo número de cientistas, ainda que não haja um claro consenso quanto à medida em que essa conexão é fundamental ou quanto às operações cognitivas subjacentes à percepção de uma peça musical. O objetivo da interpretação em música consistirá não apenas em comunicar os sinais musicais que formam uma obra, mas também em transmitir a sucessão significativa de gestos, expressões e movimentos do corpo. Esta sucessão significativa, ou de outra forma exposto, a "narrativa do gesto" é considerada muito importante para o processo de condução de um público para a interpretação pretendida. O avanço da tecnologia neste estádio de desenvolvimento da sociedade, criou excelentes oportunidades para permitir a separação de atividades auditivas e visuais da música. A gravação e posterior difusão musical, permitiu que o público consumisse música sem ter que, para essa finalidade, presenciar um evento musical. Por um lado, esse fenómeno tornou a experiência de escuta mais frequente e porventura mais focada, permitindo ao ouvinte concentrar-se na informação auditiva exclusivamente. Mas, por outro lado, também impôs restrições a uma experiência musical sincrética com o ouvir e ouvir e ver, a separaram-se em constituintes dentro do fenómeno musical.

Os gestos podem ser considerados características de funcionamento do sistema de percepção/ acção de um ser humano. Pressupõe isso a atribuição de expressão a um significado que envolve mais do que apenas um movimento físico. Os movimentos podem ser subdivididos em padrões específicos e conceptualizados. Estes gestos conceptualizados são mantidos como unidades singulares, e as operações de subdivisão significantes são levadas a cabo tanto pelos performers como pelo seu público. A comunicação musical através de gestos, não deve, portanto, ser olhada apenas sobre os aspectos do movimento, mas sim como uma interação estruturada e musicalmente contextualizada. Os processos descritos acima resultam em grande parte do ambiente de envolvimento do individuo ouvinte e dependem fortemente da sua singularidade e contexto cultural. Nem todos os movimentos poderão ser chamados gestos performativos para além daqueles aqueles cuja acção é de natureza intencionalmente expressiva ou inerente à produção de som.

Nesta pesquisa, a performance de música contemporânea para percussão solo será analisada. De uma maneira geral, o desempenho dos percussionistas é, do ponto de vista visual, extremamente rico na formação de gestos. Nessa perspectiva, a observação de uma audiência sujeita à sua presença, com e sem contacto visual com a sua acção, fornece uma oportunidade de aproximação ao estudo do gesto e da sua narrativa, do ponto de vista da percepção do discurso musical.

Um desenho de pesquisa quantitativa dividida em três experiências, foi o caminho escolhido para o presente estudo. Produziu-se uma descrição da realidade objectiva usando números, de modo a construir modelos significativos que pudessem reflectir as várias relações entre objectos ou fenómenos . Estas entidades numéricas não serão assim uma realidade em si, mas uma maneira possível de a representar . O processo de experimentação, dividido em três partes, dá-nos a oportunidade para perceber não só a existência dos efeitos de uma variável sobre a outra (visual e auditiva), mas também permite uma reflexão sobre a magnitude desses efeitos, tentando assim responder ás questões que levam a esta investigação:

É possivel detectar uma narrativa no gesto percussivo?

Como é que o gesto percussivo influencia a percepção do discurso musical?

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Chapter 1

Introduction

Music is one of the most emotionally powerful and meaningful ways of cultural expression; besides, it can be understood by listeners in different ways. For this reason, it is not surprising that interpretation of music has always played an important role in people's lives (Schnapp, 2011). The 21st-century cultural life associated with an abundance of music genres, instruments, and bands, a great number of life music concerts, and audience's diverse music experiences emphasizes the necessity to understand this meaningful art.

A musical composition, to whichever genres it would belong, can be treated as a story or a narrative. Live music is not only the representation of specific music-related information (tonality, tempo, etc.), but also an opportunity to transmit particular emotions to listeners through visual images (related to a scene, a musician's personality, etc.). Scheub (2002) agreed that "music is a tonal analogue of emotive life" (p. 36). Being compared to a storytelling process, a musical performance narrates certain feelings that create corresponding moods in people listening to it. A narrative ability of music greatly relies exactly on gestures that help a music performer to communicate with an audience, and to transmit certain emotions to it. These gestures, mainly realized through body movements and facial expressions, can be perceived as various means of live music communication (Leman & Godøy, 2009).

Percussion music is a unique type of instrumental music allowing performers to tell stories with the help of gestures. When percussionists play percussion instruments, the audience may not only hear sounds, but also see musicians' body movements and facial expressions that help to transmit certain emotions (Mowitt, 2002). Overall, percussive music performance is extremely wide, and is accompanied by bright visual images provided by musicians themselves. From this perspective, observation over percussionists' playing manner provides an audience with an opportunity to understand a narrative ability of music through

musicians' gestures. Meeting the present-day demand for understanding music, the present dissertation focuses on the investigation of percussion gestures' narrative. To be more specific, this work will demonstrate how percussionists' body movements and facial expressions can be understood through the listeners' music perception. This study will provide an in-depth insight into the relation of storytelling to music, peculiarities of percussionists' music performance, and musicians' ability to provide people with both meaningful messages and emotional experience.

1.1 Background

Each music piece possesses a narrative or inner content that can be understood by the audience through music performance (Schnapp, 2011). Overall, to understand the concept of narrative in the context of music is a relatively complicated task. However, professional experiences of specialists on semiotics (the study of signs, sign processes, linguistic and non-linguistic sign systems) and narratology (the study of narrative, its structure and the ways affecting people's perception) help to elucidate the phenomenon of narrative in music (Fludernik, 2012). According to them, both language and music rely on their own signs, which serve the starting point for the creation of the content itself (Callaghan & McDonald, 2002).

The comparison of music with language may clarify what a narrative embedded in a musical composition is. At a first glance, music differs from language, since the former does not have words, grammar, or syntax that create a meaningful context and content in general. In both language and music, a narrative is based on a properly organized sound (Callaghan & McDonald, 2002). Moreover, "patterns in music (content) correspond to words in language, and tonalities and meters in music (context) correspond to phrases and sentences in language" (Gordon, 2008, p. 23). From a linguistic perspective, a narrative represents storytelling via letters, while from a musical one, a narrative is realized through sounds that shape music speech (Callaghan & McDonald, 2002). In the world of music, a narrative is created by tonal, rhythmic, and harmonic content (Gordon, 2008). Moreover, chords, intonation, harmony, etc. help to transmit messages and feeling from a music performer to the

audience; therefore, this way of communication between a musician and people can be considered meaningful (Callaghan & McDonald, 2002). It is necessary to admit that in both music and language, content is associated with not only sounds, but also culture within which it is created. For example, a language helps to tell about national heroes, while a musical piece may rely on national motifs (McClary, 2001). Since the prehistoric past, music performance has been the reflection of human culture. For this reason, the context provided by music of a particular country can be better understood by its population than by the representatives of other cultures (McClary, 2001). Music-making consists not only in the actual production of sound, but also in "strengthening of social relationships, association with ritual, and specific social functions, such as accompaniment to dance, drama and work" (Callaghan & McDonald, 2002, p. 208). Overall, in music (as well as in language), a narrative is created by both organized sounds and culture in the context of which a musical composition is performed or heard.

Percussion music presents one of the bright areas that may help to reveal the concept of narrative in musical performance. Percussion music is created with the help of gestures commonly realized through performers' body movements and facial expressions (Halmrast, Guettler, Bader, & Godøy, 2009). This evidence implies that percussion music is characterized by obvious expressiveness. In other words, percussionists' music performance is accompanied by certain physical expressive gestures that, in their turn, generate an inner content of a performed musical composition. Depending on a chosen tonality, rhythm, and harmony as well as on the cultural context, this content may consist of particular messages and feelings that create listeners' overall impressions about a performed musical piece and musical performance in general (Ystad, Kronland-Martinet, & Jensen, 2009, p. 250).

Understanding of a narrative embedded in a musical composition greatly depends on the audience's perception of a musician's performance (Lehmann, Sloboda, & Woody, 2007). Since the ancient past until the 20th century, people mostly perceived music through live performance characterized by the highest level of expressiveness and perceived emotional load (Stevens, 2009). The revolution in technology and implementation of television, recorder players, computers, etc. in people's daily lives have provided an opportunity to listen

to recorded musical performances, and to watch videos of recorded musical concerts (Ewans, Halton, & Phillips, 2004). The recent research findings provided by Schutz and Lipscomb (2004) and Schutz and Kubov (2005) suggest that visual perception of a musical piece differ from an auditory one. Watching musical performance provides the audience with both audible and visual images (mainly, music itself and musician's gestures), while listening to a recorded musical piece is limited only to audible ones.

Listeners' perception and understanding of a narrative embedded in a musical piece is realized through the acquisition of personal (listening or/and visual) experience (Lehmann, Sloboda, & Woody, 2007). Today, people's experience gained from heard or seen music performance can be revealed in different ways. Experienced musical performance can be revealed by asking people to share their opinions about a musical composition, or resorting to biometrics measurement with the help of special equipment that measures blood volume pulse, skin conductance, respiratory system, etc., in other words, the biophysical parameters that demonstrate the evident correlation between music and its perception (Scott, 2009; Thought Technology, Ltd., 2013). In other words, opinion sharing and measuring people's biophysical parameters may provide the information about whether people like or dislike a particular musical piece, the feelings with which it is associated, etc.

It is notable that the exploration of the present topic of interest is impossible without understanding of such concepts as music narrative, percussion music, and impact of musician's gestures on listeners. The in-depth insight into a narrative in the context of music seems to be essential for understanding the specificity of musical storytelling. Detailed knowledge about percussion music-playing will help to reveal what messages and emotions can be embedded in a musical piece. Finally, awareness of percussionist's gestures and their influence on people's perception allows to identify the relationship between musician's body movements and facial expressions, and audience's experience. Overall, for the reason that understanding narrative of percussion gestures is significant, the present work focuses on the mentioned topic-related issues.

1.2 Research Problem

Musical performance attaches meaningfulness to a musical piece, so it is not surprising that in the context of music, a narrative is realized through a performer's behavior. In the context of music, narrative can be treated as a "behind the notes" ingredient the misunderstanding of which may lead to an inappropriate perception of a musical piece (Hinton, 2008, p. 58). When performing music (commonly presented by the sequence of musical phrases), a musician makes gestures for producing particular sounds. Usually, each "gesture is incorporated into the movement program required to play the phrase" (Davidson, 2012, p. 774). Gestures are often accompanied by body movements and facial expressions treated as an additional value to musical narrative. Overall, musician's physical gestures that accompany musical performance generate certain meanings, and evoke some emotions. In other words, the relationship between gesture and musical content is evident. However, understanding the ability of a musician's gesture to generate narrative in the area of percussion music is a challenging task. Percussion musical pieces and percussionist's playing behavior are specific, so percussive gestures that accompany musical performance should be decoded in a special way (Mowitt, 2002). In addition, a limited number of studies (including Schutz & Manning, 2013; Todoroff, Picard-Limpens, Leroy, & Crevoisier, 2011, etc.) has been conducted for identifying a narrative ability of percussive gestures. In this context, the necessity to reveal how exactly percussive gestures create musical content is evident in the present dissertation.

Since percussive gestures play an essential role in generation of music's meaning it is not surprising that they influence people's perception of the musical narrative (Todoroff et al., 2011). Different gestures generate various sounds that can be pleasant for some people and unpleasant for other ones. In addition, the audience's impressions about the same musical piece differ depending on whether a musical performance is perceived through visual or auditory images (Schutz & Lipscomb, 2004; Schutz & Kubov, 2005, etc.). At the same time, although the potential of percussive gestures to influence people's perception of a musical composition is widely recognized, little attention has been paid to the details of percussionists' music-playing behavior and its impact on the listeners in the existing literature

(Dahl, 2003). For this reason, this work should also focus on clarification of the audience's perception of specifically percussive performance.

1.3 Purpose of the Study

The present study has a twofold purpose: to understand the content of percussive gesture and to reveal how percussive gestures influence the musical speech perception. The achievement of this ultimate purpose is impossible without the accomplishment of minor objectives. To be more specific, narrative ability of music should be discussed, details of music performance need to be revealed, and peculiarities of visual and auditory images with which listeners are provided during a musical performance should be identified.

1.4 Research Questions

The research problem of this study implies that two research questions should guide this investigation:

RQ 1: Does a percussive gesture's narrative exists?

RQ 2: How does a percussive gesture influence the perception of musical narrative?

1.5 Significance

The present study obviously has both theoretical and practical values. The theoretical importance of this investigation lies in the fact that the work covers key information about narrative ability of percussionists' gestures and audience's perception of music; besides, the findings of the study provide the potential for further research in the field. The investigation of the chosen topic will allow obtaining practically significant results that can be used for educational (for example, systematization of learning material among students of music-related educational settings), professional (including application of the research findings to instrumental music performance, elaboration of music narrative methods for percussionists, etc.), and everyday (music interpretation, understanding of the messages and emotions underlying music performance, etc.) purposes. Overall, the ultimate significance of this work

lies in the provision of essential data related to percussion music's narrative and ability to give a better understanding of music perception by both professionals and non-professionals.

Chapter 2

The Narrative

Gestures are known to play an important role in the perception of a musical performance. The relationship between gestures, sound and musical perception has widely been studied and established in the studies conducted by various scholars and researchers. The aim of a music composition may be not only the communication of the musical sounds but also the conveying of the constant and meaningful change of gestures, body movements and facial expressions. Before the late nineteenth century the musical performances were mostly experienced as the integrated audio- visual activity. However with the emergence of the innovations in the technology which crept in the industry as radio and gramophones, the audio and visual activity of the music got separated. It was after this separation of audio and visual elements in music that the influence of the visual contribution in music composition drew the attention from the myriad scholars (Thompson and Russo, 2004).

Facial expressions and gestures are known to contribute to the musical performance a great deal. The effects of the musical composition are deeply perceived by the audience if it is infused with human emotion which is communicated by the performer not only in the track of the sounded events but also in the facial expressions and other bodily gestures. The visual stimuli offered by the actors are also known to play a crucial role in the drama, a tragedy or a narrative. The gestures and facial expressions are the critical element for the expression of the deeply embedded human emotions. It is on the account of this fact that musical structures are often compared to literary narratives. Thus to begin with the current study it is important to introduce the meaning of narrative, the relevant theories and the inter-relation of these schools of thought with the perception of musical composition.

Narrative is regarded as the most important element of a culture as all the cultures have their own personal stories to share. It can be regarded as the vehicle through which the knowledge of one generation passes on the other. The concept and importance of the narrative date back to Aristotle's *Poetics*. Aristotle is regarded as the ancestor of narratology. The great

work *Poetics* by Aristotle is deemed to be the first philosophical discourse on the literary theory. There is no explicit definition of narrative in Poetics but the Aristotle's exposition on the tragedy, drama, epic and comedy has have helped the literary scholars to draw a clear definition of how an ideal narrative is. It is due to this reason that *Poetics* has come to be regarded as the one of the important treaties on narrative and dramatic structure (Aristotle, 1925).

According to Aristotle, the plot is defined as "an imitation of an action, must imitate one action and that a whole, the structural union of the parts being such that, if any one of them is displaced or removed, the whole will be disjointed and disturbed". He believed that "tragedy is an imitation, not of men, but of action and of life, a life consists in action, and its end is a mode of action, not a quality." He contends that without action there is no tragedy (Aristotle, 1925). The Aristotle's definition of tragedy provides a classical understanding of the definition of narrative.

> Tragedy is an imitation of an action that is complete, and whole; […] a whole is that which has a beginning, a middle, and an end. […] a well constructed plot, therefore, must neither begin nor end at haphazard, but conform to these principles. – Aristotle, Poetics (31)

The study of the different expositions about the tragedy, drama, epic and comedy in Poetics helps us to understand what comprises of the "ideal narrative". It can be safely said that the ideal narrative consists of the following:

- It has a sequence of events that needs a plot which has a well- defined beginning, followed by the middle and winds up with an effective ending (Aristotle, 1925).

- The middle of the narrative must be characterized by the highest level of tension in the story (Aristotle, 1925).

- The tension in the story emerges from a critical situation of struggle or conflict which serves as antagonist. The plot works around this conflict in the narrative (Aristotle, 1925).

- The narrative must be more about the hero or the protagonist and the protagonists must serve as the representation of someone very central and important (Aristotle, 1925).

- The narrative must evoke strong feelings of pity, fear and pathos in the spectator in such a way that the spectator draws comparisons between himself and the hero and relate so closely with the hero during the conflict that he eventually achieves catharsis which implies the cleansing or purgation of pent up feelings or the gaining of new understanding. The main aim of the narrative is to achieve this purgation i.e. bring catharsis in the spectator (Aristotle, 1925).

- The narrative must have a desirable magnitude (Aristotle, 1925).

The term narrative is often confused with the other terms like story and drama. In order to distinguish between the terms like narrative, story and drama, Ryan (2001) proposes a coherent definition of narrative. According to this definition the concept of narrative can be understood when broken into two categories, the story and the story- teller. The narrative consists of a signifier (discourse) and signified (story, mental image, semantic representation). The signifier might involve a verbal act of story - telling, of gestures and dialogues performed by the actors i.e. the mimetic or dramatic narration (Ryan, 2001).

The narrative can also be defined as the chain of events that occur in time and space and are linked together in cause and effect relationship. It is contended by the scholars that the causality and time are the central elements in the sequence of events. The plot of the story comprises of the sequence of the events that are linked together based on the causality. The cause and effect in the sequence of the events called as narrative takes place in time. Another important factor is the space where the events take place (Bordwell and Thompson, 2008).

The Aristotle's definition of tragedy as "an imitation of action" emphasizes the importance of the action in a narrative. It is to be noted that through this exposition the great Greek philosopher indicates that the essence of tragedy is not in plain narration but in drama, the tragedy must show not tell. The same concept of literary narrative with the emphasis on action, the focus on showing rather than telling is related to the musical composition. The content of the narrative thus includes the actions where the events are presented to the audience and the agents responsible for those actions; the content of narrative is not just the series of the represented events. The actions thus play an important role in the narrative (Aristotle, 1996).

The narrative is widely considered by the scholars as the discourse that conveys the story. The story is defined as the image that is formed mentally through the four different constituents. These constituents are: (i) a spatial constituent that consists of world (setting) which has individual characters and objects; (ii) a temporal constituent which is responsible for the different changes that the world undergo as a result of the non- habitual events (concept of event and eventfulness); (iii) the mental constituent which indicates that the events must engage the agents who are intelligent, who have a mental outlook and who react to the states of the world in an emotional manner; (iv) a formal and the pragmatic constituent which involves the closure with a meaningful message (Ryan, 2007).

The concept of narrative has been defined differently by the scholars in the different streams of research studies like literary studies, linguistics, aesthetics and anthropology. The literary definition of narrative as explained above can be applied to music as well. The definition and concept of narrative is greatly shaped by the medium in which it is conditioned. The contributions of Aristotle are important in the context. Aristotle defines the poetry as imitation and distinguishes three types of imitation- through medium, object and mode. Under the category medium he divides the expressive resources like colour, shape, rhythm, melody and voice. The "object" helps to create the demarcation between the imitations that use the same medium like tragedy that deals with people of higher standing and comedy that deals with the people of lower standing. The "mode" throws light on Plato's distinction between the mimetic and diegetic form of presentation.

Aristotle regards the narration and impersonation as the examples of the portrayal of the similar medium (Aristotle, 1996).

The study conducted by Lessing also gives new insights on the study of narrative mediality. He distinguished between the spatial and the temporal forms of art. He emphasized on the sensory and spatio-temporal dimensions in the media forms like painting and poetry.

There are a variety of phenomena that can be studied under the concept of narrative medium. These stem from the nature of the criteria that differentiate the individual media families- verbal, visual and aural. The grouping of media families in narrative is done in line with the semiotic domain of the narrative media studies (Lessing, 1766).

On the basis of the studies that we have taken in consideration for understanding the exposition of narrative we can say that a narrative can be defined on the basis of its structure and properties. The narrative is a story that involves the events, characters and the roles performed by them. It can be in verse or prose. On the level of structure a narrative is an account of events that can be arranged in a linear, circular or recapitulation form. The properties that associate the concept of narrative to the different disciplines and domains of media and which explains the universal content of media can be summed up as- dramatic engagement, temporality, conflict and resolution, characters and roles, voice, the perspective of audience, integrative force, cultural mediator, the reflection of life cycle, and the change in the perspective.

2.1 Structuralism, Semiotics and Narratology

2.1.1 Structuralism

As a school of thought, structuralism emerged in the late fifties in France reaching its full bloom in mid- sixties. The concept is considered as a school of scientific enthusiasm that is based on the method of critical investigation. The proponents of structuralism believed that any product can be seen in the light of the underlying patterns, values and structures it is made of. The proponents of this concept adopted the methodology of investigating any

product critically with an aim to dig out the codes, systems and structures that regulated the cultural activity of any product. The structuralism at a deeper level is considered to be not just a method but an ideology or the thought that is based on the premise of realizing the value of structures more than the substances (Genette, 1988).

The roots of the movement of structuralism can be traced back to the lectures given by Ferdinand de Saussure in 1916. Saussure opposed the historical perspective of linguistics of his time which was dominant during his time and came up with the "scientific" study of language. According to him the scientific study of language begins from the analysis of the relationship between the elements of the language such as the relationship between the combination and contrast. Saussure's thoughts were based on the premise of the systematic nature of the language and the arbitrary nature of the elements it is composed of. He pointed out the difference between the two aspects of the language- LANGUE which implies the system of language and PAROLE which implies the speech acts. This differentiation between the manifestations of language is of great significance and is considered as the fundamental impetus for the development of the movement of structuralism (de Saussure, 1916).

Roman Jakobson was the first theorist to use the term structuralism. According to him the ideology of structuralism was the leading idea of the science and the most appropriate designation in their century as no scientific and critical inquiry is treated as the act of mechanical agglomeration but as the structured whole with a basic task that involves the revelation of the inner laws of the system (Jacobson, 1929).

Any system be it language or other discursive and symbolic system is the product of the immanent relations among the elements it is composed of. Thus the grammar of all such relations can be examined, discovered and formulated. The meaning of any cultural product if exists is made possible as a result of its underlying distinctions and conventions. The perception, thought or the cultural product thus are constructed through the underlying structure and hence are not natural. Structure which involves the inter-relation between the elements or the components of the value and system is the basis of the principle of construction and is therefore the main focus of the critical investigation (de Saussure, 1916).

The structuralist approach considers the structure to be the center, the main point of inquiry like the geometry of perspectives in the Renaissance painting, the arrangement of sequences in folk narratives or the array of garments for a ceremonial occasion.
The structuralists opine that every element that the system is composed of has a relational meaning and value. The meaning of each component can be found by defining the relational placing of the element within the general structure and not by relating its value to the world outside that structure.

According to the Saussure the meaning resides in the kind of relationship that exists among the component parts with the elements arranged mostly as binary oppositions. He believed that language is a self- authenticated system and it is beyond the individual's potential to create or change it. It is due to this reason that signification takes place not through the interaction of words and things but through the interaction of the signifiers (the sound images) and the concepts (signified). The signifiers exists in terms of the relationship with the other signifiers, the relationship that occur either on the paradigmatic axis in which the vertical column of possible substitute elements are used at any given place or the syntagmatic axis in which the series of individual terms are combined in a contagious chain to make a meaningful utterance (de Saussure, 1916).

The study of sign systems initiated by Ferdinand Saussure led to the creation of the new school of thought- the semiology. Semiology developed as the parallel discipline of thought very closely connected with structuralism. The two schools of thought are so closely connected that they are often used interchangeably. Roman Jackobson was one of the leaders of the structuralism. In his manifesto "Linguistics and Poetics" linguistics and semiotics merged with the literary studies as the work paved the way for the future linguistic- semiotic analysis of texts which helped in establishing the basic terms of investigation (Jacobson, 1929).

Jacobson used the Saussure's exposition on the syntagmatic and paradigmatic axis so as to formulate a new theory on the acquisition and use of language. This theory was based on the opposition between the SELECTION and COMBINATION. He collaborated later with

Claude Levi- Strauss which laid the foundation of the structuralist thought (Jacobson and Levi- Strauss, 1962).

The anthropological investigation by Levi Strauss helped the structuralism to emerge as a distinct method of investigation. In the study conducted by him, the analysis of myth both the Greek and the Amerindian ones were represented in the similar way as the representation in the linguistic sentences in order to represent their grammar relations. According to him the meaning of myth can be discovered not by studying its isolated components but in the manner in which they are combined i.e. studying their "gross constituent units" or "mythemes" a term similar to "phonemes". According to him the mythical narrative can be regarded as the orchestra score which is perversely represented as a linear series (Levi – Strauss, 1968). According to Levi – Strauss, the task of the scholar is to examine the components and establish a correct arrangement of the components. Levi- Strauss's opinion gives the evidence of the existence of the diachronic element in the myth. The view supports the metaphorical perception of the conditions of human beings, animals, deities which is based on the principle of binary oppositions like the existence of nature/culture, agriculture/ warfare, this world/ the other world etc. The system of myths can be studied by the examination of the opposing factors as the function of any mythical system is to make reconciliation between the contradictions (Levi – Strauss, 1968). According to Levi- Strauss it is possible to completely probe the structure of the internal relationship of myth if is accepted that the unconscious beliefs can be reflected by the conscious laws and that each of the terms' meaning can be derived from the principle of binary opposition i.e. the exclusive opposition; like the case of the two electric charges. He believed that the structuralist notions were quite sufficient to investigate the meaning or the structure of not only the cultural products but also the human mind, the different forms of knowledge and the institutions created by the human (Levi – Strauss, 1968). The study of the structuralist view propagated by Levi – Strauss reveals that the different cultural manifestations showed by him were no more hierarchically classified i.e. the ways of cooking; the beliefs of religion, the mythical narratives were all analyzed from an equal standpoint or the sign level. The work of another French structuralist called as Roland Barthes also shows a similar disregard to the established hierarchies. His works initiated a new wave of cultural criticism which includes the

semiology of fashion, the mythology of the wrestling, the pleasure of reading etc.

2.1.2 Semiotics

Barthes was interested mainly in the inner structure of TEXTUALITY in the later phase of the work produced by him where he left the other signifying systems. In the "textual analysis" of E.A Poe's Story "Valdemar", Roland Barthes admits that he does not focus on describing the structure of work while doing a textual analysis of a work. What matters is not recording the structure but is rather producing the mobile structuration of the text. The textural analysis according to him aims not to probe and find out the elements that determine the text but it rather aims to find how the text explodes and disperses (Barthes, 1981). According to Roland Barthes the concept of textuality refers to the interplay or the weaving of codes which create a kind of network. Text can be considered simply as the manifestations of codes. This view of text and textuality is a complete break from the older perspective of text which regards it as the autotelic and autonomous object. It is worth to be noted that the later works of Roland Barthes, Foucault and Derrida led to the complete revision or reversing of the structuralist and semiotics framework. The impact of the structuralist perspective has never ceased to be applicable on the various streams of humanities, be it literature, linguistics, music, arts, psychology or sociology. Structuralism has helped in establishing a model of the system of literature. It has made the literary studies as scientific as possible. The structuralists have revealed the system of signs and reproduced literature and language as the system of sign and codes (Scholes, 1974). The structuralism was disregarded for it suggested that there was no truth besides the structure of the texts. This was regarded as the death of the author by many scholars. However the structuralism is viewed as a historically important event as it spawned the analysis of the narrative and the science of sign- semiotics (Bal, 1991). Semiotics or the science of signs is the study of the processes of signs, signification and communication and signs and symbols. Semiotics can be formally divided in the three branches- (i) Semantics that deal with the relationship between the signs and the things to which they refer, (ii) Syntactics that deal with the relationship among the signs in the formal structure and (iii) Pragmatics which deal with the relations between the signs and their impact on those who makes use of it. The semiotic signs or the system of signs refers to the

way the codes are transmitted so as to convey a meaning. The system of signs can be the sounds or letters that are used by humans to form words or the gestures to convey a sense of attitude or emotion. The difference between the semiotics and structuralism is subtle as the terms are often used interchangeably due to the similarities in their objects and methods. Where the structuralists probe to find the "deep structures" underlying the surface features of the phenomena, the semiotics are concerned with the internal relations between the parts aiming to explore the use of signs in specific situation and contexts (Bal, 1991).

2.1.3 Narratology

The term "Narratology" was coined as *narratologie* by the French theorist Todorov (1969). This scholar contended that there must be a shift from the surface level of text-based narrative which involves the realization in the form of letters, words, and sentences to the general logical and structural properties of the narrative.

He thus called for the new kind of theory that could be applied to all the streams of the narrative (Todorov, 1969). Narratology can be defined as the stream of humanities that involves the study of the logic, principles and practices of narrative representation. The stream developed under the domination of the structuralist approaches. After its initiation it gave rise to a variety of theories, concepts and analytic procedures. The concepts and models of the narratology have evidently been used as the heuristic tools. Narratological theorems are seen to play a crucial role in the exploration of the abilities to produce and process narratives in different forms, media, communicative practices and contexts (Ryan, 2001).

The narratology is derived from structuralism and semiotics and hence it is based on the similar idea that governs the semiotics and structuralism, the idea that there is a universal pattern of codes that works within a text. Narratology owes its foundation to the work by Vladimir Propp "Morphology of the Folk Tale". In this work the author created a model for folktale. Propp presented the model of the elementary components of the narrative and the manner in which they are associated with each other. This model was based on the seven spheres of action and 31 functions of narrative (Propp, 1928).

Propp's approach and model attained a great deal of popularity among the French structuralists. These structuralists acknowledged the model for its originality but also criticized it for its mono- linear logic of action. It was suggested that the model was replaced with the combinatory multi- linear models (Levi- Strauss, 1976).

Narratology is not just a theory but it is much more than that. Though the stream could not be established as completely scientific in orientation the discipline can certainly be called as the new "science of narrative". As a scientific discipline it has a well - defined object domain, clear- cut theories and models, transparent analytical procedures, the distinct descriptive terminology and the institutional infrastructure which is typical of the scientific discipline (Todorov, 1969). The theoretical starting point of narratology is the fact that narratives are existent and communicated through a variety of media in a variety of forms. This can be in the oral or written language, gestures and music. A theoretical explanation of the literary narratives reduced to its basic principles can be found in Forster's work who argued that the presumed story "the king died and the queen died" could be transformed into a proper narrative plot by the addition of some explanatory clause like "died of grief" (Forster, 1927).

The narrative theory was further enhanced in logic and rhetoric by the contributions of Hamburger (1957) who explored the semantics and pragmatics of the literary communication and the logic. It was pointed out by him that neither the subject of the utterance nor the temporal location and reference of the utterance can be safely concluded with the help of the words/ the sentences in a literary narrative as literature do not follow the rules and conventions of the everyday language and operates as per its own logic (Hamburger, 1957).

The new structuralist approach towards narrative was informed by the three traditions: Russian morphology and morphology by Vladimir Propp, Saussurean tradition of the structural linguistics and structural anthropology, and the transformational generative grammar of Chomsky.

On the basis of the Levi - Strauss's structural analysis of myth, Greimas (1966) focused on the elementary structure of signification. He proposed a deep – level of signification called as

"semiotic square", which was a representation of the semiotic infrastructure of all the signifying systems. The universal deep structures can be mapped onto the given narrative's surface structure which can further be explained as per the terms of the transformational rules (Greimas, 1966).

Todorov furthered the research contributions in the stream by paving the way ahead for linguistic analogy and equating the actions to the verbs, the characters to nouns, the qualities of the characters to adjectives. These elements were then linked through the modal operators. Such a model of narrative syntax works on the abstract level of a langue rather than on simply the sequence of events that are represented in the fictional world (Todorov, 1969).

It is to be noted that though the theoretical explication and level of abstraction of these modals was important, their pragmatic application was still a concern unaddressed. This methodological gap was taken care of by Genette (1972) who presented an in- depth and comprehensive classification of the discourse phenomena with the analysis of the narrative composition. The taxonomy of narrative as proposed by him covered three functional domains of the literary narrative- the temporal structure and the act of representation, the mode of narration with the inherent logic of narrative communication and the normative and epistemological constraints that one come across while gathering and communicating the information in a narrative process (Genette, 1972).

Narratology like Structuralism and Semiotics is based on the patterns of codes that operated within the text. All the three schools of thought are highly significant and influential as they find their application in the variety of media and communication, be it oral or written language, gestures or music and can be seen in a variety of forms.

2.2 Narrative applied to Music

The Russian Formalism continued by later Structuralist and Semiotic studies serve as a basis of comparison between the examination or study of a narrative and musical compositions. For many of the scholars and listeners some of the instrumental music especially the one

played in the tradition from Haydn and Mozart through Brahms reminds one of the narrative or drama. This invites comparison between music and drama or music and narrative. The comments of Carolyn Abbate are the most important basis of such comparisons. She compared the diegetic and mimetic modes of story-telling. The comparisons cannot be made between the individual compositions and the individual plays or novels. Indeed some of the compositions or genres are considered to be dramatic or similar to a narrative in more general terms (Abbate, 1990).

The relationship between the literary narrative and the classical or instrumental music can be closely aligned with the structuralist notion propounded by different theorists and as discussed in the previous section of the present study. This discipline of studies helps to draw the generalizations about narrative as it recognizes the elements that recur within the plot and states the rules that combine them exactly in the same way as is done by grammarians for any language. Music was deemed highly by Theodor Adorno and other German philosophers who regarded it as the truth to which the philosophy aspired but could never reach its high level of articulation and understanding (Adorno, 1984).

Theodor Adorno was a strong proponent of the affinity between the philosophical, political and social functions and musical thought. He claims that only art has the power to say and express even by not saying it directly. According to him music has the potential to express the miseries and joys of mankind and its existence symbolically. The political and ideological functions of music were highlighted by him (Adorno, 1984). The structures that literary theorists have found in the literary narrative is quite similar to the structure that the theorists of music have found in the compositions of instrumental and other forms of music. It is believed by certain theorists that by concentrating on the structure more than the representational details or character in the narrative, the music theorist can articulate the qualities that are common in musical composition and narrative (Abbate, 1991). Vladimir's Propp's (1928) work serves as an important pillar in the study of the narrative syntax. The model proposed by the author in "Morphology of the Folktale" can serve as a model for the narrative syntax. The author came up with the ordered sequence of 31 functions while his analysis of Russian tales; these functions can be regarded as the general

descriptions of the plots. It is to be noted that not all of the functions shall find an appearance within a single tale, the plot of the story might contain a selection of functions from these 31functions in their ordered sequence (Propp, 1928).

The general descriptions of the events in a narrative are compared to the textbook descriptions of the musical patterns. A Rondo shall be comprised of the several occurrences of refrain with the intervening episodes. In these episodes, the recapitulation of the first episode and creating a sonata – rondo pattern is a matter of choice. The sonata form can thus constitute an "introduction" - "first group" - "transition" – "second group" – "closing group" and so on with some members of succession as optional. The tonal music closely resembles the narrative when depicted through the conventional analysis and the Formalist and Structuralist writings, as here it is stated that the individual texts comprises of the identifiable kinds of objects that are arranged in quite predictable patterns (Newcomb, 1987).

The analogy between the musical and narrative structures is not dependent on the acceptance of the conventional descriptions of the formal patterns of music. Schenker suggest
that like the narrative in the art of music also, during the motion towards the goal one encounters many obstacles, reverses, disappointment, distances, detours, expansion, interpolations and retardations of all the kinds. The remarks put forth by Schenker indicate
that there exists a possibility of a generalized plot structure for the tonal music. The list of obstacles, reverses and disappointments that he enumerates points out towards the informal events that occur in a musical plot. The analogy drawn by him is similar to the plot functions enumerated by Propp in the analysis of his folk tales (Schenker, 1979).

Propp do not hierarchize the plot events on the account of which the comparisons drawn between the narrative and music are often rejected but some of the theories like the one propounded by Schenker hierarchize the musical events. Some of the theories of narrative too hierarchize the events of the plot; for example Roland Barthes differentiates between the different degrees of structural importance for the narrative functions. He calls the structurally crucial functions as nuclei or cardinal functions. These nuclei follow each other in coherent succession even when they are separated by the presence or insertion of the other

catalysers. These functions are thus similar to the middle ground and background events of the Schenker's theory of musical composition (Barthes, 1988).

Another theory propounded by Tzvetan Todorov about the literary narrative also exhibits similarity with the Schenker's theory which draws observations about the plot sequences which may lie within the other plot sequences indicating that the same principles govern the sequences at the various strands or levels (Todorov, 1969).

Both music and narrative are similar on the ground that it involves a succession of the events in a regular order or sequence. The events in music and narrative evolve hierarchically. The comparisons between the music theory and the structural studies of narrative can be better understood in the light of the contributions of Eero Tarasti who is considered one of the major figure in the music semiotics. In his Theory of Musical Semiotics, Tarasti gives an in- depth analysis of the domain of musical narratology and explores the subtleties of the theory with a profound effect (Tarasti, 1979).

Tarasti divides the existent musical- semiotic studies into two categories; the structuralist which is characterized by the need of examination of the deep structures and the iconic which is characterized by the search for significant structures which cannot be reduced further in the musical surface. For him the musical discourse is the musical surface which he considers as the final step in the generative process similar to Greima's generative trajectory (Tarasti, 1979).

Tarasti divides the musical discourse at two levels- the manifest and immanent. The manifest level is influenced by the technological models which imply the technical means of constructing a musical surface and the ideological models which refer to the social customs and habits that affix value to the music surface. The immanent level is influenced by the structures of communication which refer to the sets of stylistic norms and the structures of signification which refer to the more idiosyncratic and personally expressive forms. The musical surface is produced as a result of the on - going negotiation between these models investing it with the expressivity and dynamisms (Tarasti, 1979).

In his work, Tarsti observes how musical process of tension and release can be explained by using the specifics of his narratology. He outlines the core of the narrative logic and shows how modalities are existent in musical structures. It is argued by him that the narrative structures are not always apparent on the surface of musical structure but emerge under the specific circumstances and cases. The considerations made by him fall into two categories – the case of a syntactic feature (usually non - narrative) which is made important by marking the other features and the case where syntactic feature is consciously broken (Tarasti, 1979).

The relationship between the narrative and non - narrative musical features can be determined only when a general concept of 'music feature' is found. Though Tarasti doesn't aim at developing such a concept, all the musical features that are discussed in the study are presented as the instances of isotopies- isotopy which is used as the generic term to refer to any kind of musical structure. All musical isotopies are divided into three categories – the spatial, temporal and actorial. All of these are arranged in the generative trajectory from achronic spatial background to the kinetic actorial foreground (Tarasti, 1979).

Tarastic explores each of the three types of musical isotopy. According to him the category of temporality serves as the foundation of all the other musical categories. He considers the various semantic perspectives on the enterprise of the music history. His notion of music spatiality differentiates between the inner (harmonic) and the outer (registral) spaces by mapping out their dimensions. The notion on the musical actors presents his most significant implication which suggests that the signified in absolute music is the play of tensions and modalities (Tarasti, 1979).

Of late the listeners and critics have been attracted to the analogy between the music theory and the structuralist's view of narrative studies. For understanding the appeal of the idea of the musical plot one must analyze the listener's capacity to interpret the music events anthropomorphically. The listeners hear the musical succession in a story like manner because the listeners find in it actions, thoughts and characters. The musical events can be regarded as the gestures, goal – directed motions, references, assertions, responses, resolutions or characters. When the musical events are considered in this manner they can be

safely considered as succession of events in which the characters and actions work together to constitute what can be called as plot (Davidson, 1980).

The instrumental music consists of a series of events and these events are regarded as behavior and actions. When the musical sounds are considered as actions rather than just events it is can be easily compared with the plot or narrative. Stories are basically the actions performed by the individual. The notion of action is very much dependent on the notion of intelligible action. The intelligible actions requires much more than the most routine explanation, when the sequences are described in an explicit manner it give rise to stories. Thus one can say that whenever there is an action that is interesting in nature there are stories that can be told about it. The concepts of narrative and actions are thus complementary to each other (Davidson, 1980).

The formal description of the musical events using the technical vocabulary of the music treats the events in Rondo as the series of the actions, the actions that are the repeated attempts to reach a state of satisfaction where no further action is required. The attempts are often defeated as the level of satisfaction demands a return to the opening key and opening thematic material. The attempts are not what is made at the level of the composer or performer but is the effect that is created in the fictional world as a result of music (Davidson, 1980).

It is to be noted that Rondo cannot present or encode a story about something which is completely non-musical in nature. When the goals, actions and problems of the story are musical in nature they share some common attributes of the general descriptions about day-to - day actions. It is indeed possible to add some specification of agents in the story to the musical composition. For instance one could consider the right and left hand parts in musical composition as the characters interacting with each other or the conflicting forces within a character. Pitch A might be considered as an authoritative and unruly character on the account of the mode of behavior exhibited (Davidson, 1980).

Such descriptions of musical composition indeed throws light on why the narrative theory find its application and can be easily adapted to the descriptions of music. In this context the two features of Propp's approach needs consideration as these features are the ones that have been retained in the subsequent narrative theory. According to the Propp's description of plot, the plot can be determined by the succession of the events in a story. According to him the distribution of the characters and the persona of the characters in the story are not much crucial. So the questions of what the dramatic personae of the story do in the story are more important that who does it and how he does it. So the functions must be defined irrespective of the characters that are to perform them. The listing of the functions is also independent of the manner in which they are performed (Propp, 1928). The methodology of Propp indicates at the existence of narratives in which there are no determinate characters due to which the events in the story share the general descriptions about the events of the everyday life. The narrative theory thus can be said to contribute a great deal to the understanding and description of the instrumental music. The connections between the theoretical formulation of music and narrative are evident. Besides this the narrative theory can also be applied to gather an understanding of the description of music that is theoretically unambitious like the description of the Beethoven Rondo.

The study conducted by Todorov (1969) also serves as important contribution to get an abstract model of plot structure which gives the definition of the unit called as "sequence". As proposed by him the beginning of an ideal narrative is marked with a stable situation that is then perturbed by some force. This triggers a state of disequilibrium; the action of the force is directed in the opposite direction and the equilibrium is re- established (Todorov, 1969).

The above abstraction of sequence can be observed in the Beethoven Rondo where this structure finds its manifestation in the first upbeat and downbeat of the passage. On the broader scale the state of equilibrium can be defined in the register and harmony of the first few beats which then gives a way to the state of disequilibrium in the registral and dissonance spread. Thus one can state that there are two kinds of episodes in a narrative, firstly the episodes which describe the state of equilibrium and disequilibrium and secondly the episodes that describe the transition from one state to the other (Todorov, 1969).

The above distinction made between the equilibrium, the transition and the disequilibrium can be easily made in the first four measures of Beethoven. The smaller structure at the beginning however does not contain any explicit transitions but the essential states of the sequence. According to Todorov the text generally includes more than one sequence. There are three ways in which the sequence can be combined. It can be embedded within one another which imply that one part of the sequence can consist of another sequence embedded within the first (Todorov, 1969).
The initial upbeat and downbeat of the Beethoven consists of a sequence with the part of the sequence that triggers another sequence at a higher level. The sequences may follow each other successively as they might be linked with each other. The example of this linking can be manifested in Beethoven passage.

The essay written by Edward T. Cone (1983), help us in drawing an inference that the normal, unproblematic “absolute” music can be considered synonymous to the dramatic or narrative music. One can thus claim that the music that is based on the self- sufficient forms of the classic period is different in kind and manner from the music that is based on the dramatic and narrative models (Cone, 1983).

It is to be noted that the account of instrumental music as the plotted succession of the actions is interesting enough in description but cannot be considered as enough in supporting the significant analogy between the narrative and music as the term “narrative” in itself has come to be known as highly ambiguous in meaning. The different literary theorists have tried to distinguish between the story and discourse in a narrative.

It is indeed believed that the discourse consists of the fictitious and verbal narration whereas the story consists of certain events which happen to occur much earlier than the narration. The relationship between the music and narrative can be better understood in the light of the distinction between story and discourse. In a novel the distinction between the story and discourse is temporal or time based which implies that the discourse evokes at a
time in which the story is told which is later than the time in which the events in the story actually took place. This distinction is evident with the use of past tense but as contended by

Carolyn Abbate, in music there is no clear sense of occurrence of the past tense. The use of past tense is an important element of distinction between the events and their depiction or description (Abbate, 1991).

Gerard Genette (1972) recognizes the three ways in which temporal properties of story and discourse might differ. Firstly in the discourse the events may be ordered in a different manner than the order of the events in the story. Secondly the frequency of the events may be different in story and discourse. Thirdly the difference is well marked in terms of the duration of the discourse; the implicit time of reading usually differs from the time that is taken by the event in the story. This means that the temporal proportions between the events and their depiction or description might considerably be different. The temporal discrepancies are the major source of differences between the musical composition and narratives (Genette, 1972).

It is worth consideration that music enjoys a long history of comparisons with the language for the narrative effects in sung poetry, texted music, sound track of film, opera etc. However, the idea of telling stories simply through sounds appears to be quite paradoxical in nature. When sound is analyzed at the semiotic level it cannot be said to possess the conventional meaning or iconic value which let the words and images create a concrete world bringing to mind the character alive. Thus music cannot be said to be capable of imitating speech, narrate actions, represent thought or express the causal relations. Though the mimetic abilities of music are limited, the 19th century music composers went on to tell the stories through music through "narrative program" which involved the patterning of their music (Ryan, 2007).

2.3 Narrative applied to Gesture

The second field of structuralist research concerns itself with the "Narrative Discourse" which dwells on the difference between the narrative as a verbal form of presenting the story and the enactment on the stage in the various forms like drama, choreography or cinematic art. When we consider the enactment of the narrative in the various forms the gestures come to acquire a significant position.

The theatre and literature elements are greatly influenced by the stage conventions that are largely dependent on the gestures, facial expressions and body movements. These stage conventions are represented by dramatic, operatic and choreographic conventions which are specifically found in the theatre arts. All these sub conventions perform the function of story - telling or narration in the manner that is particular to their genre.

Narratives involve the evolution of the network of human relation. Gestures and other bodily movements are seen to be considerably important in the representation of the evolution of interpersonal human relations. Gestures and facial expression serve as the kinetic means through which it becomes possible to tell a story as the art forms like ballet, pantomime and the silent movies demonstrate. However, these art forms often rely on music to tell the story and help the spectator derive its narrative interpretation. It is true that some of art forms like pantomime can narrate story simply with gestures without any other external but the inventory of such forms is limited. The musical gestures thus come to play an important role in conveying the meaning to the narrative interpretation and perception (Bordwell & Thompson, 2008).

Musical gestures are any form of physical and mental bodily movements required or made to produce sound and meaning associated with it. With respect to the musical performance, gestures are the performer's actions onto an instrument. These actions serve to be very crucial for the construction of signification in music. The signification in music is closely associated with its material vehicle. The material vehicle is considered to be fundamental element for the construction of the musical signification. Thus all the gestures that take part in the construction of the material vehicle which implies the sound materiality are the important aspects for musical signification (Clarke, 2002).

With respect to the musical composition gestures are understood as the sound materiality movement which in itself can become an audible mark of the gesture. As the brushstroke made by the painter is regarded as the visible mark of the gesture, the sound materiality in music and the movement can be regarded as the audible mark of the gesture. The gestures can also be associated with the movement that the performer makes so as to produce sound.

In both the cases – gestures as sound materiality or movement, the gestures play a far important role than just the construction of meaning (Clarke, 2002).

The gestures are used as central element by Brian Ferneyhough (one of the famous composers) in his musical compositions much like the theoretical texts. According to him the gestures serve as the objective unit that has specific configuration which is delimited in time and space. The gestures in this case can be regarded to represent the emotion in an iconic manner as opined by Boros & Toops (Boros & Toops, 1996).

Ferneyhough on the other hand is against the use of gesture as the representation of emotion in music. He coins a new term "Figure". Figure according to him is the product of the deconstruction of gesture in parameters where each parameter is provided an independent folding keeping the gesture as a backdrop. It is no longer attempted to "create a gesture through the automatic coming together of abstract parametric units or quantities" (Ferneyhough, 1992).

Gesture is not just the representation of emotions. Francois Delalande (1996) opines that gestures can be studied in another context. He defines gestures as the sound configurations that seem to be the bearer of the specific signification on the temporal plane. At times they are such configurations that can be found only in specific works whereas at other times they happen to appear in the myriad contexts, in different shapes but with the same temporal significance or effect (Delalande, 1996).

Delalande (1996) gives the example of a sequence of the sounds which are listened as contracted and the sounds which are listened as expanded. According to him such sequences of sounds will be perceived as the unit with its own signification not getting affected by the work in which it is included as the unit. He contends that temporal signification i.e. the contraction- expansion allows one to isolate or recognize the unity. Thus the representation of gesture is not simply limited to the emotions (Delalande, 1996).

In addition to the iconic representation of the emotion the gestures can also express the indexical and symbolic representation. For instance the sound moving in a concert room can act as the indexical representation of the gesture in time and space. It can be an indexical representation of the gesture in the action itself. Electroacoustic music can create the indexical representation of specific time relationship and space distances. The sound distribution in space can articulate the parts; can amplify the dynamic relationships thereby improving the musical segments. Gestures can also represent the symbolic relationships. For instance the representation of the codified features that connects the act of listening with the funeral march or tango. Musical gestures may also come as a gesture of overture with the melodic line played by trumpets. It can also represent a liturgy with a single bell sound which in reality is a gesture embodied in the spectrum (Delalande, 1996).

The deconstruction of parameters proposed by Ferneyhough cannot be regarded as the deconstruction of gestures in itself. When gestures are deconstructed in parameters the symbolic relationship is suppressed particularly of those that are stereotyped. The stereotypes place the gesture separate from the sound materiality. The deconstruction of stereotype places the gesture on the edge between the sound materiality and signification (Ferneyhough, 1992).

Though gestures can take part in the construction of the signification in music, not all of the gestures can be said to take part in the creation of new signification. The reduction of signification to gesture is also not possible as it will lead to emptiness in music. As already discussed, the signification in music is closely associated with the sound materiality. In spite of this fact the signification in music cannot be completely reduced to gesture (Boros & Toops, 1996).

The concerts serve as platforms where the gestural indexicalities are fulfilled. The listener is able to establish the indexical link between the gestures made by the performer on his instrument and what is listened. Many gestures are associated with the production of z but many others like the facial expressions and body postures might not be relevant in the context. These might be related to the socio- cultural values that are shared by the audience.

It is worth consideration that though gestures add a kinetic element to the performance; this does not essentially increase their power of expression as a narrative. At times it is indeed more difficult to communicate through the continuous use of gestures. The gestural narration unfolds entirely in the present which makes it much more difficult to narrate than the narration through the use of picture frames. For example in the Sempe cartoon, the chronological arrangements would have become impossible with the gestural narration. On the other hand the serial pictures break the continuity of action into separate frames. Gestural narration is capable of signaling breaks between the episodes by making the actors appear and disappear from the stage but it is incapable of skipping the moderate period of time in the live performance (Bordwell & Thompson, 2008).

Chapter 3

Literature Review

The present chapter is dedicated to the literature review of prior research on the connection between music, gestures, and perception of music by the performers and the audience. The chapter is divided into two parts; the first section is dedicated to the analysis of music visualization and hearing gestures performed during a musical performance. The investigation of the connection existing between the concepts of music, sign, and image is conducted in the initial part of the section on the basis of research conducted by Tarasti (2002), Leman (2008), Miclaus (2011), London (2010), and other researchers who studied the semiotics of music as a set of symbols. The second part of the first section is dedicated to the analysis of visual image as an additional perception level for music. In this part, the works of Vines et al. (2011), Platz and Kopiez (2012), Stevens (2009), Sloboda (2005) etc. are explored in terms of determining the influence of music on the emotions of the audience, and the visual components contained in the affective musical performances. The third part of the first section is dedicated to the analysis of music as an additional perspective for gesture decoding; the present part relates to the analysis of works by Leman and Godoy (2010), Hatten (2004), Nusseck and Wanderley (2009) etc. who worked on the improvement of understanding of the ways in which gestures alter the perception of a musical performance. The second section of the present chapter is dedicated to the determination of the role that movements and gestures play in the communication of a musical discourse to the audience. The present chapter includes data on the emotional expression in music performance (based on the works of Deutsch (2013), Nawrot (2003), Bhatara et al. (2011), and other researchers), the impact of visual information of a musical performance on the audience (researched by Eco (1976), Tagg (1999), Harrison (2003), Schutz (2008) etc.), and the music significance of percussionist's gestures (analyzed by Rossing (2000), Blades (1992), Kalani (2008) etc.). The main purpose of the present section is to identify the ways in which the audience is sensitive to the emotionally colored information transmitted through music and gestures, to understand the visual dimensions of a musical performance, and to explore the ways in which percussionists use their instruments, some additional instruments, and their

hands to alter the quality of sound, and to produce specific sound, expressive, and emotional effects.

3.1 Seeing Music, Hearing Gestures

3.1.1. The Connection between Music, Sign and Image

Music, though surrounding everyone on a daily basis in a wide variety of situations, is considered to be a sphere where only professionals having obtained a musical education or naturally gifted people can be knowledgeable. However, according to Tarasti (2002), "the presence of music is so overwhelming that we hardly dare ask whether or not it is communication, or even more specifically, if it is a sign" (p. 3). The modern society is essentially not only a world of communication, but also communication-production relationship. In other words, all our transactions are carried out, explicitly or implicitly, with the utilization of the model sender-message-receiver; moreover, "we also form part of the process of production-exchange (circulation, commodification)-consumption" (Tarasti, 2002, p. 3).

The nature of the former model is cognitive and intellectual in its essence, automatically involving signification and meaning at the very moment of a sender's determining what he/she wishes to communicate. The latter model, however, does not require any deep analysis, as a potential consumer is likely to decide on choosing a product in case he/she is attracted by it and satisfied with its qualities (Tarasti, 2002, p. 3). According to Tarasti, "the more philosophically-minded are not satisfied with the communication model, however, but rather see music as an emanation of values, epistemes, power relations, of gender, of ideologies, as human-animal exchanges, or as more abstract, axiological entities" (2002, p. 4). Music works as a mediator between different kinds of values. Music as a system of signs gives a perfect case of a communicative and meaningful unity, which is an excellent example of a semiotic object (Tarasti, 2002, p. 4).

Few semioticians have regarded music as a sign or system of signs. Umberto Eco described music being a system "having denotation but not connotation" (Tarasti, 2002, p. 4). Claude

Levi-Strauss, however, extensively studied music within the framework of an investigation into the mythology of Indians from North and South Americas. One of the outcomes of the study was the famous model illustrating the connection between music and myth, both developing from language:

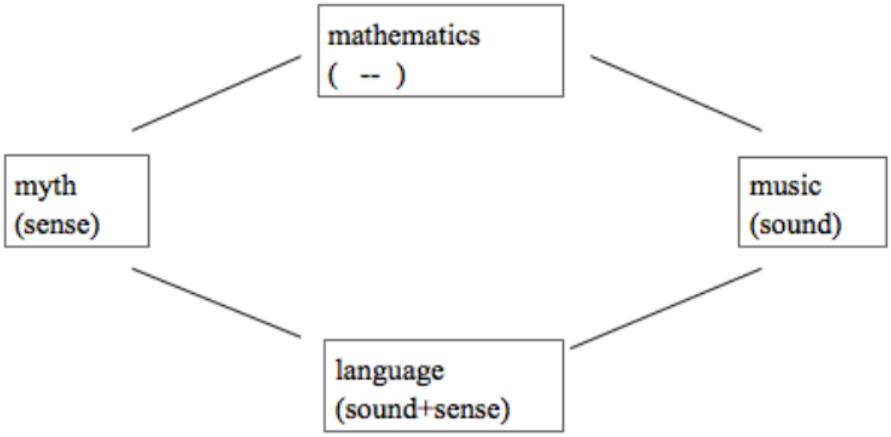

Figure 1. The Model of Music and Myth

Source: Tarasti, E. (2002). Signs of Music: A Guide to Musical Semiotics. Berlin; New York: Mouton de Gruyter (p. 5).

Levi-Strauss viewed music as a language without sense (or signified), whereas myth can exist independently of its "sounds". Everything that can be characterized as meaningful takes its source in language, which is why when one listens to music, there emerges an irresistible urge to assign meanings to it. Thus, as Tarasti put it, "the listener imbues music with sense" (2002, p. 5).

Nevertheless, music as a system of signs always utilizes other semiotic systems. Given that a sign can operate and be decoded only with reference to a semiosphere of signs, it is possible to assume the following: "Musical signs can serve as symbols of ethnic and social groups, which distinguish themselves from others by means of their songs. Thus, national anthems are cases of marked signs, which arise against the background of the broader field of non-marked signs" (Tarasti, 2002, p. 6). The application of the paradigm of the symbol manipulation to music was a promising perspective since a musical score represents a compilation of symbolic descriptors. It may be regarded as a physical form reflecting a mental representation of music (Leman, 2008, p. 33). According to Leman (2008), composers

employ the proposed perspective to conceptualize the compositional process as a procedure consisting of two separate phases:

1. the conception of the symbol structure;
2. transformation of the symbol structure into an audio stream (Leman, 2008, p. 33).

The two phases may be formalized differently. The first phases may operate based on rule-based and dynamic systems that manipulate various symbol systems and assist with or completely replace the composing process resulting in the creation of a score. Symbol manipulation may be grounded in regulations, probabilistic theory, etc. The second phase presupposes the process of translation of a symbolic system into an audio stream by musicians who play instruments. Otherwise, the translation can be carried out through sound synthesis rules defining mechanisms for a transition of symbols into streams of information (Leman, 2008, p. 33).

Music can be regarded as a polysemantic unity that makes use of several codes simultaneously. Firstly, it is possible to speak of music and the effect it produces as a stimulus creating audio images. The auditory images created by various components of music are subject to further processing. They can become a source of information that is possible to use for a comparison with behavioral data (Leman, 2008, p. 36).

In Leman's scheme illustrating how audio stimuli are processed in terms of auditory images, the general concept is shown in the following way:

Input	auditory images	pitch images/spectral images
	auditory processes	image transformation
Output	inference process	comparison /feature extraction

Figure 2. General schema for the processing of audio stimuli in terms of auditory images
Source: Leman, M. (2008). Embodied Music: Cognition and Mediation Technology. Cambridge, MA: MIT Press (p. 36).

In the 21st century, the development of the interconnection between the media and art has resulted in heavy reliance of music on the visual support. In terms of popular mainstream music, songs that have lyrics are normally accompanied by videos, whereas in the case of electronic music parties visuals are a must (Miclaus, 2011, para. 1). Therefore, there is a strong association between music and an image. Previously, the visual component of music was not taken in consideration. Moreover, even if it was, there was a destructive element that scientists tended to see. Miclaus described this tendency in the following way (2011):

> […] We could mention Herder who wrote in his "Kalligone" that the world of sounds annihilates the visual world. Nietzsche also said that everything that makes up the visible world looks for its lost soul inside music. Ribot was still a bit more cautious about this theory. According to him, those who have a good musical culture love music have no visual representations when listening to their favorite kind of music. Any association between music and mental representations maybe accidental and temporary. (para.2)

Music is essentially the emotional language, which is not only a chain of sounds, but also a sign of mental states that trigger the corresponding affective moods in the brain. Events experienced by the composer are processed by him and are coded in the musical version of his inner life. Delacroix believed that there are individuals for whom music needs to be linked to visual elements. For such audience, imagery can take the form of a drama, an extremely emotional story (Miclaus, 2011, para. 4).

A growing role of the visual component of music over the 1960s and 1970s has resulted in the development of experimental and interdisciplinary activities. At this time, video becomes linked to music in a number of connections. The history of this dependence and scientific interest in it is often regarded as a series of separate successive trends. For example, video has been viewed as a supplementary domain extending the messages and signs coded by the visual component. These manifestations included video as “a continuation of documentary photographic practices, of textual communication, or of pictorial abstraction” (London, 2010, p. 59). The plane of technology, however, can be seen not as a deterministic innovation

engine, but a sound theoretical basis where music and video are regarded as translatable codes or signals (London, 2010, p. 59). In other words, a deep connection between music and its visual representation has long been an object of consideration for scientists who studied the semiotics of music and dealt with the coding and decoding thereof.

3.1.2. The Visual Image as an Additional Perception Level for Music

Similarly to language, music is a complex phenomenon, a natural human behavior inherent in all the existing cultures. In fact, music can be regarded as a specific form of communication, which justifies the perspective considering the audience to be participants in this communication process. Simultaneously, they are deemed to have an essential role in it (Vines et al., 2011, p.157). Music has a coherent structure similar to that of language, whose meaning unfolds gradually with its elements organized into a hierarchical entity. Yet, there is a significant distinction: while language (speech) normally refers to specific objects, concepts, or events, music represents life in a most abstract form, utilizing references to emotions rather than specific referents. According to Vines et al. (2011), "evidence does suggest that instrumental music can activate semantic-linguistic networks in the brain. For example, the sound of very high violin notes primes the word needle" (p. 158). Therefore, the effect of music works through association, appealing to the emotional level of perception.

A question that follows from the assumption of the abovementioned connection is the channel through which the emotional perception of music takes place. According to Vines et al. (2011), "musical emotion may be derived solely from the sounds of a musical work, and may be mediated by schematic expectations and knowledge of musical forms" (p. 158). While the impact of visual information on auditory perception has been established in previous investigations, more recent studies have concentrated on the effect of visual codes on the emotional perception and cognition of sound signals in music. Platz and Kopiez (2012) noted that the influence of visual effects on the perception of music has been mostly overlooked in music perception research (p. 71). However, there have been signs of interest in this topic demonstrated by scientists. Platz and Kopiez mentioned Finnas and Schutz who stressed the relevance and scientific perspectives of studying the connection between music and visual elements (2012, p. 71). Vines et al. also noted that the findings of these investigations suggest

that "the experience of emotion in music involves an interaction between musical, personal, and situational factors" (p. 158). In other words, musical emotion depends on the correlation between the sounds of music and observer-specific factors, for example, the attentiveness rate, exposure of the performer to the spectator's eye, etc. (Vines et al., 2011, p. 158). Another aspect of a multifaceted connection between music and its visual component is strengthening the perceptual impact of the music performed. According to Vines et al. (2004),

> Pathways of communication between a musician and an audience become active when the musician can be seen as well as heard. The visual component of a musical performance is rich with affective and structural information has the potential to augment or to modify an observer's experience of the music. (p. 200)

Therefore, the effect of the performed music on the audience can be modified through utilization of the visual component in order to achieve an outcome expected and desired by a composer or a performer. Vines et al. (2004) conducted an investigation that was aimed at clarification of the influence that seeing a musician might produce on the audience. In the course of the experiment, thirty participants who have obtained a musical training heard, saw solo performances of professional clarinetists, or combined the two activities. The participants gave continuous judgments of phrasing and tension during the performances. These judgments were compared with regard to presentation conditions in order to understand if and how much the visual component contributed to the general impression produced by the performed pieces (Vines, 2004, p. 200). Vines et al. (2004) found that the visual component conveyed affective information that differed from the auditory component as shown by the tension judgment. The degree of tension transmitted visually tended to vary across the performers involved. Specific styles of movement seemed to imply varying tension experiences. These findings testify to the fact that the image of the performer is equally important for the assessment of the possible effect of music on the audience as the music itself.

The audio-visual relationship for a music concert remains an area where not many investigations have been conducted. However, the connection has been widely discussed in

studies involving education, multimedia, cognitive psychology, music philosophy, psychomusicology, films, etc. (Stevens, 2009, p. 9). In music philosophy, music is viewed, in accordance with Susan Langer's conception, as "symbolic of something but it is difficult to define exactly what that something is" (Stevens, 2009, p. 10).

Research studying musical emotions is as confusing as the attempts to clarify the meaning of music. Such research operates on several conflicting levels. Cognitive psychology deals with the study of a combined effect of image and music, whereas the music education domain studies utilization of image for the improvement of music learning experience (Stevens, 2009, p. 10).

Audio-visual theory based on investigations in film discourse regards music as a supporting means or alternatively an equal partner. Michel Chion's Audio-Vision: Sound on Screen has provided a basis for the understanding of how image-sound relationship operates in films. According to Stevens (2009),

> Chion's theory of Added Value states that one sensory perception influences another and transforms it, resulting in us not seeing the same thing when we are listening, and not hearing the same thing when we are seeing. In other words, if we look at something while listening to music, whatever we see may influence and may change what we hear. (p. 10).

Similarly, if one has an additional semiotic level represented by music or another sound while looking at an object, a film, or a scene, the complementary semiotic level may change the interpretation significantly. The two senses combined provide an experience that differs from the one obtained in case one utilizes only one channel for incoming information. Cognitive psychology experimentally confirms this theory: "when we receive information from multiple senses, the information from one sense can distort the information received from another, and the combined result may not accurately reflect either" (Stevens, 2009, p. 10).

According to Stevens (2009), the aspect that seems to exert significant influence on the music-image relationship is the degree of congruency between the two elements. Nevertheless, the abovementioned congruency is a complex phenomenon operating on different levels and involving congruency of narrative, synchronization, tempo and other elements. Interpretation of the music-image relationship also depends on the experience and education that the audience has, as it draws on the existing images and patterns one has. Therefore, congruency is both a general principle and a combination of specific concepts influencing the way music and images are decoded by viewers and listeners (Stevens, 2009, p. 11).

There is a tradition of visualizing music out of both artistic and scientific considerations. These representations intended to give an alternative channel for interpretation while the audition performs their function by transforming the temporal dimension of audio into one or multiple dimensions in space. Consequently, visualizations of music present a non-linear examination of separate events in the forms that become meaningful after a period of listening. This provides an additional perspective for "an inherently sequential and real-time process", as listening to audio is called by Thiebaut, Bello and Schwarz (2007, p. 1)

However, much of the contemporary research is concentrated on the music visualization with the assistance of the media of art or computer facilities. According to Sloboda (2005), "it is commonplace knowledge, although rather little researched, that music evokes in people physical concomitants of emotion" (p. 168). However, the results obtained by Sloboda in the process of his investigation concentrate on the influence that music produces on the emotions of the audience. The manifestations of musicians' emotions and the way their demonstration affects the interpretation of music by the audience may be also an essential contribution into the study of music as a polysemantic unity operating on several separate levels.

3.1.3. Music as an Additional Perspective for Gesture Decoding

The role of gesture in the perception of music is quite important. As Leman and Godøy (2010) indicated, gestures can be viewed as functioning features of a person's

perception - action system, which presupposes a meaning that is more significant than just a physical movement. As the authors describe it,

> It implies that movements can be chunked into patterns and that these patterns can be conceptualized and held in our mind as single units. This chunking is carried out by the performer as well as by the listener. The definition implies that musical communication is not merely about movement, but about structured interactions. It implies gestures, gestural sequences, and gestural hierarchies as means for an efficient structuring of large amounts of information. (Leman & Godøy, 2010, p. 9).

The abovementioned structuring stems from the embodiment of people's perceived environment. However, defining music-related gestures based on the perception-action system is fraught with certain difficulties. For example, as Leman and Godøy mentioned, one may question the possibility of considering all actions to be gestures. Quite frequently, the concept of gesture expands to cover those actions that can be characterized by an expressive nature (2010, p. 9).

Playing a melody can be regarded as based on a gesture, yet playing a specific melody in a particular tone or mood, or the style characteristic of another musician is even more exemplary. Such performance presupposes utilization of some gestures that point to a certain cultural context. It is often hypothesized that the knowledge of the cultural context is essential for the understanding and accurate interpretation of a movement. Nevertheless, some researchers might assume that within a social context music frequently entails movements devoid of any semantic meaning. For example, people's moves during live music performances are mere synchronization and resonating with the music (Leman & Godøy, 2010, p. 9).

Hatten (2004) presented the viewpoint of David Lidov on the artistic gesture who defined it as "movement that is marked for significance, whether by or for the agent or the

interpreter" (p. 112). The difference between a human gesture in general and an artistic one lies in the fact that the former one is marked by the potential for the possible meaningful interpretation. Nevertheless, interpretation of a gesture as significant does not necessarily presuppose that the movement should be produced intentionally (Hatten, 2004, p. 112). Musical gestures can be inferred from either notion or performance. If a gesture is interpreted in the process of performance, the motivation for the musical gesture can be physically heard. As Hatten explained,

> Its source in a human performer's movements need not to be seen to be inferred. When hearing a performance with our eyes closed, or when listening to a recording, we can readily reconstruct the kinds and qualities of motion that give character to musical gestures. (2004, p. 113)

Expressive movements demonstrated by performers represent the inferred levels of communication and may possess some characteristics or meanings of embodied human expressivity. Nusseck and Wanderley's investigation (2009) concentrated on the kinematic demonstrations of four clarinetists that were used to conduct perceptual experiments where participants were asked to assess particular music-related aspects of both the performer and the performance. The researchers were guided by the consideration that in music context, musical instruments are played with the help of body motions that might be employed to communicate important meanings (Nusseck & Wanderley, 2009, p. 335).

Artistic movements regarded as music gestures are complementary with respect to the sound of music and affect the perception of the music played. There are two types of movements distinguished by Nusseck and Wanderley:

1. instrumental actions;
2. ancillary/expressive movements (2009, p. 335).

Instrumental actions are responsible for the production of sound, whereas the ancillary, or expressive, moves are closely connected with music; they represent a link between the

expressive intention of the musician who performs and the music. Ancillary movements are frequent in musical performances, though they are not an inextricable part of a musical performance. These actions vary from one performer to another, but tend to be consistent within one specific musician. They are not performed randomly, but "rather are used to communicate a holistic, musical, expressive unit" (Nusseck & Wanderley, 2009, p. 335).

Nusseck and Wanderley referred to the studies conducted by Juslin, Vines, Krumhansl, and Levitin to indicate that experimental studies have shown that movements of musicians can convey expressive and structural information and might affect musical intelligibility and the perceived duration of tone (2009, p. 335). Performer motions may involve body sway, head, arm, or body movements, subtle facial motions and expressions (for example, eyebrow moves). Initial performer intention appears to be deciphered by the audience easily given that they have a chance to see performers' body movements. Even when demonstrating simplified bodily representation by way of using "point-light displays, in which body motions are presented through moving light points fixed to certain parts of the body", the audience still tends to have no difficulty in identifying the emotions (Nusseck & Wanderley, 2009, p. 336).

Nusseck and Wanderley's (2009) study has also shown that each player participating in the investigation performed his/her piece "with idiosyncratic movement velocities" (p. 350). The body movements were individual, tended to have consistencies, yet the amount of such movement varied for individual parts of the body (Nusseck & Wanderley, 2009, p. 350). Yet, it is important to remember that this study concentrated on the performers of one instrument and one music style.

Gesture and non-verbal communication perform a role in the way performance is managed. Such signals as winks, nods, manual gestures, as well as musicians' postures are all possible ways to achieve a desirable effect on the audience and communicate the necessary message. Some gestures, for example, have a commonly adopted meaning: the "ok" or "thumbs up" signs should be performed in such a way that their meaning was not lost upon the audience (Dahl et al., 2010, p. 49). According to Dahl et al. (2010), the communication between co-performers also presupposes the employment of gestures and non-verbal signs:

> During playing, instrumental musicians generally have little opportunity to produce the right emblems, their hands being occupied with the production of the actual sound events. Nevertheless, players communicate with nods, smiles, and eyebrow flashes. Players can also indicate direction using the head or other parts of the body not conventionally used for pointing. (p. 49)

Such gestures are associated with the immediate context and are widely used for regulating the performance. Musicians may take turns during their improvisations or signal a return to a specific passage in the performed piece. At the same time, conductors make use of such gestures in order to communicate to the performers their instructions as to how a piece must be played (Dahl et al., 2010, p. 49).

Overall, it is possible to regard music as a complex phenomenon utilizing several semiotic systems. The audio channel normally associated with music is not the only one that affects the audience's perception. What the audience sees may just as well influence the way they decode the information received through the audio perception channel.

3.2.The Role of Movement and Gesture in Communicating a Musical Discourse to an Audience

3.2.1. Emotional Expression in Music Performance

Musical expressivity plays a role in the way music discourse is communicated to the audience. Music and language are the instruments employed by people in order to convey their emotions. Similarly, emotions are part of performance, helping musicians communicate their message to listeners and viewers.

Music and emotion are linked to the concept of meaning, according to Deutsch (2013), which allows one to assume that music might contain references to objects and concepts other than itself. However, there is a debate on if the music has any particular meaning and if it has, then what kind of meaning is communicated through it. There exist two perspectives on musical

meaning supported by the so-called 'absolutists' and 'referentialists'. In absolutists' viewpoint, the musical meaning is embodied in it, e.g. music can refer to itself exclusively. Referentialists, in contrast, argue that meaning is acquired by music through references to specific 'extramusical' phenomena, which makes this kind of meaning designative (Deutsch, 2013, p. 589).

For the purpose of this research, musical expression is regarded as multidimensional. Music has been deemed to be capable of expressing a wide range of ideas and describing a lot of concepts, such as character, identity, social conditions, history, religious beliefs, etc. It is commonly believed that listeners perceive music as an expression of emotion (Deutsch, 2013, p. 589). According to Deutsch (2013),

> The findings from over a hundred studies have suggested that listeners are generally consistent in their judgments of expression in music. That is, listeners' judgments are systematic and reliable, and may even be predicted with reasonable accuracy on the basis of factors in the music. High agreement among listeners implies that there is something to agree about in the music. However, although there is usually high agreement among listeners about the broad emotion category expressed in the music, there is less agreement concerning the nuances within the category. (p. 589)

Nawrot (2003) stated that people of all ages tend to be sensitive to the emotionally colored information received from music, or facial and vocal expressions. The growth of the amount of research on the development of emotion interpretation in music shows that the interest in this aspect of music expressiveness tends to increase. Some of this research concentrates on the responses of people representing different age groups in order to identify consistencies found in the interpretation of affect (Nawrot, 2003, p. 75).

According to Bhatara et al. (2011), music expressivity comprises those aspects of music performance that are controlled by the performer and which may be manipulated for

communicative and aesthetic purposes. Aspects of musical prosody may be involved (Bhatara et al., 2011, p. 921). Musical performance is extremely efficient at communicating emotion; at the same time, unique expressiveness demonstrated while performing is likely to be one of the factors that contribute to people's preferences concerning the choice of performances.

Music theorist Leonard Meyer observed that deviations from the notated music carried out by musicians are vital to the delivery of an affective aesthetic experience. That means that "expressive performance in Western classical music is largely based on systematic variation of duration and intensity, and, to some extent, timbre and intonation, depending on the instrument" (Bhatara et al., 2011, p. 921). Similarly to actors and public speakers who seldom read their parts and speeches isochronously and monotonously, proficient musicians do not tend to play a music score as originally written. Instead of it, they intentionally introduce changes and variations to timing, timbre, and amplitude. Notes of the same indicated duration may differ by one or two aspects during an expressive performance (Bhatara et al., 2011, p. 921).

Expressivity of musical performance may perform the function of conveying metrical information to the audience and registering a specific emotion, for example, sadness, happiness, fearfulness or excitement. Listeners are capable of eliciting the intended emotions from music even if it does not belong to their own culture. Performers, therefore, face the issue of how to achieve the most efficient level of expressivity in their performance. Moreover, they are also concerned with the question if the strategy utilized to this end should include elements of musicians' own emotional experience or if they should rely merely on the technical use of the corresponding musical means, such as volume, articulation, tempo, or timbre (Zijl & Sloboda, 2010, pp. 196-197).

There are several opinions on the abovementioned issue which differ considerably. Some researchers and musicians believe that musicians cannot touch listeners' feelings unless they are touched by the music they are performing, too. Proponents of another viewpoint consider that the act of performance is rather "a matter of deliberate conscious awareness and planned expressiveness" (Zijl & Sloboda, 2010, p. 197). They adhere to the belief that being a

professional musician presupposes performing a variety of pieces that the musician cannot be equally attached to. Also, there are individual differences characterizing performers and different ways to build an expressive musical performance. The role of a musician's emotions for the construction of a successful and musically expressive performance is the focus of a range of studies on musical expressivity (Zijl & Sloboda, 2010, p. 197).

Two concepts that are central to the study of musical expressivity are 'emotion' and 'a musically expressive performance' (Zijl & Sloboda, 2010, p. 197). Gabrielsson argued that there exists no unanimous agreement on the definition of such terms as 'affect', 'mood', 'feeling', or 'emotion' in either psychological terminology or everyday language use (as cited in Zijl & Sloboda, 2010, p. 197). An essential distinction concerning emotional expression in music is the distinction that refers to perceived and induced emotion. According to Zijl and Sloboda (2010),

> Induced emotion could be described as someone's emotional response to the music: the music causes, for instance, a sad feeling. Perceived emotion could be described as the ability to perceive an expression in music – of, for instance, sadness – without necessarily being affected oneself. (e.g., feeling sad) (p. 197).

The second concept referred to as a 'musically expressive performance' is a multifaceted unity. Zijl and Sloboda regarded it as the desired result of an interpretation, which in itself may be viewed as "the individualistic shaping of a piece according to the musical ideas of the performer" (Zijl & Sloboda, 2010, p. 197). These musical ideas may include the intention to express an emotion or idea lying beyond the musical structure, but this expression is accomplished with the aid of the means of articulation of the musical structure. The interpretation process is influenced by both internal and external factors. The former include emotions or the intention to express personal considerations, whereas the latter include the composer's intentions, musical style, or structure of the piece (Zijl & Sloboda, 2010, p. 197).

Juslin and Persson (2002) indicated that the conceptualization and assignment of meaning to pieces of music by performers while preparing it for performing in public was not extensively

investigated. Nevertheless, empirical research (for example, those studies which were conducted by Woody or Persson), and biographical accounts (prepared by Blum, Menuhin, or Schumacher) tend to confirm that performers frequently conceive of performance with regard to moods and emotions. Quite numerous performers consider expressivity one of the most crucial aspects of performance (Juslin & Persson, 2002, p. 220).

Despite the emphasis that musicians put on expressiveness, some studies suggest neglect of the expressive aspects of performance in music education. More specifically, educators working in the sphere of music education prefer spending time and effort on technical aspects of performance rather than aesthetic or expressive ones. As an outcome, students tend to focus on the expressive aspects quite late in their professional development. That appears essential, as critics frequently charge that young musicians develop proficiency in the technical skill of music performance but fail to induce any emotional experience in listeners (Juslin & Persson, 2002, p. 221). Consequently, those engaged in teaching music are encouraged to emphasize expression and emotion in music. Such a shift is expected to lead to "increased concern with the actual strategies used to teach expressive skills of music performance" (Juslin & Persson, 2002, p. 221).

Performers and listeners tend to compare and discuss musical performances with regard to their expressive aspects, and there are publications considering performance practices used to increase emotional expressivity. Nevertheless, researchers started to focus on the phenomenon not long ago. According to Juslin and Persson (2002), "this may reflect the dominant influence of cognitive science in psychology in general and music psychology in particular, which has led to a focus on cognitive aspects of performance, such as structural representation" (p. 221).

Emotions are an elusive category that escapes measurement and definition. However, most researchers agree that emotions consist of many components, such as physiology, cognitive appraisal, action tendency, subjective feeling, and expression. There are two main approaches used to discuss emotions. According to Russel, within the categorical approach, "people experience emotions as categories that are distinct from one another" (Juslin & Persson,

2002, p. 221). Thus, this approach stresses those characteristics which help people distinguish emotions from each other. The dimensional approach utilizes the strategy that consists in identifying emotions through placing them on a number of dimensions, such as valence (negative or positive) and activation (high or low) (Juslin & Persson, 2002, p. 221).

Emotional communication is reserved by Juslin and Persson (2002) for those situations where the performer has the intention of communicating a specific emotion to the listener. According to the authors, "accurate communication takes place to the extent that the performer's expressive intention is understood by the listener. This approach implies that expression and recognition of emotions should be studied in an integrated fashion" (Juslin & Persson, 2002, p. 222).

A number of studies have focused on the description of the code (or the acoustic means) used by performers to communicate emotions to the audience. The findings of these investigations suggest that the performer' intention influences practically every aspect of a musical performance. This means that emotional expression presupposes a measurable range of cues (or pieces of information) used by both performers and listeners (Juslin & Persson, 2002, p. 222). The acoustical code used by performers assumedly reflects contributions from nurture and nature. In terms of nature, there is evidence suggesting innate brain programs for the vocal expression of emotion. According to Juslin and Persson (2002), "studies of the neurological substrates that underlie spontaneous vocalizations of emotions in monkeys and humans with brain lesions provide evidence of brain circuits that function to initiate innate affect vocalizations" (p. 222). Juslin and Persson also hypothesized that performers communicate emotions to their audience by way of using the same acoustic code that is utilized in vocal expression. The hypothesis can be supported by the similarities in the use of cues between vocal expression and music performance. For instance, the vocal expression of such an emotional state as sadness may involve slow speech pace, low intensity of voice, and little energy with high frequency in the voice spectrum. Similar acoustic cues are utilized for the expression of sadness in music performance (Juslin & Persson, 2002, p. 225). Moreover, cross-cultural studies concentrating on vocal expression and music performance conducted by Johnstone and Scherer and Juslin, correspondingly, indicate the existence of cross-cultural

similarities. There arguably exists an innate code for acoustical communication of emotion. This might explain why the ability of emotional expression is often considered by many educators in the sphere of music to be instinctive (Juslin & Persson, 2002, p. 225). As Juslin and Persson put it, "if musicians are to apply this innate code to their performance, they need to understand the parallels between human voices and musical instruments and to learn sufficient technique to express emotions in accordance with the vocal code" (2002, p. 225).

Another factor affecting the emotional expression in a performance is a musician's memories or social learning. Although the code that mothers use when talking to their infants seems to be innate, the specific expressive style of a mother tends to modulate the infant's expressive style. This process of modulation continues throughout a person's life with the accumulation of experience. Performers learn the links between cues and relevant extramusical life experiences, such as body language or motion through analogies. This implies the importance of extramusical life experiences in the process of forming expressivity in a musical performance (Juslin & Persson, 2002, p. 225).

Patel (2008) mentioned research conducted by Juslin and Laukka that assessed the acoustical cues as those used "probabilistically and continuously, so […] cues are not perfectly reliable but have to be combined" (p. 346). These cues appear to be combined in an additive way, so the amount of cue interaction is restricted. There is a degree of 'cue trading' in the musical expression which reflects exigencies of specific instruments. For instance, if a performer cannot resort to varying timbre to express anger during the performance, he or she might compensate this by changing loudness a little more (Patel, 2008, p. 346).

Considering the existing similarities between music and speech, Juslin and Laukka suggested that the brain processes the sound of many musical instruments as if they were 'superexpressive voices'. This implies that despite the fact that the majority of musical instruments cannot be said to sound like voices from the phenomenological perspective, they can involve emotion perception modules located in the brain because they comprise enough acoustic features similar to those of speech to launch these modules (Patel, 2008, p. 346).

Also, according to Juslin and Laukka,

> The emotion perception modules do not recognize the difference between vocal expressions and other acoustic expressions and therefore react in much the same way (e.g., registering anger) as long s certain cues (e.g. high speed, loud dynamics, rough timbre) are present in the stimulus. (as cited in Patel, 2008, p. 346).

Juslin and Laukka's (2003) investigation has also reached a conclusion that performers who code their emotional message communicate it to the addressee with above-chance accuracy. They also considered the possibility that the accuracy of the coding-decoding process might be restricted to the five emotion categories discussed by the researchers, namely anger, fear, happiness, sadness, and love/tenderness (Juslin & Laukka, 2003, p. 789). Juslin and Laukka conducted an analysis of the cues used for the communication of emotion to the audience. A comparative study of the cues commonly used in both vocal expression and music performance (speech rate or tempo, sound level or voice intensity, high-frequency energy) has shown the following:

> There are relatively similar patterns of cues for the two channels. For example, speech rate/tempo and voice intensity/sound level were typically increased in anger and happiness, whereas they were decreased in sadness and tenderness. Furthermore, the high-frequency energy was typically increased in happiness and anger, whereas it was decreased in sadness and tenderness. Although less data were available concerning voice intensity/sound level variability, the results were largely similar for the two channels. (Juslin & Laukka, 2003, p. 789).

Nevertheless, there were also differences. For example, fear was associated with the highest level of intensity in vocal expression, whereas in music performance it tended to be perceived through low sound level. A possible explanation for the abovementioned discrepancy might lie in the assumption that the results reflect varying intensities in which one and the same emotion is manifest. This may also be explained by qualitative differences registered in

closely related emotions. For instance, mild fear can be linked to low voice intensity combined with a low degree of high-frequency energy.

Panic fear, in its turn, can be associated with the highest voice intensity and a great amount of high-frequency energy (Juslin & Laukka, 2003). However, confirmation of these results would involve "studies of music performance that systematically manipulate emotion intensity in expressions of fear" (Juslin & Laukka, 2003, p. 789). In general, the results obtained by the researchers showed similarity of the three major cues: speech rat/tempo, vocal intensity/sound level, and the amount of high-frequency energy.

Other cues and factors were also discussed. For example, the hypothesis mentioned by Davitz as early as in 1964 operates on the assumption that microstructural regularity or irregularity might be instrumental in the task of distinguishing one communicated emotion from another. In particular, positive emotions appear to show a greater degree of regularity than negative ones. Irregularities of the frequency, duration, or intensity, therefore, seem to be suggestive of negative emotions (Juslin & Laukka, 2003).

Juslin and Laukka also mentioned the relevance of Sundberg's observation "that perceptual stimuli that change are easier to process than quasi-stationary stimuli and that the beginning and the end of a sound may be particularly revealing" (2003, p. 791). This assumption might be used for the study of voice onsets or tone attack. Limited data suggested that tone attacks and voice onsets varied with regard to the emotion expressed. Fast tone attacks were employed in happiness and anger, while slow ones were used to express tenderness and sadness (Juslin & Laukka, 2003).

One of the major cues specific to music performance is articulation, or "the relative proportion of sound to silence in note values" (Juslin & Laukka, 2003, p. 796). More specifically, staccato articulation implies much air between the notes in a performance; legato articulation means continuous playing of the notes. The results elicited from the study of articulation showed a consistent pattern. Such emotions as happiness, fear, and anger were linked to staccato articulation, while sadness and tenderness were expressed with the aid of

legato articulation. The only inconsistency was shown by guitar players who expressed anger through legato articulation. This suggested that the code may vary across musical instruments (Juslin & Laukka, 2003).

There is another channel to communicate human sensations, actions, ideas, and feelings. Gestures and other non-verbal components may be a powerful tool to communicate emotions during a musical performance. In fact, this kind of expression is not new; it has always been used in, for example, theater productions.

According to Thompson, Graham and Russo (2005), facial expressions and gestures exert influence on music experience with regard to several aspects. At a very basic level, the visual information might serve for the timing of musical events, or focusing the attention of listeners on relevant acoustic information at particular moments. Visual cues might modify musical intelligibility. Just as the image of a speaker's face may increase intelligibility of a delivered speech if it is taking place within a noisy environment, the same is arguably true of music performances (Thompson, Graham, & Russo, 2005).

At the level of perception, visual cues might serve as signals of crucial harmonic, melodic, or rhythmic events. As Thompson, Graham and Russo explained, "facial expressions may reflect the additional concentration that is needed to perform notes or passages that are unexpected or totally unstable" (2005, p. 204). Performers may also use them or other gestures in order to share their own understanding of the significance of certain musical events. They might convey points of closure, intervallic information, or points indicating expectancy fulfillment or violation. In such a way, visual cues imply that performers' role is not restricted to the production of sound; they are listeners themselves and this stresses that musical activity can be regarded as a shared experience between listeners and performers (Thompson, Graham, & Russo, 2005).

At the affect level, music is closely connected with human emotion, and performers harness a wide range of resources to convey the emotional content of the pieces they are performing. Emotions in music discourse are communicated in bodily gestures and facial emotions

besides sounded event. Davidson and Correia mentioned that those listeners who do not have musical schooling tend to rely more on the visual images than on audio ones when estimating the affective meaning of musical pieces (Thompson et al., 2005).

Eventually, visual images are efficient in expressing attitude and persona or constructing the so-called 'interpersonal' or 'attitudinal' dimensions of meaning in Halliday's and Lemke's terms correspondingly (Thompson et al., 2005). The role of bodily movements consists in the following:

> Facial expressions and hand gestures allow performers to cozy up to the audience, emphasizing the music performance as reciprocal human interaction, whereas an absence of visual information leaves an impression that the performance is a solitary act in which the listener's role is primarily that of a voyeur. That is, visual aspects of music personalize the music, drawing performers and listeners closer together in a shared experience. (Thompson, Graham, & Russo, 2005, p. 204)

Camurri et al. (2004) conducted the analysis of expression through gesture in music and dance, making expressive gesture the key concept of their investigation. This is to a great extent preconditioned by the fact that in many artistic contexts and in the area of performing arts specifically, gesture is not meant for denoting objects or supporting speech the way it is viewed within the traditional framework for the study of natural gesture. Artistic gesture includes and conveys the information which is connected with the emotional or affective domain (Camurri et al., 2004). As Camurri et al. indicated,

> […] Gesture can be considered 'expressive' depending on the kind of information it conveys: expressive gesture carries […] 'implicit messages' […]. That is, expressive gesture is the responsible of the communication of information that we call expressive content. Expressive content is different and in most cases independent from, even if often superimposed to, possible denotative meaning. Expressive content is different and in most cases independent from, even if often superimposed to, possible denotative meaning. Expressive content concerns

> aspects related to feelings, moods, affect, intensity of emotional experience. (2004, p. 21)

For example, it is possible to perform one and the same action in a variety of ways, emphasizing different features of movement. One can recognize a person by the way he or she walks, or judge a person's emotional state by his/her appearance (Camurri et al., 2004).

On the one hand, expressive gestures include natural gestures partly, as well as natural gestures might comprise expressive gestures. On the other hand, a more general idea of expressive gesture presupposes that it includes not only natural gestures, but also musical movement or visual gestures (e.g., animated with the aid of computer technology) (Camurri et al., 2004).

Camurri et al. (2004) analyzed visual cues utilized by performers to convey music expressiveness. The research has shown that there is an opposite relation between the performer's posture and emotional intensity. In the study, the pianist's posture appeared to be quite efficient in communicating emotion. Thus, the pianist tended to lean forward for more relaxed and soft passages and backwards when the piece was more intensive. Also, there appears to be a degree of differentiation in expressive means involving tempo or key-velocity and movement velocity. This differentiation was confirmed by the analysis of the listeners' data (Camurri et al., 2004).

Thompson, Graham and Russo reached a conclusion that visual aspects of music are crucial in live performances. However, facial expressions, gestures, or other bodily movements of performers tend to be replaced by other kinds of visual images constantly presented in popular music events. This tendency emerged in early 1970s with the beginning of stadium concerts making use of a range of visual effects to enhance the expressive power of the show. Light shows, tricks and surprises, as well as elaborate sets have become indicators of prestige and success, but also disrupted the traditional narrative. This kind of visual information makes reference to the music performed, just like gestures and facial expressions. However, there is a difference which lies in the fact that non-verbal behavior of performers cannot be

detached from the audio experience, whereas video images can. These video images compete for the listener's attention rather than support the music. In this way they may arguably power the separation between the audio and visual aspects of music that started after the invention of such media as radio, silent movie, or gramophone (Thompson et al., 2005).

Summarizing the abovementioned information, it is possible to conclude that music appears to be a powerful tool in expressing emotions. There exist specific cues that enable listeners to perceive emotions communicated by performers. However, the cues that help the audience decode the visual component of a performance remain an area that requires further investigation.

3.2.2. Impact of Visual Information of Musical Performance on Audience

Although music does not convey letters, its presentation generates non-verbal information (in other words, meanings) perceived by the audience. The visual images of musical instruments and the musicians playing on them produce special effects on public. The ability of musical performance to transmit visual information influencing audience's sentiments, impressions, and understanding is a matter of embodied music cognition, the field focused on semantic interpretations of music and musicians' behavior representing mediation technology between the world of music and real-life physical environment (Leman, 2008).

Numerous authors and researchers created their works in this field attempting to provide an in-depth understanding of the influence of visual information contained in musical performance on audience. For example, the theorist Eco (1976) applied a semiotic theory to music in order to reveal which signs, symbols, and meanings it may convey. In their article, Nusseck and Wanderley (2009) suggested that live musical performance produces much nonverbal information that helps to narrate a story or transmit a particular message to public. The work by Vines, Krumhansl, Wanderley, Dalca, and Levitin (2011) implied that musical performance (both recorded and live) provides people not only with conceptual but also emotional information. Overall, the authors covered by this subsection present essential, detailed, and empirical information that will provide the insight into visual information

(transmitted especially through live musical performance) and its impact on listeners and audience (Schutz, 2009).

General knowledge on the semiotic theory and its relation to music touched upon by numerous authors (including Eco, 1976; Kühl, n.d.; Harrison, 2003, etc.) may provide an essential theoretical framework for the understanding of the essential aspect of embodied music cognition, i.e., the visual information incorporated in musical performance. The general semiotic theory (based on semiotics, the study closely related to linguistics) focuses on the signs and processes of their production. Correspondingly, the application of this theory to verbal or non-verbal sources may provide the understanding of how signs may transmit messages, and be a part of communication (Eco, 1976). Eco (1976) agreed that the semiotic theory helps to decode a complex communicative process defined as "the passage of a signal (not necessarily a sign) from a source (through a transmitter, along a channel) to a destination" (p. 8). In other words, the semiotic theory may clarify how signals or signs (providing particular meanings) can be communicated to people via literature, pictures, feature films, sculpture, and other objects of reality and art.

The application of the general semiotic theory to culture or music in particular helps to reveal the details of non-verbal expression. The theory's application to the world of music gives rise to musical semiotics, the study of musical codes and their transmission (Tagg, 1999). Musical semiotics provides the idea that music represents a structured sign (graphic and non-graphic) system; besides, musical semiotics implies that musical signs (or codes) are certain emotional and conceptual meanings with the help of which musical composition (and performance, as well) may narrate a story or transmit a message from a composer (performer) to public. For example, the descriptions of music as "pastoral" or "thrilling" are based exactly on musical semiotics (Eco, 1976, p. 11). Overall, according to musical semiotics, both tonal and atonal musical patterns produced by all kinds of musical instruments convey codes or signs. However, in order to transmit an original sign (and, correspondingly, a meaning, message, and story) to the audience, music should be produced professionally; otherwise, the originality will be distorted or modified inappropriately. Besides, musical semiotics suggests that the same musical code can be interpreted in different ways (Tagg, 1999).

Being one of the forms of musical semiotics, (live) musical performance lies in the area of what Harrison (2003) called as "visual social semiotics" (Harrison, 2003, p. 47). This type of semiotics focuses on examining how images convey meaning; in addition, it underlies that each image is a social process rather than the result of a singular, isolated, and creative activity. In other words, visual social semiotics presents a "negotiation between the producer and the viewer, reflecting their individual social/cultural/political beliefs, values, and attitudes" (Harrison, 2003, p. 47). This way, musical performance is a meaningful and emotionally loaded negotiation between a performer and audience realized through visual representation (Schutz, 2008). In its turn, this visual representation transmits the signs occupying a significant role in creation of corresponding meanings, images, symbols, etc.

Musical semiotics, along with visual social semiotics, provides the idea that musical performance transmits meanings. According to Kühl (n.d.), "musical meaning is fluid", since the same piece of music may convey different meanings for different people; correspondingly, the same person may experience a piece of music differently (p. 1). The ability of musical performance to transmit meanings makes music an indispensable part of people's most meaningful life moments, and transforms it into "a device for sharing and bonding" (Kühl, n.d., p. 1).

According to the research evidence, musical performance may transmit both conceptual and emotional meanings (Juslin, 2006; Nusseck & Wanderley, 2009; Tagg, 1999; Vines et al., 2011, etc.). Tagg (1999) suggested that music can be perceived as conception; in other words, it may communicate a particular thought or an idea, and provide reference to a specific content and context. For example, since the 1960s, pop and rock music has usually been considered to reflect social concerns associated with mass culture and delinquency, the themes remaining relevant even in the 21st century (Tagg, 1999). However, as Juslin (2006) mentioned, music transmits primarily emotional meanings or particular emotions. Defining music as "communication of emotion", the author underlined that numerous people enjoy listening and viewing musical performance because pieces of music respond to their wide range of emotions: happiness, sadness, anger, fear, tenderness, love, frustration, disappointment, shame, etc. (Juslin, 2006, p. 86).

The research attention to emotionality of musical performance is reasonable, since music is always emotionally colored. In this context, the main research findings of Vines et al. (2011) focused on people's perception of emotions via musical performance are worth mentioning. Investigating non-verbal communication through expressive musical sounds, the authors revealed, "variations in expressive intention had their greatest impact when the performances could be seen" (Vines et al., 2011, p. 157). In other words, the research evidence demonstrated that the level of musical expressivity is much higher when musical performance can be seen, since the live sound and special atmosphere facilitate the transmission of different emotions from performers to the audience.

Overall, the meaningfulness of music (whether it conveys mostly conceptual or emotional information) makes musical performance one of the most favorite and demanded entertainments for public. It is not surprising that "the average citizen of the Western world hears three-and-a-half hours of music a day and spends an average of $75 a year on music" (Tagg, 1999, p. 1). Whether it is popular, rock, classic, jazz or folk music, hearing or viewing musical performance remains a widespread activity in today's world; as a result, millions of people buy musical CDs, watch musical bands' concerts on TV, and visit outdoor musical festivals. Moreover, people evaluate musical performances, since they represent not only a type of entertainment, but also a source for inspiration, an opportunity to make acquaintances, a way to escape from the real-life problems, etc. (Rink, 2002).

Musical performance represents the process of musical communication important in the context of the present review. In his work, Tagg (1999) revealed five general tenets of musical communication providing an understanding of how music communicates to people, and to identify the role of music for public. The first tenet of musical communication is called as "music defined"; in other words, the definition of music implies that it is one of the ways to communicate with people (Tagg, 1999, p. 17). For example, the author provided an academic definition of music as follows:

> that form of interhuman communication which distinguishes itself from others in that individually and collectively experienced affective / gestural (bodily) states

> and processes are conceived and transmitted as humanly organized nonverbal sound structures to those creating these sounds themselves and / or to others who have acquired the mainly intuitive cultural skill of 'decoding the meaning' of these sounds in the form of adequate affective and / or gestural response. (Tagg, 1999, p. 17).

In other words, music does not exist beyond the society, since it is created by people in order to be heard (or seen, in case of musical performance) by others. Besides, music consists of the sets of sounds (combined simultaneously or in sequence with other sounds) that have a primarily gestural or affective character (Rink, 2002). Overall, according to the first tenet presented above, music is communicated only among people, and comprises small meaningful parts (sounds) that help to create a communicative process. The mentioned principles of music (non-verbal) communication allow tracing the evident parallels with verbal communication: both music and language are treated as socially based systems; sounds can be compared with letters; musical presentation (performance) resembles a speech process.

The second tenet is that "music refers to itself" (Tagg, 1999, p. 18). Nalapat (2008) agreed that this tenet suggests that it is absurd to understand music as a self-contained system of sound combinations, since changes in musical styles are usually historically found in conjunction with (preceding, accompanying, following) change in culture and society of which music is part. It is not surprising that "direct imitations of or reference to sound outside the framework of musical discourse are relatively uncommon elements in most European and North American music" (Tagg, 1999, p. 18). Overall, musical structures usually refer to 1) their own contextual position in the musical composition within which they occur, 2) their appearance in similar guise in other music, or 3) nothing outside themselves (Nalapat, 2008).

According to the third tenet of musical communication, "music is related to society" (Tagg, 1999, p. 18). It is necessary to admit that the second and the third tenets are not antagonistic. In order to reveal what is supposed by the mentioned phrase about music and its relation to society, one should take into consideration that music styles and interpretations vary within

the society and from one society to another in place and time. Correspondingly, music refers to society because all musical traditions are inseparably connected to people and the processes related to them (Shepherd, Horn, & Laing, 2003). In other words, music is socially related, since it:

1. refers to other musical codes (sounds) acting like social connectors;

2. reflects changes in collective self-perceptions shaped by the transformations in acoustic conditions, sound technology, or the so-called "soundscape" (for example, from clavichord to grand piano, from rural to urban blues, etc.);

3. reflects demographic changes (such as the shift in dominance of US popular music (of the 1930 – 1960s) from Broadway shows to the more rock-, blues- and country-based styles from the US West and South);

4. acts as a combination of any of the processes mentioned above (Tagg, 1999, p. 18).

Tagg (1999) called the fourth tenet of musical communication "musical universals" (p. 18). To be more specific, the author suggested that cross-cultural universals of musical code are bioacoustic because relationships between the human body and musical sound present the basis of all music. Bioacoustic relationships imply that obvious relations between music and people (for example, between musical tempo and heart beat, musical loudness or timbre and a certain type of physical activity, musical phrase length and the capacity of the human lung, speed (and loudness) of tone beats and the acoustic setting, etc.) can be traced (Tagg, 1999).

Although music of all cultures has a bioacoustic nature, the majority of musical communication is mostly culturally specific. For example, one may admit that people's emotional attitudes towards large spaces (free and open versus cold and lonely), hurrying (pleasant versus unpleasant), and hunting (cruel versus exhilarat ing) are not the same

between cultures and even within one culture. The mentioned evidence is explained by the fact that such musical parameters as pulse, volume, certain aspects of timbre and pitch, and general phrase duration do not include the way in which timbral, tonal, rhythmic, metric, melodic, harmonic or instrumentation parameters are organized in relation to each other inside the musical discourse.

The reality demonstrates that musical organization presupposes social organization and cultural context before it is created or understood (Tagg, 1999). Overall, the bioacoustic nature is peculiar to all musical communications, which, in their turn, are bounded to the cultural or social context. This fact makes music a non-universal language equally understood in different societies or cultures (Titon, Fujie, Locke, Cooley, Rasmussen, McAllester, & Reck, 2009).

The fifth tenet of music communication consists in "music's collective character" that means that it reflects social dimensions, rather than lends itself to isolation (Bohlman, 2004; Tagg, 1999, p. 19). Clarifying this tenet, Tagg (1999) paid attention to the fact that musical communication takes place between an individual and himself/herself, two individuals, an individual and a group, a group and an individual, individuals within the same group, and members of one group and those of another. Musical communication possesses "concerted simultaneity" of non-verbal sounds and movements (for example, a performer may move his hands, dance with his or her legs, and plays a musical instrument at the same time). This way, music expresses collective messages of individual's affective and corporeal identity in relation to himself or herself, each other, and both social and physical surroundings (Tagg, 1999). All five tenets identified above mean that music communication is characterized by its own peculiarities. The evidence suggests that music's communicative character is rooted in the fact that music is an exclusively social product, since it is created by individuals and targeted at them. Music communicates via sounds that create a communicative process; in its turn, this process is inseparable from cultural and social changes, has its peculiarities within different societies and cultures, and involves individuals in a collective process (Tagg, 1999). Correspondingly, musical performance presents the brightest example of music

communication, where combination of sounds, individual(s), affective (gestural) states, and underlying meaningful (both conceptual an emotional) context can be traced.

According to the researchers (Vines et al., 2004; Doğantan-Dack, 2012; Vines et al., 2011, etc.), live musical performance represents a communicative process providing people with visual information. For example, according to the study provided by Vines et al. (2004), musicians' expressive gestures accompanied their musical performance convey much structural and emotional information that produces suitable effect on audience. Musically trained individuals (study participants) were selected by the researchers for seeing, hearing, and both hearing and seeing a classic musician's performance (Vines et al., 2004). Although the findings indicated that although "the visual component carries much of the same structural information as the audio", audience's impressions become bright and emotionally loaded if visual experience is combined with audio one (Vines et al., 2004, p. 368). Overall, according to the results, simultaneous hearing and seeing live musical performance provides audience's in-depth experience of the event.

Besides, according to Vines et al. (2011), visual information received by audience from live musical performance has a more powerful effect than aural one presented by recorded version does. According to the researchers, visual images provided by live musical performance have higher levels of emotionality. Exactly visual information (if combined with aural one) helps the audience to form a mental representation of a musical performance. Correspondingly, without visual information, audience cannot create their impressions thereof. For this reason, the people visiting concerts easier evaluate musical performance than those who only hear its recorded version do (Doğantan-Dack, 2012).

The visual aspect of musical performance occupies a significant place in creating the audience's perception. According to Auslander (2009), "the visual dimensions of musical performance convey musical information and shape the audience's perception of the musical event" (p. 304). This musical information can be both formal (associated with the perception of purely musical characteristics such as phrasing, dissonance, and interval) and affective

(related to the interpretive intentions of a performer and the particular emotions he or she conveys through the music).

The research evidence (provided by Vines, Wanderley, Krumhansl, Nuzzo, & Levitin, 2004; Auslander, 2009; Armontrout, Schutz, & Kubovy, 2009, etc.) suggested that during a musical performance, a musician (or a performer) and the setting in the context of which music is performed create corresponding visual images producing different effects on audience. Pleasant visual images lead to positive emotions, while negative ones create the audience's negative experience. Since visual images have a great emotional impact on audience, it is not surprising that the success of musical performance mostly depends on visual experience provided to the audience, it's perception of visual information, and impressions rather than musician's musical background or attributes (such as originality, harmonious and beautiful melody, etc.) of the musical composition which he or she produces (Vines et al., 2004).

Overall, musical performance presentation cannot be imagined without visual information influencing the audience's perceptions. According to Rink (2002), "it is evident that an audience discerns all kinds of subtle information about performers from their body movements and general appearance and of course from the musical sounds made" (p. 149). Besides the musical gestures naturally accompanying a musical performance, performers may produce some cues to public. Givens (2008) clarified that a cue is "a nonverbal sign used to prompt an event" (p. 1). Depending on the setting and general mood provided by musical performance, musicians' cues can make the audience enthusiastic, concentrated, excited, surprised, etc. These cues help to establish a psychological-emotional connection with public.

The recent data on visual information of musical performance implied that among all visual images, the musician's personality produces the most powerful effect on the audience. As Auslander (2009) revealed, "to a surprising extent, facial expression and other bodily movements affect music experience at a perceptual level and an emotional levels" (p. 304).

Correspondingly, performer's bodily movements may cause the same musical performance to provide different experiences to the audience.

Visual aspects of musical performance are not only functional, since they do not convey merely formal information. With the help of emotional expression, body movements, and behavior patterns that ultimately indicate who they are, performers seek to create the audience's impression about their performance. In this context, "musicians do not only play music; they also play roles" (Auslander, 2009, p. 304). For the reason that mostly musicians' personalities create audience's perception of their musical performance, solo musicians (for example, in comparison to average orchestral performers) with their solo parts, obviously affective states, and corresponding bodily movements have higher chances to produce a special effect on public.

The investigations by Armontrout et al. (2009) and Schutz and Lipscomb (2007) demonstrated that visual information intentionally provided by musicians may create a certain illusion that determines audience's perception of musical performance. According to the researchers, live musical performance may lead to a naturally occurring audiovisual illusion provided by a musician's gestures (that occur in the process of playing) the visual information of which changes the perceived duration of simultaneous auditory information. However, they underlined that this illusion is controlled by the duration of musician's post-impact motion that influences the audience's perception of event duration (Armontrout et al., 2009). The intentional creation of this illusion can be explained by the musician's desire to strengthen the effect and audience's unforgettable impressions of his or her musical performance.

Overall, non-verbal musical gestures are a part of human body language. This way, by gesticulating during performance, a musician communicates with the audience. According to the recent statistical data, "55% of the impact of human communication is attributable to body language"; besides, "over 65% of our communication is non-verbal" (Psaila, 2007, p. 1). All these facts demonstrate that the significance of bodily movements should not be underestimated. By using gestures during musical performance, musicians provide the audience with conceptual and emotional messages (Psaila, 2007).

Music-related ancillary bodily movements (mainly, gestures) are an essential part of communication between a performer of live music and the audience. The research evidence (provided by Kühl, n.d.; Nusseck & Wanderley, 2009; McNeill, n.d.; Psaila, 2007, etc.) suggested that the majority of musicians' gestures traced in musical performance have special psychological and emotional effects on public. For example, McNeill (n.d.) applied a psycholinguistic approach to musical gestures in order to demonstrate in his article that a gesture is a communicative movement that becomes a representation of a sign language. According to the author, beats (sometimes called as "baton" by musicians) are musical gesticulations or speech-farmed gestures accompanied by rhythmical beating time by a hand; beats highlight important moments "signaling the temporal locus of something the speaker feels to be important with respect to the larger context" (McNeill, n.d., p. 4). Overall, musician's beats usually attract the audience's attention because they may echo human heart beats, reflect emotional and psychological states (for example, stress, excitement, expectation, etc.), and provide a musical composition with rhythmical harmony.

Sometimes, a musical performance can be accompanied by a musician's expressive gestures. Nusseck and Wanderley (2009) revealed that "expressive performer movements in musical performances represent implied levels of communication and can contain certain characteristics and meanings of embodied human expressivity" (p. 335). The authors suggested that sometimes, classic musicians intentionally use large body motions for exaggerating particular moments in musical phrases; this behavior produces an expressive effect on audience causing it to make more emotionally colored judgments about a musical performance (Nusseck & Wanderley, 2009).

Meanings embodied in musical gestures form corresponding impressions of the audience experiencing a musical performance. For example, Kühl (n.d.) underlined that "gesture becomes the key to the understanding of musical meaning" (p. 1). In other words, musical gestures should be treated as physical expression of particular feelings (for example, love, sadness, etc.) and emotional states (such as joy, disappointment, etc.) that, in their turn, shape audience's impressions of musical performance. Moreover, musicians' gestures can be traced in different musical styles with the help of which musicians' motions may embody a

particular social context, cultural values, meanings relevant to the present or the historical past, and even national identities (Kühl, n.d.). Gestures not only attach expressivity to musical performance, but also help to create audience's positive or at least satisfactory impressions of the musical event.

It is essential to admit that the audience's impressions from musical performance vary depending on a musical style, (Tagg, 1999). For example, in the context of a classic music concert, visual images provided by musicians make people feel participants of a music event; in other words, a live musical performance provides the audience with a sense of belonging. At the same time, the audience members remain passive, since they "are observers who have no impact or influence on the entertainment they experience" (Sayre & King, 2010, p. 521). Nevertheless, the atmosphere presented at popular music concerts is another one. Musicians' gestures and other bodily movements accompanying a musical performance produce a sense of a real-life interaction between performers and the public. In this case, audience members feel active participants of the event. According to Sayre and King (2010), "musical performances in which audience members shout out requests can be considered interactivity" (p. 521). In other words, popular music events make live musical performance an interactive entertainment with greater emotional and psychological loads than those traced at classic music concerts do.

The evidence (provided by Eco, 1976; Tegg, 1999; Auslander, 2009; Kühl, n.d., etc.) suggested that visual information embodied especially in musicians' personality is the attribute of a live musical performance. Performers' facial expressions and expressive bodily movements (including gestures and cues) have a significant impact on the audience's impressions of musical performance. In the process of musical communication, musicians take advantage of the powerful psychological and emotional effects provided by visual information. All visual images contained in musical performance allow performers to transmit particular messages to audience members, to generate certain emotions and feelings in them, and to provide them with a new experience.

3.2.3. Music Significance of Percussionist's Gestures

Percussionists are musicians who use particular gestures in the process of their musical performance. Percussion instruments (including bass drum, shaker, xylophone, cymbals, triangle, etc.) require specific gestures from performers that produce necessary musical effect (Knight, 2005). The works of numerous authors (including Mowitt, 2002; Rossing, 2000; Campbell & Hill, 2008, etc.) provide the idea that the research attention to percussionists' gestures and their music significance is evident. The present section will demonstrate the obvious significance of percussionists' gestures for music.

According to Rossing (2000), the significance of percussionists' playing was recognized a long time ago. Blades (1992) underlined that since pre-historical times, percussion musicians have occupied a special place in society. For example, people of Stone Age used primitive percussion instruments to alert or warn their community about oncoming danger, or to attract one's attention (Rossing, 2000). Religious ceremonies among ancient (and even modern) tribes (of Africa, India, North America, etc.) cannot be imagined without drummers who are believed to contact the world of spirits. Besides, tribal shamans usually used hand percussion instruments for spiritual, emotional, and healing rituals (Kalani, 2008). In the Middle Ages, church bells were commonly used for making significant announcements or heralding a solemn event. During war times, military drummers enheartened soldiers strengthening their courage and patriotism (Blades, 1992). Campbell and Hill (2008) paid attention to the fact that today, cultural and stylistic diversity in music makes professional and amateur percussionists experiment with different percussion instruments and techniques, and take part in public musical performances. Overall, as Rossing (2000) admitted, "throughout the years, drums have been used for signaling, for sending messages, and for marshaling troops to battle as well as performing music" (p. 3). This way, percussionists' historical importance cannot be underestimated because since the ancient times till nowadays they have played significant social, religious, and cultural roles.

The overview of the development, variety, and other peculiarities of percussion instruments will help to reveal percussionists' gestures that can be seen during their musical performance.

Parsons (2001) admitted that percussion instruments are considered the oldest musical instruments that amaze average people with their variety. Since the term "percussion" means "struck", it is not surprising that all ancient and modern percussion instruments are those instruments in which sound is produced by striking (Rossing, 2000). According to Smith and Bersh (2012), with a lapse of time, a range of percussion instruments has widened; correspondingly, percussionists' playing techniques have become more complicated.

Since the remote past, percussion instruments have greatly changed. Blades (1992) provided the idea that archaeological evidence, pictorial representations, and literary references to primitive people's first musical instruments suggested that the earliest known percussion instruments are those made of naturally sonorous materials (such as wood, skin, bone, metal, etc.). In addition, ancient people used rattles (small hard objects bunched together), stampers (resembling stamped pits in the ground covered with a wooden lid), and scrapers (notched stone, gourd, bone, or shell with a hole) (Blades, 1992). Strong (2011) added that in the remote past, people also started using drums, some of the most popular percussion instruments (known for its great variety) used nowadays.

Drums became the first resonant percussion instruments requiring from a player to use sticks or palms for beating and producing a sound. With the lapse of time, people created the variety of different percussion instruments (including darbuka, triangle, bodhrán, etc.) that can be seen today in orchestras, at national festivals, on parades, and other public places where musical performance can be heard (Knight, 2005). The brightest feature of modern percussion instruments is the usage of different materials in order to create them and techniques (or styles) for producing special effects. Overall, one may admit that musical instruments have passed a long way of their development from primitive to sophisticated forms.

Being the oldest family of musical instruments, all percussion instruments can be classified in different ways. For example, Rossing (2000) classified them into four following groups: idiophones (marimba, cymbals, gongs, etc.), membraphones (bass drum, timpani, djembe), aerophones (samba whistle, siren, etc.), and chordophones (piano, cimbalom, berimbau, etc.).

Percussion instruments can also be divided into tuned (for example, keyboard instruments such as xylophone and celesta, tubular bells, etc.) and unturned (such as castanets, maracas, bongos) groups (Rhythm and percussion, n.d.). Kalani (2008) mentioned that hand percussion is usually treated as a separate type of percussion instruments held in hand (for example, shakers, clapping sticks, cowbell, etc.); they are usually opposed to drums and pitched percussion (such as marimba, xylophone, etc.) that are too heavy or inconvenient to be held by a musician. Anderson and Campbell (2011) paid attention to the fact that all these types of percussion instruments are used in music of different styles (classic, rock, ethnic, folk, pop music, etc.).

Percussion instruments may amaze with the variety of playing techniques. The representatives of Vancouver Symphony Orchestra (2012) identified the main playing techniques used by percussionists. According to this classification, three playing techniques can be distinguished: hitting (or beating), scraping, and shaking (Vancouver Symphony Orchestra, 2012). Correspondingly, different percussion instruments demand different playing techniques. For example, a hitting technique is used by the percussionists playing triangle and cymbals, a scraping manner is more peculiar for hang and güiro players, while maracas and rattles using requires a shaking technique. At the same time, as Mowitt (2002) admitted, some percussionists may use different techniques playing on the same instrument. This way, drum players may follow both beating and scraping techniques; in the first case, drummers use hands, drum sticks, or a foot pedal for playing, while in the second one, they use brushes. It is essential to mention that although beating, scraping, and shaking refer to different playing techniques, they all are based on the same striking principle (Mowitt, 2002).

Different playing techniques mentioned above help to produce a variety of sounds. Parsons (2001) identified the sounds that come from the percussion instrument family: “clash, clatter, rattle, boom, chime” (p. 8). All these sounds are produced in a rhythmical way during a musical performance. Overall, the ultimate musical effect of all percussion instruments is associated with rhythm generation. Dahl (2003) clarified that in the world of music, rhythm is understood as:

> 1) regular (or, occasionally, somewhat irregular) recurrence of grouped strong and weak beats, or heavily and lightly accented tones, in alternation; arrangement of successive tones, usually in measures, according to their relative accentuation and duration;
> 2) form or pattern of this; as rumba rhythm, triple rhythm (p. 6).

In addition, it is worth admitting that the way a percussion instrument sounds usually depends on its shape, size, and what it is made of (Parsons, 2001). Campbell and Hill (2008) clarified that sounds of percussion instruments are associated with different music styles and cultures. For example, gong (made of copper-based alloy, bronze or brass) comes from Eastern and South East Asian culture, and its sounds can be associated with orchestral classic style because this percussion instrument is frequently found in orchestras. Similarly, sounds of bodhrán (a frame drum made of wood and synthetic or animal skin) are associated with folk (mainly, Celtic) music, since this percussion instrument is believed to be traditionally Irish. As one may admit, different percussion instruments help to produce their own characteristic sounds.

Different percussion sounds (beats, tinkles, etc.) serve to achieve special music purposes. For example, Odam, Arnold, and Ley (1996) admitted that percussionists prefer using particular instruments to produce a specific sound effect, to provide a background rhythm, etc. It is reasonable to mention that whether percussionists' sounds are used for accompanying other musical instruments (for example, in a classic orchestra) or making solo parts fitting a musical composition (for example, at rock concerts), they can be produced in different pitch, timbre, and speed or tempo. Naturally, the pitch (whether it is high or low), timbre (dark, warm, harsh, etc.) and tempo (fast, moderate, or slow) of a percussion instrument should fit the harmony, melody, and mood of a music piece (Odam et al., 1996). As one may notice, the peculiarities of the percussion instrument family provide an opportunity to produce a variety of sounds for making desirable effects.Percussion instrument playing requires sound-producing gestures from a musician. Dahl, Bevilacqua, Bresin, Clayton, Leante, Poggi, and Rasamimanana (2009) revealed that percussionist's primary goal is to produce or modify a

sound. Sound-producing gestures of percussionists may involve their fingers, hands, and arms; however, their also move with their corpora for convenience. Dahl et al. (2009) admitted that percussion instruments require making the movements that are often noticed by an audience. Besides, it is reasonable to admit that percussionists' gestures are made in either standing or sitting position (Redmond, 2011). Mowitt (2002) underlined that the ultimate purpose of all sound-producing gestures is striking, and a flexible movement strategy requiring a free surrounding space seems to help percussionists to in achieving this aim.

Sound quality control is usually achieved by percussionists' flexible movements. As Dahl et al. (2009) mentioned, "in percussion playing, where both the position and the feedback from instrument tend to vary a great deal, a flexible movement strategy could be considered a prerequisite in order to adapt to different playing conditions" (p. 38). With the help of expanded "working area" of their instruments, percussionists may control tempo, rhythm, and dynamic level playable (Dahl et al., 2009, p. 39). In cases where feedback from instrument is not so important, a flexible strategy of percussionists' playing does not have any value; for example, the observations of percussionists' behavior demonstrated that some drummers prefer auditory feedback to tactile feedback (Bresin & Dahl, 2003). However, it is worth admitting that in the majority of cases, percussionists' flexible strategy is significant for percussionists' playing. Overall, sound-producing gestures have their own specificity associated with the involvement of musician's particular body parts (upper extremities and corpus) and free surrounding space; exactly these conditions determine the quality of a sound produced or modified.

Percussionists make different gestures used for both production of a sound and preparation for it (Bresin & Dahl, 2003). Dahl et al. (2009) noted that preparing for the upcoming sound event, percussionists transit the hands to their instruments, and may lean towards them for convenience. Bresin and Dahl (2003) added that in case of a drummer, the preparing movement may be characterized by "raising the drumstick up to a greater height, thus arriving at the striking point with greater velocity" (p. 112). In this context, Dahl et al. (2009) underlined that before playing, a drummer should ensure that the stick and hand are placed in

the right position to the instrument; for this reason, three main preparatory strategies can be used:

1) upward lifting with the arm, hand, and wrist;
2) lifting with the top pointing down followed by flicking back;
3) leading of the wrist. In the process of playing, percussionists use the so-called "drumming" gestures (Dahl et al., 2009, p. 39).

At the same time, percussionists' playing is accompanied with numerous other actions, as well: touching, pressing, tapping, flicking, caressing, rattling, etc. (Kalani, 2008). In addition, at both the preparatory and playing stages, percussionists tend to use large bodily movements in order to be able to hit the right spot of their instruments at the right time (Bresin & Dahl, 2003). It is worth admitting that all percussionists' preparatory or sound-producing gestures are relatively expressive (probably, for the exception of orchestral percussionists who tend to make moderate gestures) and ergonomic (in other words, reflecting optimal interaction of a musician with his or her instrument and surrounding environment).

Since beating playing technique is a widely spread one among percussionists, the overview of drumming (or striking) gestures seem to be relevant (Mowitt, 2002). Dahl et al. (2009) argued that percussionists use many percussion instruments, therefore, they use different kinds of striking gestures. Percussion instruments have different size, force, placement, and kinesthetic feedback to the player who has to adapt correspondingly. Depending on a percussion instrument, a musician should use various range and types of movements (Bresin & Dahl, 2003). It is worth mentioning that "percussion instruments generally produce sounds with impulse-life characteristics, a shared property that distinguishes them from most other instruments (such as woodwind or strings)" (Dahl et al., 2009, p. 39). Since onset times and durations are usually short, the percussionist's direct contact with the instrument takes a few milliseconds. In addition, the movement trajectory of the striking gesture is directly linked to the duration, sound level, and timbre of the stroke (Dahl et al., 2009).

Although many percussionists use their hands (mainly, palms or fingers) for producing a sound, it is common to use special striking tools, as well. Rock concerts, orchestral settings, and jazz festivals are the main application areas for percussionists who use sticks, brushes, or mallets (Kalani, 2008). According to Mowitt (2002), the percussionists using a hitting technique may use different objects such as specialized beaters, sticks, tippers, brushes and mallets that help to produce a beating sound. Striking with these special tools allows a performer to excite the instrument more vigorously than would be possible using only a hand. It is possible to alter the instrument's timber if a striking tool has a changed weight, hardness, and shape. Dahl et al. (2009) revealed that "a percussionist or drummer will grip the drumstick or mallet so that it is free to rotate around a fulcrum point, most commonly between the thumb and index finger" (p. 40). This way, the striking tool is free to rotate in the vertical plane; at the same time, a musician can use other fingers to stabilize, mask, or "lock" the sound if it is necessary (Dahl et al., 2009, p. 40).

Percussionists tend to follow certain rules for achieving excellence in musical performance (Dahl et al., 2009; Mowitt, 2002; Kalani, 2008; Bresin & Dahl, 2003). For example, strokes at higher dynamic levels are usually initiated from a greater height. With the help of so-called longer "runaway" used for stronger strokes, a percussionist may play loudly at low physiological cost (Dahl et al., 2009, p. 40). The more practice a musician has, the more efficient and smooth gestures he or she makes. Professional percussionists (including drummers) tend to display flexible and "whip-like" gestures when playing, while beginners or students demonstrate less control over the drumstick (Dahl et al., 2009, p. 40).

Nevertheless, even skilled percussion players may also have some problems when playing at extreme dynamic levels and tempi (Mowitt, 2002). Dahl et al. (2009) admitted, "to reach a desired high initial position becomes increasingly demanding when tempo increases and thus the combination very fast/very loud is difficult to achieve" (p. 40). Overall, it seems worth underlying that professional percussion playing requires the stiffness of the drumsticks (or mallets) that allow the player to excite the instrument with more force than possible with bare hands.

Although percussion playing with striking tools helps musicians to achieve high speed and loud sound, some music pieces still require using bare hands. Percussion playing with bare hands involves "concussion" instruments (primarily those that are used for scraping or shaking), and helps to achieve special musical effects achieved with softer and more sophisticated sounds (Kalani, 2008, p. 4). The sphere of hand percussion application embraces orchestral settings, folk festivals, rock concerts, and other areas where popular music can be heard. Such hand percussion instruments as tambourine, rattle, hands drum, and shaker are highly demanded instruments during playing and singing at live performances and various music recording studios where bands want to record their music piece in a new version (Kalani, 2008). Overall, hand percussion instruments are appreciated by musicians and the audience for generating excitement, energy, relaxation, meditation, and spirit of social unity (Campbell & Hill, 2008).

Taking advantage of different playing techniques (beating, scraping, and shaking ones), hand percussionists use different gestures to achieve a desirable musical effect, primarily, necessary pitch, timbre, volume, attach, and decay that fit a music piece. According to Kalani (2008), the value of sound-producing gestures in hand percussionists' playing cannot be underestimated, since they help to maintain rhythmic acuity, to switch from one music style to another, to warm up, to cool down, to attach charisma to a live performance, etc. Overall, since a powerful music effect of percussion instruments is evident, hand percussionists' gestures deserve special attention (Mowitt, 2002).

Grosso (2000) noted that in order to make a particular gesture, a hand percussionist should use some actions without which high-quality percussion playing would be impossible.

Kalani (2008) identified three categories of percussionists' actions: path, duration, and force. Path can be direct, directional (along a curve or line) and circuitous (indirect/changing). Duration can be either momentary or sustained, while force – either gentle or short (Kalani, 2008). The categories of percussionists' actions suppose that the musician touches, taps, presses, strikes, rubs, flicks, scrapes, caresses, shakes, and rattles his or her percussion

instrument. As one may admit, percussionists' gestures vary, and reflect a complex behavioral system that helps to achieve a desirable music effect (Grosso, 2000; Kalani, 2008).

Kalani (2008) revealed the world of hand percussionists' specific gestures performed by musicians using either one hand or both hands during playing. For example, when a hand percussionist uses one hand, he or she may follow general, zonal, or the so-called "digital" strategies (Kalani, 2008, p. 8). A general strategy supposes using the entire hand making moves from elbow to shoulder. A zonal strategy makes a percussionist use palm, fingers, or thumb primarily moving from the wrist or forearm. Finally, a digital strategy involves individual fingers moving from knuckles or joints. It is worth mentioning that according to all these strategies, a percussionist's gestures may be single (reflecting one-directional hand movement), reciprocal (making a musician perform a hand movement in opposite directions), or rotary (supposing percussionist's movement around a circle). In case when a percussionist uses both hands while playing, he or she uses the same strategies mentioned above in a simultaneous or alternative mode (Kalani, 2008). Taking into consideration the variety of percussionists' gestures, one may see that different movement strategies help musicians to produce different music sounds.

It is reasonable to mention that all percussionists (both musicians using hand percussion instruments and those using special tools to play on them) tend to use expressive rather than moderate gestures while playing. In other words, whether a percussionist's sound is gentle or strong, it is mostly accompanied by expressive hand movements. For example, the investigations of Bouënard, Gibet, and Wanderley (2008) suggested that timpanists' expressive playing comes from the tools they use to produce a sound. By making "legato", "tenuto", "accent", "vertical accent", and "staccato" gestures, timpanists achieve a corresponding sound (Bouënard et al., 2008, p. 39). Each of these gestures supposes a particular trajectory of drumsticks. This way, legato is made with an up-and-down gesture, tenuto and accent – with a movement reflecting increased velocity and decreased space, occupation, and vertical accent and staccato – with a gesture characterized by increased velocity and space occupation for a more powerful attach and loudness (Bouënard et al., 2008). One may admit that timpanists' playing includes several obviously expressive gestures

that can be easily noticed by the audience, and traceable in a recorded version of a musical performance. Overall, timpanists' expressive sound-producing gestures attach a particular music value to the sound quality of orchestral music.

In case of hand percussion playing, expressiveness of musicians' gestures is also evident. Kalani (2008) proved this evidence by overviewing the movements and musical effect of musicians' playing on shekere. According to the author, a shekere is associated with African and Caribbean rhythms used in folkloric music. Hence, this hand percussion instrument should be used as follows: by shaking, flicking, tapping, and caressing the instrument, a performer makes single gestures in an alternative mode. The shekere is usually rocked gently back and forth; this manner of playing makes the instrument "float" between the hands (Kalani, 2008, p. 43). A shekere is often used for rhythmic music accompaniment; for this reason, a percussionist strikes the base of the instrument for accents and sort staccato notes. A desirable music effect is achieved by the qualities of this instrument characterized by medium and high pitch, dry and coarse timbre, loud volume, medium attack, and fast decay (Kalani, 2008). One may agree that a wide dynamic range of a shekere allows performers to make expressive gestures that attach a special musical effect to the musicians' performance.

While playing, percussionists tend to make both short and long gestures that help to gain control not only over a quality of a sound, but also over its perception. The reality demonstrated that percussionists tend to use long rather than short gestures (Schutz & Kubovy, 2006). In their turn, long gestures made during a live music performance may produce an illusionary music effect making people believe that a sound produced with a long gesture leads to a longer sound than it is in reality.

Floyd (2010) even admitted, "skilled performers can strategically manipulate audience experience in order to achieve a desired result" (p. 2). However, the investigations of Schutz and Kubovy (2006) demonstrated that in real life, a gesture length does not influence an ultimate duration of a note. The findings of the study indicated, "while differences in gesture length offer no acoustic control over actual note duration, visual gestures allow the performer to control perceived note duration" (p. 148). According to of Schutz and Kubovy (2006), the

perception of note duration depends on the manner (mainly, visual or auditory) of representation of a percussionist's playing.

Overall, percussionists' gestures possess great significance in music regardless of its style (Campbell & Hill, 2008). Usage of gestures helps percussionists physically embody the music they perform. Floyd (2010) implied that percussion players make numerous gestures following different techniques. For example, using a concert bass drum, a percussionist may produce whole notes. A tambourine player performs a shake roll to produce crescendo. Marimba playing may require using a note marked staccato. One may agree that each of the mentioned techniques is associated with corresponding gestures enabling "the listener to perceive the effect intended by the performer" (Floyd, 2010, p. 1). In its turn, this effect makes the audience literally see the music, and experience it through visual images created by percussionists' movements of hands or special tools.

Dahl (2003) suggested that all percussionists' gestures are an integral part of percussionists' movement strategies aimed to create a particular music effect. This effect is characterized by both provision of a rhythm (or accents) and an emotional intention. In order to provide rhythm properly, a musician should not only strike at a specific moment of time, but also to take into consideration the physics (mainly, physical properties of percussion music instruments) lying behind a sound (Kalani, 2008). In other words, all music qualities of a particular percussion instrument should be perfectly known to a percussionist for producing a necessary sound harmoniously fitting a music piece.

This way, sound-producing gestures are the reflection of skilled movements characterized by a high level of efficiency and ergonomics (Dahl, 2003). Dahl (2003) mentioned that besides rhythm provision, percussionists' movement strategies help to attach an emotional effect to a music piece, as well. The observation of percussionists' movement cues allowed the researcher to conclude that the so-called "Angry performance was characterized by large, fast, uneven and jerky movements, Happy performances by large, somewhat fast movements, and Sad performances by small, slow, even, and smooth movements" (Dahl, 2003, p. iii). Hence, for the reason that percussionists gestures have a potential to provide a music piece

with both rhythmical patterns and emotions, these gestures are obviously significant for music.

According to the scientific evidence (provided by Blades, 1992; Dahl. T al., 2009; Kalani, 2008, etc.), percussionists' professional movements generated with the help of bare hands or special tools for sound production help to visualize music for both the audience and other musicians. Knowing about the opportunities of pitch, timbre, volume, attach, and decay of each percussion instrument, a musician makes a corresponding gesture for preparing for and producing a desirable sound. All main gestures of percussionists can be traced in various playing techniques (beating, scraping, and shaking ones), strategies (general, zonal, and digital), and actions (touching, tapping, pressing, rubbing, flicking, rattling, etc.) that allow to generate legato, tenuto, accent, staccato, etc. Besides, the usage of percussionists' gestures in the context of a particular music style helps to transmit specific emotions embedded in a music piece. Overall, the importance of percussionists' gestures should not be underestimated, since they attach conceptual and emotional significance to music.

3.3. Chapter Summary

The present chapter was dedicated to the analysis of the relationship between music and gestures produced when producing music that can potentially alter the audience's impressions from the musical performance. Tarasti (2002) admitted that music is not only the product of the human creative activity, but also the emanation of values, relations, gender, and other aspects of the human culture. Music was studied by semioticians that regarded it as a sign and a system of signs. Tarasti (2002) also found a connection between music and myth that both develop from language. Leman (2008) made a conclusion that music is a polysemantic unity that makes use of several codes simultaneously. The author generated a scheme to illustrate the ways in which audio stimuli are processed in terms of auditory images.

Miclaus (2011) researched the heavy reliance of music on visual support, thus admitting that music is an emotional language of humanity. London (2010) emphasized the growing role of

visual components in music production and presentation. Speaking about the visual image as an additional cue to perception of music, Vines et al. (2011) claimed that music is a means of communication that is mostly similar to language, and it represents the channel through which emotional perception takes place. Platz and Kopiez (2012) researched the influence of visual effects on the perception of music, and identified a major research gap in this field of research. Stevens (2009) also stated that the research on musical emotions is mostly unclear at present, and it is the field researched by various, at times contradictory, fields of science such as cognitive psychology and music education. Sloboda (2005) dwelt on the influence of music on the emotions of the audience, and found a strong correlation between the presence of visual cues and the emotional loading.

In the field of studying music as an additional perspective for gesture decoding, the research findings of Leman and Godoy (2010) and Hatten (2004) implied that gestures are highly important in the perception of music, and they function as features of a person's perception-action system. According to these researchers' findings, gestures in the musical performance possess a much deeper meaning and higher value than the plain physical movement. Nusseck and Wanderley (2009) admitted that the kinematic demonstrations of clarinetists they researched showed that musical instruments are played with body motions employed to communicate important meanings. Musical gestures are thus seen as the means of communicating a holistic, musical, and expressive unit of the musical performance. Dahl et al. (2010) dealt with the communication between co-performers and also found out that their gestures serve for communication, and contain non-verbal communication signs.

The emotional expression in musical performance has been extensively researched up to date. Thus, for instance, Deutsch (2013) admitted that music and emotion are linked to the concept of meaning acquired by referencing music to some extramusical phenomena such as human experiences and emotions. Nawrot (2003) claimed that all people are sensitive to emotionally colored information contained in the musical performance, while Zijl and Sloboda (2010) stated that musicians navigate the emotional coloring they give to music they perform by choosing among their own emotions and the technical use of musical means. Juslin and Persson (2002) regarded expressivity as one of the crucial aspects of a musical performance

by admitting that performers usually communicate their emotions to the audience by means of using the same acoustic code used in the vocal expression. Patel (2008) inferred that the human brain processes musical sounds similarly to the super-expressive voices, and Juslin and Lankka (2003) noted the importance of articulation in the transition of emotions through a musical performance. The impact of visual information on the audience has also been proven by numerous researchers. Eco (1976) applied the semiotic theory to the study of music, while Tagg (1999) admitted that musical semiotics is the study of musical codes and their transmission. Harrison (2003) stated that musical performance lies in the field of visual social semiotics, while Schutz (2008) stated that a musical performance is a meaningful and emotionally loaded negotiation between the performer and the audience. Juslin (2006), Tagg (1999), and Vines etal. (2011) claimed that a musical performance can transmit both the conceptual and emotional meanings, while Titon et al. (2009) recognized music as having a bioacoustic nature.

The significance of gestures in the performance of percussionists has also been widely researched; Rossing (2000), Blades (1992), and Kalani (2008) assumed specific significance of percussionists' gestures during a musical performance. Percussion instruments are the oldest type of musical instruments known to the humanity; the ancient shamans played them, and percussions were also extensively used in the Middle Ages. There is a great variety of percussion instruments in the modern music; Mowitt (2002) admitted that percussionists typically use different techniques during playing the same musical instrument. Dahl (2003) tied the variety of percussionists' gestures with the concept and significance of rhythm in music, while Odam et al. (1996) stated that percussionists use various instruments to produce specific sounds. Dahl et al. (2009) found percussionists to be able to achieve sound quality control achieved by flexible movements, while Kalani (2008) researched the use of hands, sticks, tippers, beaters, and other supplementary instruments for sound production and alteration by percussionists.

Chapter 4

Methodology

The choice of the methodological framework to address the research questions formulated in order to achieve the ultimate research objective appears to be crucial for a successful completion of a study. It presupposes finding an optimum way to establish the truthfulness of the research hypothesis by way of using different criteria and instruments to find the sought result with a near-optimum utilization of resources available. Development of a solid methodological ground presupposes careful planning, well-controlled implementation, thorough analysis and using the analyzed data for the development of valid and plausible conclusions.

In order to provide this study with accurate and comprehensive research data, a methodological approach was designed to operate three sets of data obtained from varying samples. This chapter includes the description of the research design, sampling, instruments, and variables that are characteristic of the overall canvas of this study. It also dwells upon each of the three data collection contexts, each of them being an individual experimental research design. Each experiment is described in terms of the specifics of the dependent and independent variables, with an account of the research procedure, data collection and processing instruments, the presentation of findings, significance and validity of the obtained results.

4.1 Research Design

This research operates the data expressing measurable relations between the selected variables. This makes the quantitative research methods the most appropriate for the purpose of this study. According to Curwin and Slater (2004), quantitative data provides “an awareness of magnitude, expressed in numerical terms, [which] allows more effective description, more effective communication and develops the ability to ask the right questions” (p. 1). The authors stressed that a wide variety of questions can be addressed by utilizing numerical description and analysis. Quantitative research presupposes description of

the objective reality through numbers, which provides data for the construction of models of varying kinds. These models are "a projection onto reality of our understanding, and not reality itself" (Tolmie, Mujis, & McAteer, 2011, p. 5). This implies the necessity of verifying the accuracy of the developed models by hypothesizing and testing. Numerical data correlate with the reality in a similar way. More specifically, numerical entities are not a fact of the objective reality, but a way of representing it. Analyzing phenomena through their measurable characteristics allows researchers to capture patterns which are not obvious otherwise, predict possible developments, as well as test the validity of theories developed to study specific areas of knowledge (Tolmie, Mujis, & McAteer, 2011, p. 5). The two quantitative research designs employed in this study are true experiment and survey.

The experimental method, as Bartlett described it, gives the researcher "a sense of evidence, a realization of the difficulties of human observation, and a kind of scientific conscience which no other field of study can impart so well" (as cited in Bernard, 2011, p. 82). There is a logic according to which true experiments are conducted, which presupposes five stages. The initial phase is formulating a hypothesis that will be subsequently tested. The second stage involves random assignment of participants to the intervention and control groups. After that, the dependent variable or multiple variables are measured in one group or both of them. The fourth stage is when treatment or intervention is introduced. Finally, the dependent variable is measured again after the intervention (Bernard, 2011). There are possible deviations from the general formula, however. In particular, the specifics of this study presuppose no pre- and post-intervention testing, since the effect of the independent variable is rather spontaneous in its nature and cannot be planned. Gorard (2001) described the strength of the design in the following way:

> In many ways the experiment is the 'flagship' or gold standard of research designs. The basic advantage of this approach over any other is its convincing claim to be testing for cause and effect, via the manipulation of otherwise identical groups. (p. 133)

Above this, experimental studies may provide tools for measurement of the magnitude of the studied effects. Whereas other research designs may be used for establishment and observation of a relationship between some variables, experiments can ensure accuracy of measurement of this relationship. There is a viewpoint that for this reason only experiments are instrumental in order to "produce secure and uncontested knowledge about the truth of propositions" (Gorard, 2001, p. 133).

Other advantages of experimental designs include, first, flexibility that gives an opportunity to operate the data obtained from varying numbers of groups and used for the comparison of different variables. In addition, outcome measures may take a variety of forms, although the most common mode involves coding the data in the numeric form. Besides, one of the most empowering strengths of the design is the absence of the need for a big sample. Thus the number of the participants can be reduced to a minimum that is common for surveys, for example (Gorard, 2001).

However, despite the strengths of this design, there are inherent weaknesses as well. One should keep in mind its limitations associated with internal and external validity. According to Cohen, Manion, and Morrison (2011), an essential objective of the experimental design is imposing control over the factors that might otherwise make the true effect of the independent variables on the dependent ones obscure. Although in true experiments, the control of such conditions is significantly stronger than in quasi-experimental designs, it is impossible to fully eliminate threats to validity. Internal validity of the experimental aspect of this research may be jeopardized by statistical regression, flaws in testing, instrumentation, selection, instrument reactivity. External validity of the experimental designs, in turn, is linked to the issue of generalizability of the results (Cohen, Manion, & Morrison, 2001).

In order to ensure comprehensiveness of measurable data, another research design is used in this study. Using a survey is likely to widen the scope of the research. As Gorard (2001) indicated, this method is quite common despite its inescapable weaknesses: "Surveys are generally inferior as a design compared to experiments as they are less well theorized […].

Even good ones cannot hope to establish a causatory explanation for any observed phenomenon." (p. 80)

The survey design used for the purpose of this research does not rely on the descriptive approach, but rather the comparative one. In other words, it is employed "to find out how one group differs from another" (Sapsford, 2007, p. 10), which makes it applicable in terms of the treatment and control groups. Validity of the results obtained from such a research design is ascertained by way of concentrating on three aspects:

1) validity of measurement – the degree to which the data reflects the specifics of the studied phenomenon;
2) population validity – reliability of the obtained results as representative of the population;
3) validity of design – propriety of the comparisons for the establishment of arguments resting on them (Sapsford, 2007).

A combination of the two research designs is likely to ensure versatility of the obtained quantitative data. This, in turn, is likely to increase validity of the results and give an opportunity to generalize the elicited trends.

4.2 Sampling

According to Lohr (2010), sampling is essential in the research planning. A perfect sample would be what Lohr called "a 'scaled-down' version of the population, mirroring every characteristic of the whole population" (2010, p. 3). Although the existence of a perfect example is not possible for complicated populations, a well-selected sample is possible to compose, and it should be representative, i.e. the characteristics of interest that the sample should demonstrate can be assessed on the basis of this sample with a sufficient degree of accuracy (Lohr, 2010).

Another feature of a good sample is that it has specific responses concerning the items of interest. If a response in the survey deviates from the true values, it results in measurement error. Also, measurement bias takes place if a response differs from the true value in one specific direction. As these aspects affect the overall outcome of a study, it is necessary to consider measurement error and bias and take steps to minimize them at the design stage (Lohr, 2010). In order to maximize accuracy of the obtained data, the design stage of this study was carried out with close attention. Using several different research types operating on the basis of different samples was a strategy to both retrieve the data that would reflect varying measurable aspects of the effect of the visual component on music perception and ensure a minimum measurement error and bias. Since the highest probability of these developments could be expected at the survey stage, though this research type itself was a useful source of information on the intensity of music perception and effectiveness of the visual component, the researcher used a smaller sample for this phase to minimize the possible effects of the abovementioned limitations.

The data used for quantitative analysis in this research was obtained from three measurements that took place at three varying stages. The first phase, experimental in nature, involved two groups consisting of 15 music students each. The groups were equal in size and age (17 years old on the average), thus the only variable was the listening situation stressing presence or absence of the visual component. All participants were students of Escola Profissional de Musica de Espinho, which ensured that their level of musical perception was approximately equal.

The second phase also presupposed the involvement of two groups whose responses were compared on the basis of quantitative data obtained from surveys. This stage also took place at Escola Profissional de Musica de Espinho. The sample included 12 percussion music students (19 years old on the average), which ensured the accuracy of the estimates they provided for musical expressive components. The participants were subdivided into two equal groups.

The third phase of the study took place at the Center for Interdisciplinary Research in Music Media and Technology (CIRMMT) in Montreal, Canada (www.cirmmt.org/). 16

representatives of an audience watching a percussion concert were involved. They were grouped similarly to the first and second stages, which helped maintain methodological consistency. Simultaneously, using different samples at various stages of the research fostered generalizability of the obtained results, as the population includes both professionals and laymen.

4.3 Instruments

The instruments used for the three stages of the study are compliant with the research designs utilized to obtain quantitative data from experimental and survey data. The instruments for the experimental study that took place at the first stage included special equipment that could register fluctuation in the perception of the musical dynamics. Participants used a 10K potentiometer with a rotative control button that was equipped with a relief surface on the scale, which enabled them to concentrate on their perception of the music without looking at the scale while manipulating the button.

For the second phase, a questionnaire was used consisting of seven questions pertaining to various aspects of the participants' perception of the musical pieces selected for the study. The design of the survey implied that the participants used their own senses to assess their perception of music, contrary to the instruments of the first and third stages where the effects of visual and blind listening modes were measured by special equipment, even though in the first experimental study the participants were in control of the equipment.

The third stage was aimed at the measurement and analysis of the involuntary reactions of the participants, so to this end a wide range of equipment was used to measure the variance of biometric parameters as they changed after visual and blind listening. Since there are multiple parameters of this kind, it is important to consider each of them. The biometric data was obtained by using blood volume pulse sensors, skin conductance sensors, respiration sensors.

Heart rate is a reactive metric that responds to various stimuli promptly. For example, fluctuation of more than 10 b.p.m. from an established baseline is interpreted as a measurable

response, whereas such anomalies as peaks and plateau might indicate a change in the emotional state. Heartbeat detected by a corresponding sensor is stored for later download and processing (Smeaton & Rothwell, 2009).

Galvanic skin response represents a measure of the electrical conductivity of the skin that is affected by the individual's perspiration exuded. As Smeaton and Rothwell noted, "changes in the eccrine sweat glands of the skin cause perspiration and have been linked to increased emotion, arousal or attention" (2009, p. 2). Finally, respiration frequency fluctuations are likely to be similarly affected by the changes in the emotional state of ttention of the listeners in the process of the experiment. The data obtained from this equipment can be collected on the precomp boxes before it can be processed and used for ultimate analysis on a computer.

Using these sensors allowed the researcher to ensure that the slightest reactions to music perception were registered, captured, measured and analyzed even if neither the researcher nor the participants themselves were able to sense them. Thus a variety of instruments intended for measurement of voluntary and involuntary reactions to visual and blind music perception utilized for the purpose of this research provided the near-maximum accuracy of the obtained data and rigor of the analysis.

4.4 Variables

When establishing the dependent and independent variables of this study, the researcher relied on the distinction described by Babbie (2008) in the following way:

> Essentially, an experiment examines the effect of an independent variable on a dependent variable. Typically, the independent variable takes the form of an experimental stimulus, which is either present or absent. That is, the stimulus is a dichotomous variable, having two attributes – present or not present. In this typical model, the experimenter compares what happens when the stimulus is present to what happens when it is not. (p. 247)

Though a common and most useful approach to distinguishing between dependent and independent variables is that the former is the effect, whereas the latter is the cause, there might be more complex designs, as some phenomena are reciprocal in their influence and it may be challenging to establish which of the two variables is the experimental stimulus. Nevertheless, despite the whole complexity of the assumed relationship between music perception and the visual component of a musical performance, it appears possible to make a distinction between the area that is likely to influence and the one that is likely to be influenced. Since the principal criterion for the comparison of data sets obtained in this part of the study is the presence of absence of the visual component of a percussion musical performance, this variable can be called the experimental stimulus. The effect of the visual component on the listeners' perception appears to be central for this and the following parts of the study. Therefore, the latter is the dependent variable, whereas the former is the independent one.

4.5 Experiment 1

4.5.1 Specifics of the Dependent and Independent Variables

As it has been mentioned before, the three phases of the study addressed varying aspects of such a complex and multifaceted phenomenon as music perception. The measureable aspect of the dependent variable considered during the first experiment was the sensitivity of the perception of dynamic characteristics. The independent variable was the visual component – the video of the musical performance that was demonstrated to one group of listeners as accompanying the aural perception, whereas the other group had to rely on the sounds of music exclusively. The hypothesis offered for testing was that the audience exposed to the live performance and, correspondingly, perceiving the pieces in progression by using two perception channels would respond to musical dynamic differently than the audience whose only source of information incoming from the piece performed was the aural channel. Therefore, sensitivity of dynamic perception, being the influenced area, can be assigned the role of the dependent variable.

4.5.2 Research Procedure

The research procedure was designed in order to comply with the requirements of a quantitative experimental research design. The perception situation used at this stage involved specific professional context. The experiment was carried out at Escola Profissional de Musica de Espinho, where 30 students aged 17 on the average were selected for the sample. They constituted the experimental and the control group. One group including 15 students had a conventional listening situation, in which they had an opportunity to see the performance as well as hear it, whereas the other one, used for comparison, was deprived of the ability to see the visual component of the performance, as their eyes were covered. The experiment lasted for 22 minutes.

Figure 3 Dynamics perception experimental group.

The audience was offered two musical works. The first one was *Sen VI* by Toshio Hosokawa for Multipercussion, the other – *Vox Sum Vitae* by João Pedro Oliveira for Vibraphone. All participants were using a 10K potentiometer, which they were asked to use in order to report their perception of dynamics during a solo percussion performance.

Sen VI is an unusual musical piece that can serve the purpose of this research quite effectively. The piece was written for solo percussion and one of its outstanding features is its strong links to the visual significance of gesture, which conditions the propriety of using this piece for the experimental research design addressing the importance of the visual component for listeners' perception of music. According to Tolentino (n.d.),

> Inspiration for these gestures comes from the art of Japanese calligraphy and the use of a significant, expressive gesture before each brush stroke. During the piece, the performer activates vocal noises and uses only hands and soft mallets to play skin drums and a single crotale. (p. 8)

The opening pages of *Sen VI* encompass vast, graceful arm gestures drawing on the preparatory strokes of the Japanese calligraphy. The score written by Toshio Hosokawa harnesses tied and empty measures in order to demonstrate circular moves sometimes followed by an intense attack, and sometimes not by an attack, but a period of silence or a preparatory movement. It is the performer's decision ultimately how these gestures should be carried out (Tolentino, n.d.).

There is claimed to be a relationship uniting the gestures executed by the performer and the physical impact tracing either "a disjointed attack, where the gesture ends before the attack is initiated; or an exaggerated attack, where an unnecessary large gesture is connected to and immediately precedes an attack" (Tolentino, n.d., p. 4). In case if the disjointed attack is used, the musician should incisively thwart the energy of movement that would otherwise reflect on the drum severing the preparatory movement from its subsequent impact. On the other hand, the disproportionate version presupposes that the performer should use the unnecessary accumulation of movement for a strong and individual attack. Therefore, Tolentino as a performer argued that the technique of gesture is equally important for the esthetic effect of the performance of this piece as the score itself (Tolentino, n.d.).

Tolentino indicated in relation to this work:

> In percussion performance, a performer executes an attack using the gesture he finds necessary to execute the sound. *Sen VI* pulls at the heart of this notion by asking us to control not only a sound and its precision, but also the mechanical direction of our motion leading up to that sound. (n.d., p. 4)

The choice of a gesture during the performance of *Sen VI* might affect listeners in various ways. A linguistics student majoring in American Sign Language cited by Tolentino maintained that deaf people have a visual connection to sound. An individual with a strong link between the visual and aural channels of perception might associate the volume of the sound with the scale and size of the gesture accompanying it (Tolentino, n.d., p. 4). By way of using the example of hearing-impaired individuals the author suggested that "a preparatory motion that preserves momentum that lacks a resulting attack" might actually *sound* for that individual, if he or she watched a performance of *Sen VI*. The ability to "see" the sound might preserve the inspirational content of the piece for a person who cannot actually hear it.

Another interesting hypothesis is that this person might have a more conventional music listening experience if this person was positioned closer to the area where drum vibrations are physically perceptible. Tolentino called this a "cognitive twist", since "normal-hearing listeners [are] perceptually limited by what they can in fact hear" (n.d., p. 4). Finally, *Sen VI* is criticized for what disapproving individuals call latent "inaccessibility" to all people, which can be viewed from a diametrically opposite standpoint. More specifically, *Sen VI* deserves close attention for an indication of a strong connection between movement, image, sound and the ultimate effect on the audience. For some gesture can arguably speak louder that music itself (Tolentino, n.d., p. 4). Such an inherent connection between sound and gesture stressed by performers and researchers makes this piece a perfect instrument for the study of the effects of the visual component of the performance.

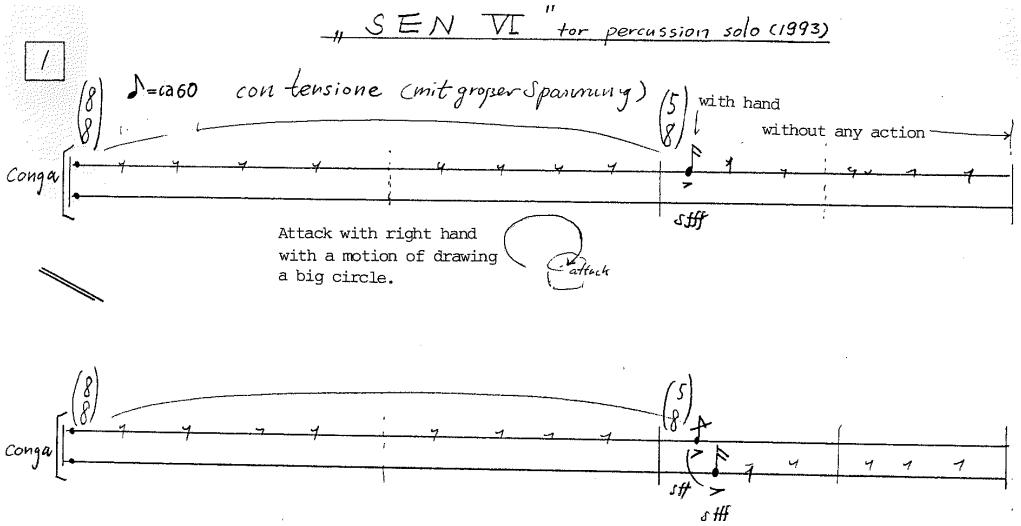

Figure 4 score excerpt of *Sen VI* , by Toshio Hosokawa

The second piece used for the first experimental stage of the research is *Vox Sum Vitae* composed by João Pedro Oliveira. This composer is one of the most prominent modern composers of Portugal. He has an extensive education that involves such different arts as music (organ performance) and architecture, so his esthetical views are quite rich. His music is represented by varying genres: a chamber opera, a range of orchestral compositions, one Requiem, three string quartets, solo instrumental music pieces, as well as electroacoustic music. His experience and eclectic taste resulted in experimental music exploring the possibilities of interaction between electroacoustic and instrumental sounds, which draws equally on both sources (Babel Scores, 2013).

The title of Oliveira's work *Vox Sum Vitae* (I am the voice of life) is an allusion to an inscription in a church bell located in Strasbourg. The essence of the piece is described in the following way:

> In one of my trips to Germany, on a Sunday morning I was woke suddenly with the sound of hundreds of church bells, announcing the early morning church service. This piece is a representation of that sound image. It intends to lead the

> listener in a trip where bell sounds are around him (emphasized by the distribution of the loudspeakers in the room and the spatialization of the electronic sounds) (New York City Electroacoustic Music Festival, 2013, p. 31).

The produced sounds and instrumental gestures carried out in the process of performance are blurred and melted in the electronics, which leads to an illusion that the vibraphone turns into a "carillon of infinite bells" (New York City Electroacoustic Music Festival, 2013, p. 31). The blend of media used for the performance of this piece and its inherent strength seeking to imitate the power of a bell consonance through the utilization of contemporary technology also justifies the choice of this musical work for the study of the effect of the visual component on listening perception.

While listening to the pieces the participants were asked to use their potentiometers to signal the dynamics of the music while solo percussion performance was in progress. Utilization of a potentiometer proved a useful instrument for the establishment of one aspect of the visual modality in music perception. The dynamics of the reactions of the participants correlated with the pieces' progression in detail, which allowed the researcher to use empirical data and build models reflecting the relationship between the visual and audial modalities as linked to the perception of musical dynamics.

4.5.3 Data Collection and Processing

The collection of the data and transferring it into codifiable and comparable form that is useful for quantitative research requires utilization of special software that is likely to simplify the data analysis and model construction stages. To this end, Laboratory Virtual Instrument Engineering Workbench (LabVIEW) software was employed at this stage of the study. LabVIEW is a method with a high standard productivity that is conditioned by a set of characteristics:

1) readability – the overall bulk of information obtained is easy to process and implement, a single computer can present a significant amount of the problem domain;

2) writability – designs developed by using the software are easily transferrable into the real world;

3) editability – the software gives an opportunity to edit the existing developments rather than create new ones, a range of templates is available to facilitate data collection;

4) reusability – once developed code may be reused for other projects;

5) understandability – the software provides a large toolkit for the visualization of the problem (Conway & Watts, 2003).

LabVIEW is supported by a wide range of toolboxes designed for specialized applications which are essentially compact collections of code that are specific to the application. Using these code templates is useful and practical because they help save a significant amount of development time. Among these toolboxes is the signal processing toolkit, which is applied to digital filter design and time-frequency analysis. Sound and vibration toolset maintains audio measurement, sound level assessment, transient analysis, and frequency response. State diagram toolkit provides a basic tool set utilized for interactive development and state machines implementation (Gupta & John, 2010). This software allows the researcher to select experimental parameters for the control of instruments used in this experimental research. Therefore, the LabVIEW instrument sets developed as templates modifiable to apply to varying types of data ensures the simplicity of operation, neatness and the possibility of transformation of the obtained measurements into a visual model reflecting the dependency of the listeners' perception on the absence or presence of the experimental stimulus. Also, LabVIEW instruments are helpful for the task of drawing tendencies in the variances of the perception of dynamics in either of the groups.

Since the data used in this experiment is quantitative, the relationships established as a result can be presented in the graphical form that would reflect the variances and dependencies characterizing the correlation of the aspects of the dependent and independent variables

defined for this research. Graphical presentation of quantitative data may take the form of a graph or a diagram constructed by using the resources of Microsoft Excel or a similar software option.

4.5.4 Significance of the Data

The data obtained at this stage of the research appeared to be illustrative of the trends characterizing the abovementioned relationships. It also indicated that the choice of the sample consisting of 30 people was representative, as the measured variances allowed the researcher to establish illustrative trends, as the visual and blind listening audiences demonstrated different levels of music perception sensitivity. Moreover, the study gave an opportunity to register minor aspects of this dependency that served as additional confirmation to the hypothesis. The specific aspects of the experiment results will be discussed in the corresponding section. The data obtained from the first experimental context provided the researcher with a sufficiently objective model. It reflected the relationship between the chosen variables viewed from one perspective and estimated on the basis of one characteristic. The sample size, professional data analysis software tools, and an adequate duration were the aspects that stipulated the validity of the obtained results.

4.6 Experiment 2

4.6.1 Specifics of Dependent and Independent Variables

The send phase of the data collection process in this dissertation was also of experimental nature, but the way in which dependent and independent variables were assessed differed from the first stage of the present study. The present stage also addressed the concept of music perception, and variables measured through this intervention related to the impact of visual component on the specificity of music perception among the participants. The independent variable involved in the experiment again included the visual component, as two groups participated in the second experiment, one exposed to blind listening, and the other one – receiving both visual and aural cues. The present feature is similar to that of the first

experiment's procedure. However, the dependent variable in the second experiment related to successfulness of perceiving the musical expressive components during a percussion musical performance. The present variable was measured not objectively, through certain biometric appliances, but subjectively – allowing the experiment's participants to evaluate their impressions in self-reports through closed-ended surveys.

4.6.2 Research Procedure

Experimental settings for the present intervention were designed with proper regard to the requirements of experimental design as well, and involved the creation of a specific experimental context in which measuring the variables of interest would be more effective, and the impact of extraneous variables could be minimized. The second stage of experimentation also took place at Escola Profissional de Musica de Espinho, and included 10 students aged 17 years old divided into two equal groups into the experiment. The piece that served as research material in the present experiment was *Spatial Network* for multi-percussion by Beau Sievers previously recorded at UCP TV Studios for the research purposes.

Beau Sievers is an outstanding modern percussionist, and it is much more notable that he positions himself as both a composer and a researcher. At present, Beau Sievers is working on a PhD in Psychological and Brain Sciences in the Wheatley lab at Dartmouth College. The specific focus of his research is the connection between music, motion, and emotion, which means that he is a music cognition researcher. Some other fields of his research interest revolve around the principles of music synthesis, incorporation of electronic and computer elements into music, and mixing and mastering engineering (Beau Sievers, 2013). The underlying basis of Sievers' Master's thesis is that musical emotion operates according to mimetic principles in relation to the emotion-signifying movement, which allowed him to hypothesize that music-motion-emotion mappings can be formulated concerning specific musical pieces (Sievers, 2010).

There is little known about *Spatial Network* as a musical piece, but Doug Perkins, one of today's promising percussionists, characterized it as a work able to incorporate computer

technology into the act of composition itself. The reason for such specific feature of Spatial Network is that the piece does not exist on paper, so it is performed as a changeable "open score" piece generated in real time by each performer during each performance (Johnson, 2013). However, the specificity of multi-percussion performance is also a subject to consider, as it may be a specific variable of interest in this particular experiment.

As Cangelosi (2013) indicated, multi-percussion is an outstanding musical medium opening up new avenues for the expression of equal creative energy from both the composer and the performer. The process of multi-percussion performance composition involves the combination of several differently sounding percussion instruments for the purpose of creating something new, which will ultimately represent a hybrid musical instrument with a particular sound. According to the author, uniting a snare drum with its own voice and sound with such instruments as high-hat, bass drum, tom toms, or ride cymbals give birth to a new social order among the chosen group of the instruments, which should be taken into account and properly organized to receive the intended sound.

Another specific feature of multi-percussion music is to give it a proper direction; Cangelosi (2013) explained this as follows: in regular music, tonal melodies have a built-in guide for direction made up of the seven tunes, each with its specific function. However, in multi-percussion music, there are no pitched instruments that would give a directive guide to the performer. Therefore, it is the task of the performer to communicate that guide to the audience and to explicate the relationships between musical instruments, showing which musical material is important. Because of this specificity of melodic formation of percussion music, percussionists often have to make inspired decisions about phrasing, melody, shape, and form of their music, which they often complement with their body movements and emotions (Cangelosi, 2013).

4.6.3 Data Collection and Processing

The present stage of research involved data collection by means of using a closed-ended survey, and the method of intervention delivery was the exposure of participants to visual and

blind listening to a discussed musical piece. Those exposed to blind listening used only the audio information broadcast by means of a Sony CMT-SBT100 hi fi system. The experimental group received sound through the same system but was also exposed to the video of percussion performance through a Sony KDL-42EX440 device. After receiving corresponding visual and/or aural information, participants were offered a seven-point closed-ended survey offering them to evaluate their emotions and specifics of perception.

Since the specifics of experimental research design and procedures has already been discussed in the previous section dedicated to the first experiment, there is a clear necessity to reveal the peculiarities of survey research used in the second experimental phase. Survey research is considered the key applied took in social sciences research, since it offers a wide variety of opportunities for learning about society and specific social phenomena (Marsden & Wright, 2010; Punch, 2003). Surveys offer a toolkit for collecting information on individuals, households, organizations, or larger entities through questioning systematically identified samples, which provides the researcher with an opportunity to receive systematic, standardized sets of analyzable data (Marsden & Wright, 2010). Surveys are mostly quantitative, and they enable the researcher to explore relationships between variables. The major task of the investigator is to conceptualize variables that need to be measured, and to find out the trends of their distribution (Punch, 2003).

The quantitative aspect of any phenomenon of interest is best explored by means of applying closed-ended questions in the survey design. Babbie (2010) defined open-ended questions as those "for which the respondent is asked to provide his or her own answers" (p. 256). In-depth, qualitative interviewing is also a popular method of data collection, but it can be used for specific purposes only, and it has a number of limitations such as researcher's bias, confidentiality of participants, time-consuming nature of such interviewing, and the possibility of processing data from a limited study sample – with the sample's increase, the depth of analysis may be lost. As for closed-ended questions, they are defined as "questions in which the respondent is asked to select an answer from among a list provided by the researcher" (Babbie, 2010, p. 256). Such an approach is popular because it provides great

uniformity across responses, and the results of such surveys can be processed and codified more easily than the results of an open-ended survey are.

Gideon (2012) criticized the use of closed-ended questions in survey research because they give a limited number of responses as available options for respondents. However, the researcher also pointed out that using such form of surveys is desirable when the researcher aims at exploring something well-researched and well-documented in prior research literature. Using such an approach allows the researcher to make better-informed decisions between a limited set of options, and make clearer conclusions on one theory's (or hypothesis') prevalence over another one.

Closed-ended questions can be formulated differently, with multiple-choice options focusing on specific aspects of a phenomenon of interest, or with a grading scale asking the respondents to evaluate their experiences, attitudes, knowledge, or emotions regarding a certain issue. According to Grossbauer (2001), the common rating technique used in survey research is the Likert scale; it is "a system allowing people to rate how they feel about something by choosing a word or a number" (p. 51). Blazey (2009) indicated that the advantage of the Likert scale is its relative ease and speed of administration, and ability to elicit the opinion of a wide variety of population's categories. However, there is a disadvantage of the Likert scale as well: it is simple and descriptive, which makes results received from the Likert scale survey subject to a wide variety of interpretations.

Speaking about the survey designed specifically for the present research, it aimed at the identification of the quality of perception self-rated by the experiment's participants. The variables of interest constituted the duration of performance, the average pitch region of the composition, the tempo, dynamic range, and rhythmic content of the performance. The survey also intended to find out the overall self-rating of the quality of perception that participants acquired during their exposure to either only aural or both aural and visual cues of the performance. The survey presented to respondents looked as follows:

Dear Participants, after listening (and viewing) the performance of Beau Sievers' Spatial Network, you are asked to evaluate your impressions about certain aspects of the performance, including your overall impression about the performance. Please keep in mind that the rating you will be giving to the heard (and viewed) piece is the Likert scale evaluation, the 5-point scale in which number 1 means the lowest level of impression, and number 5 means the highest level of impression. Thank you for attention and participation.

Questions	**Answers**
- How did you percept the duration of the performance? (1 the shortest 5 the longest)	
- How did you percept the average pitch region of the composition? (1 low frequency 5 high frequency)	
- How would you classify the variation of the tone/timbre of the composition? (1 poor variation 5 rich variation)	
- How did you percept the tempo (bpm) of the composition? (1 slow tempo 5 fast tempo)	
- How did you percept the dynamic range of the composition? (1 low range 5 high range)	
-How did you percept the rhythmic content of the composition? (1 less rythmical 5 more rhythmical)	
How would you overall evaluate the performance you listened to? (1 not interesting 5 very interesting)	

Figure 5 Survey for Experiment 2

The data received from the survey will be processed with the help of descriptive statistical analysis; since the variables within this survey have already been quantified with the help of a Likert scale rating system, the easiest and most illustrative way of their analysis and presentation of results will be in the form of diagrams, descriptive statistical graphs, and charts, with the subsequent analysis of identified trends and differences in music perception between the control and the experimental groups.

4.6.4 Significance of the Data

The survey portion of data in the present research possesses specific significance in the overall framework of the study because it has some specific features not reachable through experimental research alone. As Cottrell and McKenzie (2005) noted, survey research is often considered descriptive in terms of revealing the attitudes, opinions, beliefs, values, and characteristics of a certain phenomenon being studied. It helps to compare subgroups and also provides rich data on revealing the individual opinions of respondents, at the same time providing proper confidentiality of data. Survey research is also considered an ideal way of getting information about a particular group of interest – in the present case, data on the opinions of groups exposed to blind listening and visual listening will be received and compared, allowing the researcher to identify differences in perception between these two key groups of interest.

At the present stage of data collection, the sample of 10 respondents divided into two groups of five persons is considered representative, as it gives an idea of basic differences in perceptions of people exposed to only aural information and both aural and visual information related to a percussion performance. Though measurements of objective characteristics of respondents' emotional reactions to a performance constitutes the basis of the present research, it does not give an opportunity to assess the way in which respondents themselves evaluate their emotions and experiences after exposure to a performance, which can be compensated with the help of including a self-assessment survey. Therefore, the survey results received as a result of completing the second experiment will serve a valuable

portion of information opening new pathways for understanding the mechanics of percussion performance's impact on the audience's perception through aural and visual cues.

4.7 Experiment 3

4.7.1 Specifics of Dependent and Independent Variables

The third portion of experimentation in the present study took the form of biometric data capture, which means that the method of biometric experience was used to measure involuntary physiological reactions of the audience regarding the chosen percussion performances. The experiment was designed similarly to the two experiments held before it, but its aim was to understand the differences in control and experimental groups' participants' involuntary reactions to the music they hear (or hear and see). The measurement of such differences was executed with the help of biometric sensors including the galvanic skin sensors, heart beat measurements, and breath sensors. The instruments used in this experiment enabled the researcher to collect and systematize data on the procomp boxes. The independent variable was again the presence/absence of a visual stimulus for the audience, while the dependent variable referred to the specificity of emotional reaction to the performance listened (and watched).

4.7.2 Research Procedure

The third experiment was conducted at CIRMMT in Montreal, Canada. The procedure of the experiment involved measuring the involuntary reactions of the audience exposed to either visual or blind listening during a contemporary solo percussion concert. The sample of participants constituted 16 persons, musicians and researchers on music, divided into two equal groups. The visual representation of the experiment can be found in Figure 6.

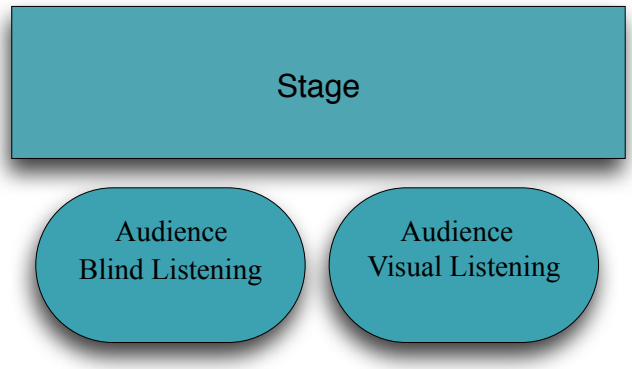

Figure 6 Experiment 3 visual representation

The concert program designed specifically for the third experiment consisted of three musical pieces: *'Xcuse Me While I Kiss the Sky* (2010) by Pedro Junqueira Maia, *Vox Sum Vitae* (2011) by Joao Pedro Oliveira, and *Tres Quadros Sobre Pedra* (2008) by Luis Antunes Pena. The instruments used during the present experiment included:

- Vibraphone
- Bass drum w/pedal
- Tom Tom 14" and 16"
- Snare drum
- Electric guitar
- Thai and Chinese opera gongs
- Wood block
- Chinese cymbal
- Guiro
- Tuned granit stones Ceramic bars
- Cowbells
- Garbage percussion
- Broken flower pots
- Tin cans

Other instrumentation involved in the process of designing and conducting the experiment included the amplification with reverb effect (1 pair of stereo microphones), amplification with directional microphone (1 microphone), a stereo PA connected via interface to the computer and a mixer used for electronic pre-recorded parts to be released.

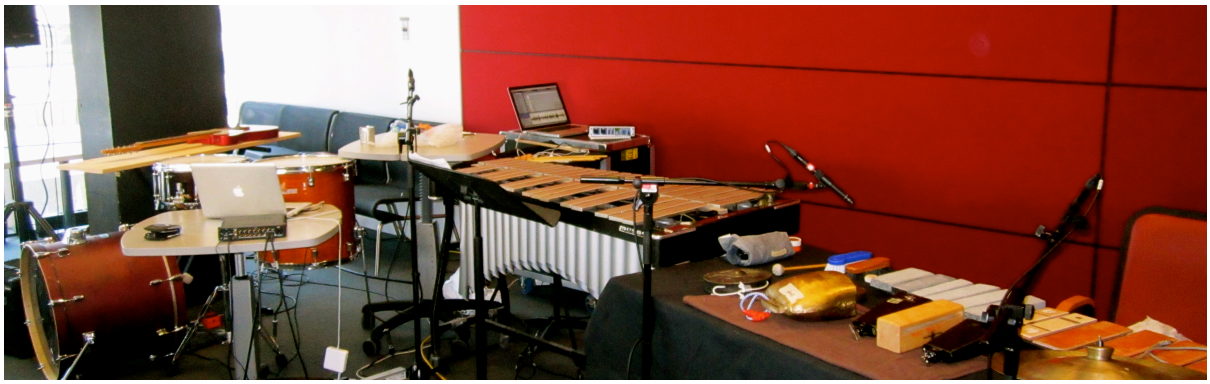

Figure 7 The instrumental set up for the experiment 3

4.7.3 Data Collection and Processing

A specific aspect of interest in this experiment is the equipment with the help of which various biometric properties of respondents were measured. For the purposes of this research, the Blood Volume Pulse (BVP) Sensor SA9308M, the Skin Conductance Sensor SA9309M, and the Respiration Sensor SA9311M by the were used.

Figure 8 - Sensors used in experiment 3.

The BVP sensor is a development of Thought Technology Ltd., and it represents a blood volume pulse detection sensor, a small package put on the finger and registering heart rate and BVP amplitude, BVP waveform, HR, and HR variability feedback (Thought Technology Ltd., 2013b). The Skin Conductance Sensor is an appliance used to measure conductance across the skin, and it is usually used by means of connecting to fingers or toes (Thought Technology Ltd., 2013b). The Respiration Sensor is an appliance containing a sensitive and repeatable girth sensor fixed on the human body with the help of a self-adhering belt for the purpose of controlling and measuring the respiration rate, waveform, and amplitude. The convenience of its use is preconditioned by the ability to wear it thoracically or abdominally, and apply it over clothing (Thought Technology Ltd., 2013b). After collecting data with the help of the described sensors into the procomp boxes, the researcher analyzed them with the help of Thought Technology Ltd.'s software, Biograph Infinity. The ProComp Infinity appliance is an 8-channel, multi-modality encoder with the power and flexibility of providing the real-time, computerized biofeedback and data acquisition opportunities in the experimental settings (Thought Technology Ltd., 2013a).

Figure 9 Procomp Box by Thought Technologies Ltd

Out of these eight channels, two channels are used to provide the ultimate signal fidelity for viewing RAW EEG, EMG, and EKG signals. Other six channels are aimed specifically at combining with any other sensors, such as those used for measuring skin conductance, heart rate, BVP, respiration, goniometry, etc. Therefore, ProComp Infinity may be used as a reliable and well-calibrated tool for obtaining a wide range of physiological signals in the

process of clinical research, observation, and experimentation (Thought Technology Ltd., 2013a). The ProComp Infiniti device is equipped with the BioGraph Infiniti software package allowing to obtain only the data the researcher needs; the user can choose only the software modes he or she needs, and install them selectively to receive precise research results. The Developer Tools in ProComp Infiniti provide an opportunity for the researcher to create screens, scripts, and channel sets of interest, which provides a high level of options' diversity under the conditions of using only one data collection and analysis system (Thought Technology Ltd., 2013a).

4.7.4 Specificity of Biometric Data Collection and Analysis

The core rationale for using biometric measurements in this research is the observation implying that neuroscience shows the connection between emotions and exposure of individuals to any stimulus. Thus, the initial emotions felt by people are processed below the conscious level, and cannot be adequately reported by individuals possessing them, which can be done effectively by biometrics. Biometrics is the field of bio-indictors' measurement focusing on the heart rate, skin conductance, respiratory rate, and human motions as revelations of people's emotional states and changes in them (Ipsos MORI, 2013). According to the opinion of Ipsos MORI specialists, biometric measurements are a realistic indicator of people's emotional engagement, which can be fruitfully used in many contemporary fields of activity such as advertising and marketing, emotion research, etc.

The most valuable contribution of biometric measurements to the present research can be noted in the ability of these indicators to unveil emotions lying under the level of consciousness, which is a highly valuable set of knowledge in the field of measuring emotional perceptions related to music. Members of the audience listening to music rarely feel and assess their emotional states at the conscious level, since music is a means of aesthetic impact on people's minds, hearts, and states of souls. Therefore, making a rational assessment on the basis of reported emotions is a highly challenging task in the field of music research. Assessment of physical responses is a more accurate and reliable measure allowing to learn what stimuli are delivered to the emotional centers of the human brain, which is

trustworthily revealed in the biometric changes such as heart rate or breathing (Glasspoole, 2012).

Taking these considerations into account, the researcher has chosen to measure the blood volume pulse (BVP) as one of the biometric characteristics indicating the measure of emotional involvement of the audience during listening to a musical piece with and without the ability to watch it. As Andre (2004) stated, BVP is a measure used to determine the amount of blood currently running through the individual's vessels; it reveals the vasoconstriction and heart rate of the subjects. Obaidat, Denko, and Woungang (2011) noted that low heart rate variability may imply the state of relaxation that subjects experience, while high variability indicates a stressful situation (which may be both a positive and a negative stress condition). Hence, BVP sensors apply the method of photoplethysmography for detecting blood pressure in extremities, which means that a light source is used, and light reflection by the skin is measured (Sankur, 2007). The mechanism of BVP measurement is as follows: during heart contraction, blood is forced through peripheral vessels, which results in the engorgement of vessels under the light source, ultimately changing the amount of light available for the photosensor's measurement. This way, BVP sensors are applied to the palmar side fingertip of the subject's non-dominant hand to minimize such extraneous variable's impact as motion artefacting. The rationale for using BVP measurements as a biometric indicator of emotion is in the control of vasomotor activity by the sympathetic nervous system, which allows suggesting that BVP measurements display changes in the sympathetic arousal (Sankur, 2007).

Skin conductance is another factor measured within this experiment, and the choice of this indicator is not random; according to Zeile, Hoffken, and Papastefanou (2009), skin conductance is an indicator for the electrodermal activity influenced by the perspiratory gland activity. Perspiratory glands are activated to perform the thermal regulation of the body in emotional situations. Thus, according to the principles of biometrics, emotional experiences and situations are usually accompanied with increased electrical conductibility of the human skin. Measuring the skin conductance of individuals may thus give hints at the autonomous nervous system's (ANS) activity, and may reveal the cognitive and emotional reactions to environmental impacts (Zeile et al., 2009). Miesenberger (2004) also added that skin

conductance sensors are connected to the skin surface with two electrodes, which allows recognizing even the weakest signals. Thus, if sweat is produced, the ability to conduct electricity increases, and higher skin conductance is indicated by the sensor.

Respiration sensor is also used in the present experiment as a source of biometric data on emotional states of subjects; according to Andre (2004), respiration sensors are used for measuring the depth and speed of people's breath by means of rubber band use around the chest. In cases when individuals reveal fast and deep breathing, such a state may be associated with excitement, anger, fear, and even joy. In the cases of rapid shallow breathing detected, tense anticipation with panic, fear, or concentration may be suggested. Slow and deep breath is commonly associated with relaxation, while slow and shallow breath serves as the manifestation of withdrawal, calm happiness, or depression (Andre, 2004). The use of emotion-sensing hardware in the present research is a highly helpful technique allowing to make a new step forward in understanding the ways in which people react to a musical performance. According to Senechal (2012), researchers around the world have become increasingly perplexed about the ways in which emotionally sensitive software can be developed in educational and other domains. Emotions affect human experiences to a tremendous extent, and shape their visions and impressions about phenomena and events; at the same time, emotions are often irrational and highly subjective, thus constituting a challenge for measurements. In this case, the discussed biometric indicators of human emotions are a valuable tool for researchers in the field of music research, as they provide a set of concise and accurate data on human responses to music of which they may not even be aware.

4.7. 5 Significance of the Data

Significance of data received from the third experiment discussed in the present section is hard to overestimate, since there has always been an intense research interest in automatic measurement of human emotions. As Peter and Beale (2008) indicated, emotional information can be obtained by means of monitoring the human facial expressions, gestures, and body language with the help of image capture and processing. Some other biometric measurements commonly used in tracking of physiological changes include heart rate,

respiration, etc. Biometrics is specifically related to detection and measurement of autonomic and involuntary bodily changes triggered by nervous system responses to a certain emotional impact within interaction events (Hartson & Pyla, 2012). Therefore, biometric data may be highly helpful in the research regarding emotional responses and perceptions of a musical performance because they clarify those responses in an objective manner by providing unbiased information about human responses of which the respondents may even not be aware. Under the condition of using good, precise, and specialized monitoring equipment, the researcher can obtain rich data on the human responses to certain stimuli, which can inform the research process tremendously.

4.8 Limitations of the Research Design

In line with the discussed research approaches, one should note that each of them has its own advantages and disadvantages. Obviously, the combination of research approaches chosen the present research strengthens it to a certain extent. However, at the same time, each of the methods has its own methodological limitations that deserve special attention for the sake of adequate and unbiased interpretation of results. Hence, the limitations of each approach should be revealed for the clarity of information evaluation.

Experimental research design is considered one of the strongest research methodologies providing the most unbiased and precise data. However, as Odle and Mayer (2009) pointed out, the such requirements as random assignment, experiment control, and appropriate measures may result in the artificiality of the experimental situation, which ultimately leads to obtaining non-truthful data. Moreover, perfect control of experimental conditions is next to impossible, which imposes the need to involve in a trade-off between experimental rigor and practical authenticity. Sattler and Lipscomb (2003) added that the limitation of experimental studies is in their limited use because of ethical considerations, and high cost. Nevertheless, the present limitation has been effectively mitigated in the present research through multi-institutional collaboration and involvement of the Porto Biomechanics Laboratory (LABIOMEP), Porto University (http://www.labiomep.up.pt) in a joint project to reduce costs and obtain richer data.

The survey research design is also a method of data collection possessing a range of particular limitations impeding on the value of obtained findings. As Klandermans and Staggenborg (2002) found out, survey research regards an individual as a unit of analysis, so it restricts itself to the explanation of individual opinions, attitudes, and behaviors. Hence, surveys are able to tell only a part of the human story, and they have to be complemented with other methods of research to provide more objective and precise data revealing the reality regarding some phenomenon of interest. Miller, Strang, and Miller (2010) added that surveys are limited because of their inability to demonstrate causation between variables, and can provide only certain associations. In addition, surveys cannot capture the complexity of a social situation, since the information obtained from surveys cannot go beyond the questions asked within a certain survey (Miller et al., 2010). Finally, the biometric measurement method also has a certain range of limitations that should be considered. Though biometric measurements are indeed capable of providing the adequate real-life data on the emotional reactions of research participants to a certain musical performance, there is always a need to take into account the baseline physiological differences in participants' indicators. For some people, fastened heart rate may be a normal condition, while for others, it may manifest a genuinely striking emotional reaction. Moreover, it is natural that some people may be more emotional than others, and the presence of differences in responses has to be treated and interpreted with much caution, in conjunction with other tests and indicators providing a much fuller personal (both psychological and physiological) profile of research participants.

Chapter 5

Results

The present section is dedicated to the analysis of results obtained in the process of conducting three separate experiments to identify the differences in perceptions among respondents exposed to blind versus non-blind listening of percussion performances. Each experiment's data will be analyzed in a separate section with regard to the key hypothesis of the present research – visual cues accompanying the percussion performance enhance the audience's experiences, and are manifested in more intense emotional reactions to the performance. Respondents' gender characteristics, statistical analyses, and visual representations of received data will be presented to explain the extent of differences between emotions experienced by participants, and a detailed discussion and interpretation of findings will be given in the final section of the chapter.

5.1 Experiment 1

The first experiment was directed at the investigation of dynamics perception among participants. To distinguish between the ways in which people perceive a percussion performance only with their ears and with visual cues, the group of 30 music students at Escola Profissional de Musica de Espinho was divided into two equal groups of 15 participants, and one group was exposed to blind listening to the musical performance (with their eyes covered), while the other one could listen to, and watch the percussion performance. The instrument with which respondents could report their perception of musical dynamics was the 10K potentiometer that students held in their hands and "drew" the dynamics by navigating the rotation control button reflecting the intensity of their perceptions. The potentiometer was equipped with relief surface on its scale so that respondents did not have to look at it to navigate it, and were able to move the button even with their eyes covered. The image of the potentiometer scale used for the present experiment can be seen in Figure 10.

Figure 10 The 10K Potentiometer Scale

The respondents were presented with two musical performances – *Sen IV* by Hoshio Hosokawa for Multipercussion, and the *Vox Sum Vitae* by Joao Oliveira for Vibraphone. During the performance, they had an opportunity to manipulate the button on the potentiometer to reflect their perceptions of music's dynamics. The preliminary testing results may be seen in Figure 11.

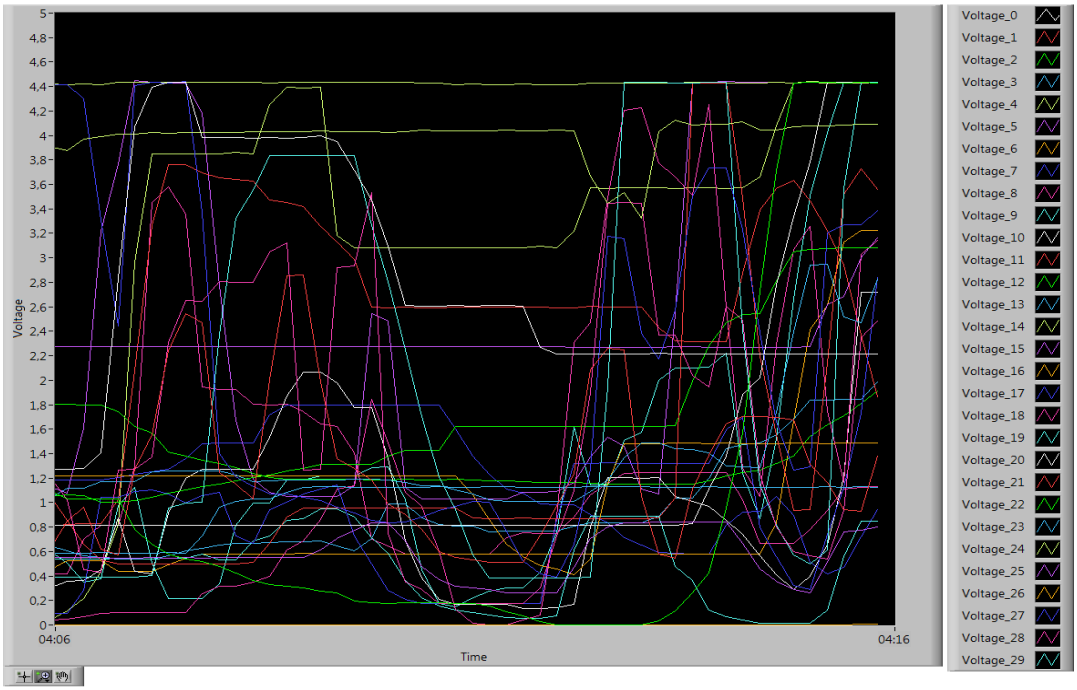

Figure 11 Preliminary Testing for Perception of Musical Dynamics

As one can see from Figure 11, all participants revealed differing extents of understanding the musical dynamics, and some participants displayed a low ability of distinguishing the twists and changes in dynamics of the percussion performance. The majority of respondents nevertheless exhibited a more or less similar tendency of musical dynamics' assessment,

which proves that the experiment may yield highly positive results, and may inform the present research with fruitful findings. The comparative testing results from two groups of respondents may be viewed in Figure 12.

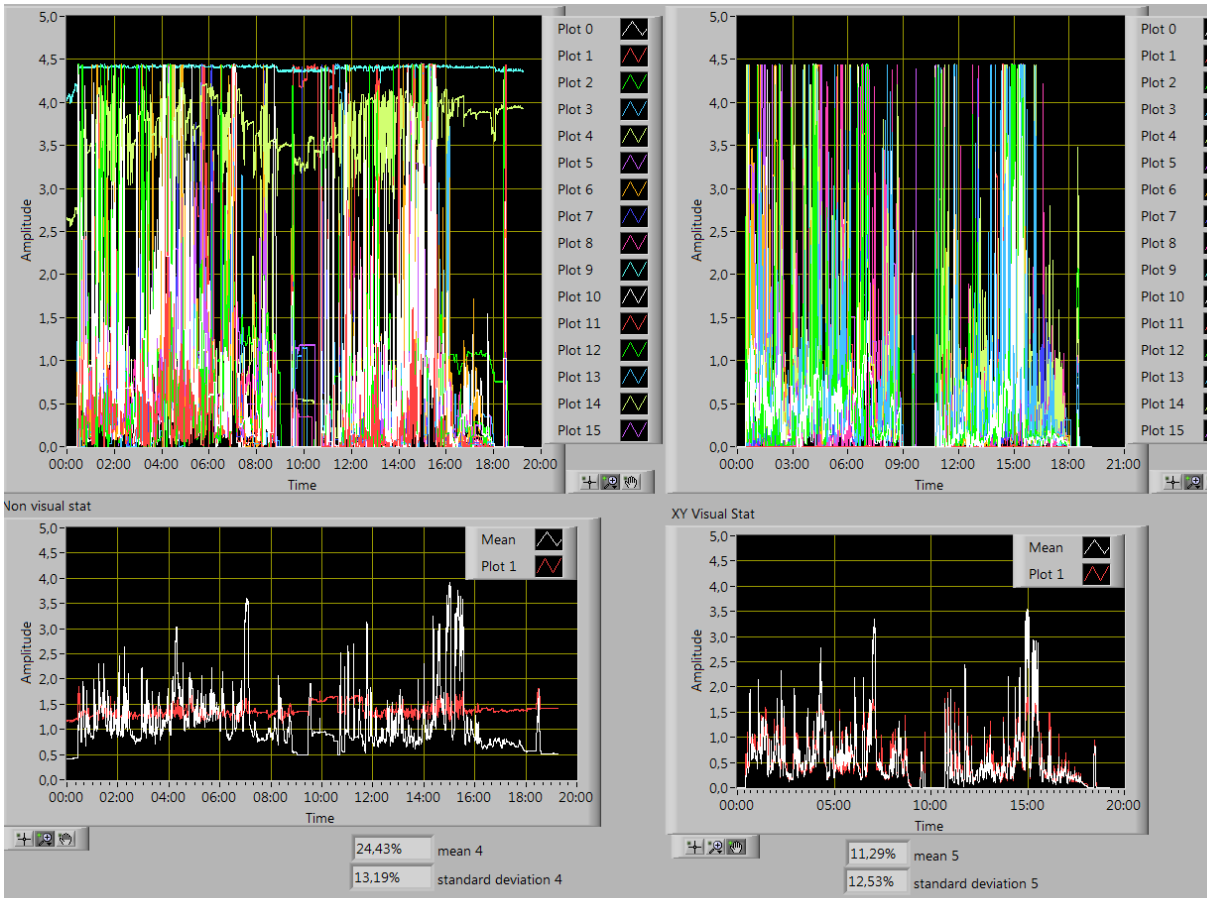

Figure 12 Dynamics Testing Results

As it comes from Figure 12, both groups displayed a relatively high level of dynamics' perception, and the majority of respondents managed to provide a sensitive image of musical dynamics in progress. However, some tendencies still stand out from the comparative analysis of the ways in which blind and non-blind groups perceived the musical dynamics.

First, it is evident that the blind listening group demonstrated a much more sensitive perception of musical dynamics – the diagram of blind group's reaction to the changes in dynamics, and the presence of numerous varied peaks and plateaus reveals the fact that blind listeners managed to grasp a much larger group of musical changes and variances. Moreover, a much higher level of musical perception's sharpness may be seen in the moments of silence

while the non-blind group seeing the pause in the percussionist's movements moved the potentiometer button to the zero indicator, the blind group's participants still sensed the dynamics of music and preferred not to choose the zero level, indicating certain levels of musical dynamics. It is thus possible to infer that the blind group did not indicate a zero level of activity as they reacted to the resonances and remaining sounds more sharply than the visual listeners did, most probably because of their inability to see the absence of movements and activity from the side of the percussionist.

Speaking about the visually enhanced group of listeners, the researchers noted that visual listening was accompanied with an ability to react to the percussionist's gesture before it was executed, which was reflected in the diagram – some fragments of musical dynamics were indicated by visual listeners before they actually occurred, which means that visual listeners perceive the dynamics present in music more with their eyes than with ears. Moreover, such observations imply that there is a tendency to rely on visual cues more predominantly throughout the process of listening to percussion performance, which is usually less melodic than other types of instruments can be. Therefore, the gestures performed by the percussionist are a vital component of the whole complex of musical performance's perception, speaking about those who are able to view and hear the performance simultaneously.

Finally, it is necessary to admit that another difference between blind and non-blind groups is the constancy of standard deviation among the participants of both groups. The researchers analyzing the potentiometer output found out that the standard deviation was more constant for the blind listening group, which means that blind listening was much more homogeneous in terms of musical perception among participants. This fact suggests that in case viewers have an opportunity to interpret the musical performance through dual channels, that is, sight and hearing, they may involve a much wider spectrum of criteria into their personal analysis of perceptions and impressions from the performance. Hence, those who only hear the performance have a much more objective and sensitive perception thereof, simply because they have only one available channel for the analysis of input data. Those who see and hear the performance have a wider range of opportunities for interpretation, and they may employ

additional factors such as their opinion about the appearance of percussionist, his or her emotional involvement, etc. in their judgments about musical dynamics. Thus, such extraneous variables may affect the ways in which participants perceive the performance, ultimately bringing about a much higher level of results' diversity.

5.1.1 Summary of Results on Experiment 1

Overall, the comparative analysis of musical gestures' impact on the musical performance's perception has shown in the present experiment that the gesture indeed has a certain narrative content, and it has to be perceived as a valuable contributor to the creation of the impression about a certain performance. Percussionist's gestures have proven to have a tremendous impact on the musical perception of the audience, but there is an obvious need to confirm the findings by means of conducting additional testing. Two more experiments will be discussed in detail to explore the role of percussion gestures and visual cues on the musical perception.

5.2 Experiment 2

The second experiment involved a 12-minute listening experience for two groups – one exposed to blind listening, and another one – to visual listening. The participant sample constituted 10 percussion students average aged 17; it was divided into two groups of 5 participants, and each of them was later offered to fill in the questionnaire relating to their perceptions of the musical performance. The questions asked to respondents have already been discussed in detail in the methodology section; hence, in this section, only the comparative analysis of students' responses will be presented. The answers to questionnaire provided by the blind group may be seen in Figure 4.

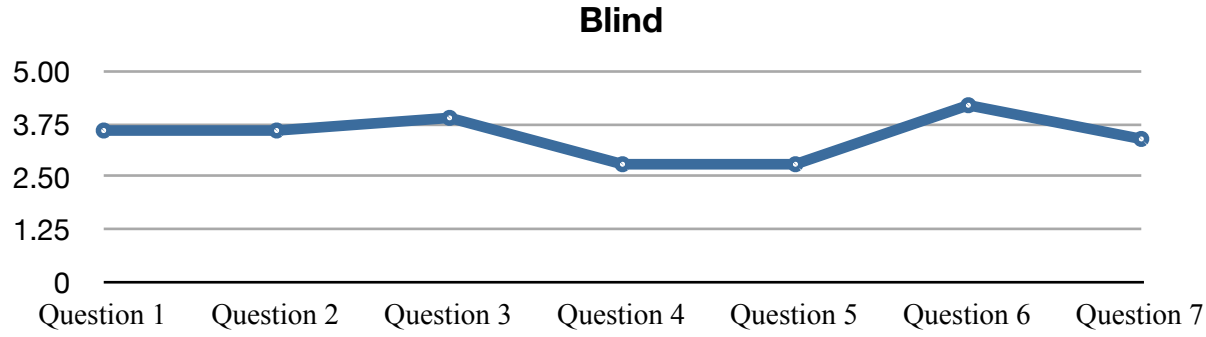

Figure 13 Survey Results for Blind Listening Group

Since the range of possible replies varied from 1 to 5, it is reasonable to assess the obtained data in terms of these responses; the lowest assessment was noted in questions 4 and 5, which asked about the perception of tempo and dynamic range of the composition. The average indicator for these two questions was 2.8, which means that the respondents did not perceive these features of the performance well enough. A bit better result was obtained for the duration and average pitch region of the composition (3.6 points each), and the variation of tone/timbre of the composition was evaluated slightly higher, receiving the average point of 3.9. Interestingly, the rhythmic content of the composition was perceived the best among the blind listening group, which implies that listening without watching the performance is still well connected with the perception of musical rhythm, for which percussion music is famous and with which it is mostly characterized. Therefore, one can assume that perceiving the rhythm of percussion music is not impeded with the inability to watch the visual cues of percussionist's gestures, which cannot be said about other features of music. It is notable that the overall evaluation of the performance was not high, with the average point being 3.4. The survey findings for the non-blind group can be seen in Figure 5.

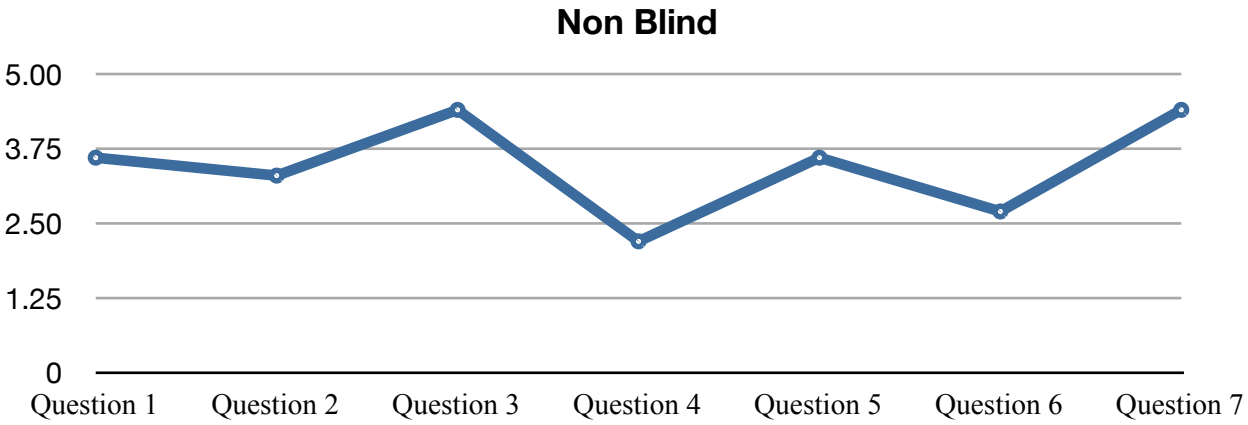

Figure 14 Survey Findings for Visual Listening Group

As one can see from the survey results for the non-blind group, which is the one that had an opportunity to listen to the performance and watch it simultaneously with listening, the lowest indicator was provided for the tempo (bpm) perception – 2.2 points on average. The duration of performance and its average pitch region were assessed relatively well, but did not reach 4 points – 3.6 and 3.3 respectively. The dynamic range of the composition was evaluated fairly similarly – at 3.6 points, while the rhythmic content of the composition

received a much lower estimate – 2.7 points on average. The overall perception of the performance was nevertheless high enough – 4.4 points, which means that survey participants evaluated their perception quality quite highly. However, to unveil the real-life trends and tendencies related to this experiment, one should present comparative statistics on the two groups – see Figure 6.

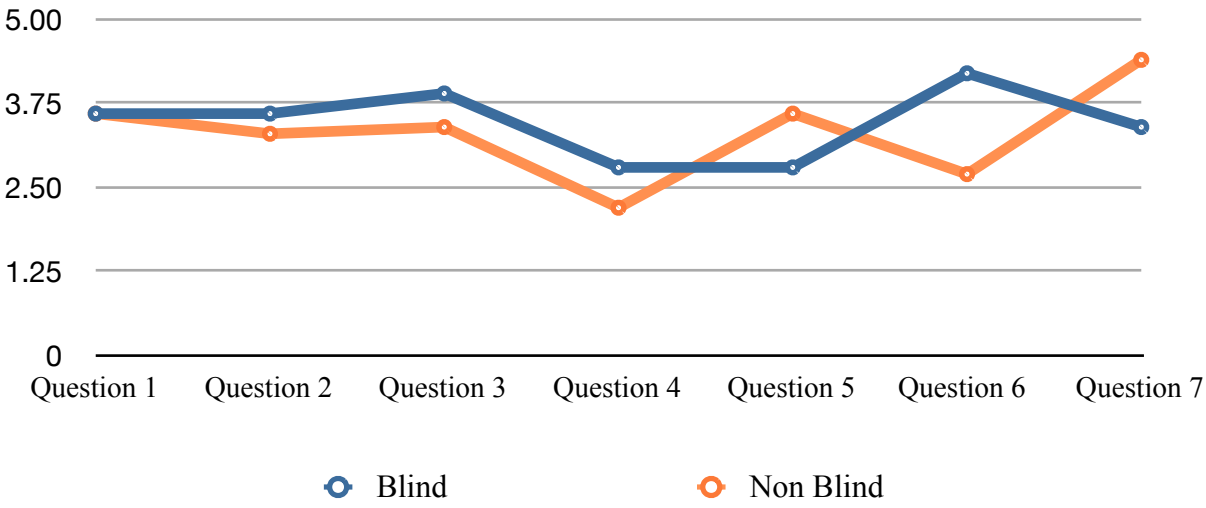

Figure 15 Survey results for both groups, comparison chart.

The comparative evaluation of survey results for blind and non-blind listening groups shows that the assessment of the performance's duration and pitch region of the composition are practically identical, while the assessment of variation of tone/timbre of the composition is significantly higher for the non-blind listening group. In terms of perceiving the tempo (bpm) of the composition, the blind listening group's participants surprisingly revealed a much higher assessment of this criterion, which may be explained by the fact that visually enhanced listening allows the audience to avoid concentrating on such issues as tempo, and involves them into the evaluation of other components of the performance. The perception of a dynamic range of the composition by visual listening group participants was also considerably higher than that of a blind listening group, which is understandable in terms of holism of perception.

However, the surprising difference may also be noted in terms of question 6 – the rhythmic content of the composition. The blind listening group assessed the rhythmic content of the

composition much higher than the visual listening group did, which is rather strange taking into account the overwhelming body of research on the topic of visual cues' efficiency and contribution to the musical performance's perception. However, such a difference in perceptions may be attributed to the fact that blind listening group did not experience the interference of visual cues that obviously enrich the perception of a percussion performance on the whole, but distract listeners from some purely musical features of the performance, such as, for instance, the rhythmic content. The overall perception of the performance was nevertheless higher for the non-blind group that assessed it one point higher than the blind group did, which may be attributed to the fact that indeed, visual cues provide a more holistic and more enriched impression from the percussion performance than only listening can do.

5.2.1 Summary of Results on Experiment 2

The comparative analysis of survey responses for both the blind and visual listening groups shows that there are some points in which perceptions about the performance coincide among the respondents, which is the duration of the performance and the average pitch of the composition. Such similarity of evaluation may be attributed to the fact that these characteristics are rather objective and do not depend on the ability of the respondent to see the performer. Hence, the similarities in answers are understandable in this context. However, there are pronounced differences in average answers to other questions, and it is notable that the blind group's respondents assessed the tempo of performance and its rhythmic content much higher than the visual listening group's representatives did. The noted difference in responses proves the findings of Tarasti (2002), Miclaus (2011), and London (2010) who stated that visual cues enrich the perception of a musical performance, but at the same time, they make the very process and output of perception different. People who watch a performance make a conscious emphasis on a different set of parameters they assess, and their ability to anticipate some movements and gestures of the percussionist also changes the way in which they envision the performance's characteristics such as rhythm and tempo. Moreover, the overall assessment of the performance by the visual listening group's participants one full point higher than the blind group's assessment makes the researchers infer than the visually enhanced performance produces a much more holistic and much more

interesting impression on the audience than the aural perception of the performance may provide.

5.3 Experiment 3

The group constituting the research sample in this experiment comprised 16 respondents; four of them were female, and 12 were male. The age average was 24 years old. All other socio-demographic variables have been presented in the methodology section. The overall experiment indicated that reactions of the visual listening group tended to be much more pronounced and much more gesture-sensitive than those of the blind listening group were. The average statistics on the biometric indicators of both groups can be seen in Figure 16.

Sensors	Blind Listening	Visual Listening
Blood Pressure	66 bpm	75 bpm
Skin Conductivity	0.5887 mho	8,556 mho
Respiratory	16 cpm	21 cpm

Figure 16 Average Biometric Indicators of Both Groups

For the sake of results' objectivity, preliminary measurements were made by the research team to estimate the extent of blind and visual groups' responsiveness to the musical performance. The preliminary biometric indicators can be seen in Figure 17.

Sensors	Blind Listening	Visual Listening
Blood Pressure	69 bpm	65 bpm
Skin Conductivity	0.6899 mho	0.6256 mho
Respiratory	18 cpm	17 cpm

Figure 17 Preliminary Biometric Results – 5 Minutes Before the Performance

Again, to satisfy all experimental conditions, the measurements were again taken in both groups five minutes after the performance, in rest and silence. These data can be seen in Figure 18.

Sensors	Blind Listening	Visual Listening
Blood Pressure	66 bpm	68 bpm
Skin Conductivity	0.5887 mho	0.7665 mho
Respiratory	16 cpm	18 cpm

Figure 18 Ultimate Biometric Results – 5 Minutes After the Performance

As the experiment's results indicated, the visual listening group performed more actively in their involuntary biometric reactions to the music as compared to the blind listening group throughout the whole experiment. The present observation may be explained by the fact that as long as music went denser, the physical action of the percussionist became more demanding and active, which involuntarily required a reaction from the audience, at the conscious and unconscious level. One of the illustrative examples of the biometric peaks of reactions is the response to *Vox Sum Vitae* by Joao Pedro Oliveira: around the 15th and 18th minute of the performance, the 7 second rest in bar 32 and the 5 second rest in bar 92 were revealed in the biometric responses of the visual listening group, but not in the responses of the blind listening group, which implies that the responses were directly connected with the observed action on the scene.

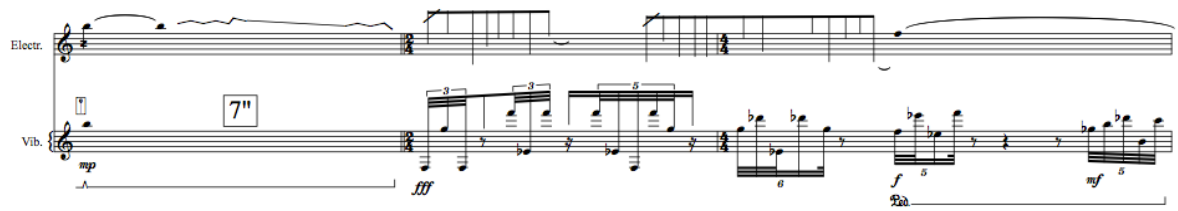

Figure 19 *Vox Sum Vitae* by João Pedro Oliveira - bars 32 to 34

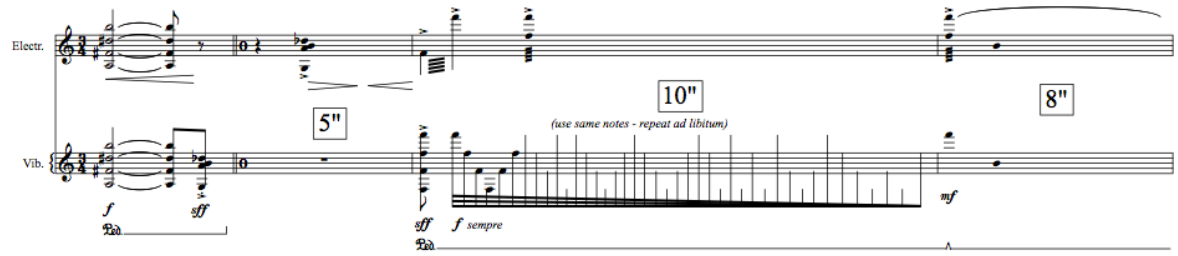

Figure 20 *Vox Sum Vitae* by João Pedro Oliveira - bars 91 to 94

At the time when the pauses were made, the tendency to slowdown in the heart rate, skin conductance, and a breading pace was noted, which was followed by the immediate rise as soon as the denser part starts again. Therefore, it is reasonable to infer that the visual listening group exhibited more visually sensitive reactions to music because they could see the performer, anticipate his activities, and react to them accordingly, which was reflected in the dynamics of biometric changes in reactions.

Certain interesting tendencies were also noted in the reactions of the blind listening group to the course of performance in terms of biometric indicators. During the experiment, the blind listening group's participants tended to keep small changes on the involuntary reactions, which usually occurred independently of the movement of the musical text. The present observation implies that blind group's participants were unable to grasp the context of performance and its narrative in its wholeness because of the absence of visual cues. Blind listening is obviously more emotional because it does not involve any distraction from the music heard; however, as it has already been discussed, percussion music differs very significantly from other types of music, as it possesses no melody in the traditional sense thereof. Hence, it is much harder for the blind listeners to follow the plot of the musical performance and to react to it accordingly and on time.

Since the blind listening group's reactions were more constant, the research team realized that the physiological movements of the percussionist do not match the musical context's density, and the climaxes are not accompanied with them. The same absence of a match was noted in the period of flat performance fragments, thus showing that the blind listeners are unable to assess the performance's fabric adequately because of limited perception. The only time

window in which the sudden change of musical dynamics was reflected in the biometric reactions of the blind listening group was the last piece of '*xcuse me while I kiss the Sky* by Pedro Junqueira Maia, but it was only less than 5 bpm in the heart rate.

5.3.1 Summary of Results on Experiment 3

The third experiment showed that visually enhanced listening enables the research participants to assess the percussion music's narrative, and to react accordingly to the performance's twists and changes. The blind group's participants revealed no sensitive reactions to the changes in the performance, only in the most abrupt cases, which makes the research team suppose that there is a close and direct relationship between the visual impression from the performance and the biometric reactions of its audience. Visual listeners were able to assess the upcoming changes in the performance, and reacted simultaneously with the changes in the percussionist's behavior, thus showing that the sight of the performance was inseparably connected with their emotions, and that from the medical viewpoint, changes in biometric indicators are directly connected with the changing state of awareness, be it an emotional tension or a relaxed mood.

5.4 Interpretation of Findings

The results of all three experiments can be considered fruitful, since each experiment has revealed a certain pronounced difference in perception of percussion music between the blind and visual listening groups. Therefore, there is a need to analyze and interpret the obtained findings in the light of theories and academic disciplines covered in the present paper such as narratology, semiotics, cognitive psychology applied to music perception, etc. To achieve the ultimate purpose of the study, the present subsection will deal with each of the experiments separately, and will then summarize findings according to their theoretical and practical significance.

5.4.1 Interpretation of Experiment 1

Since the first experiment dealt primarily with understanding of respondents' perception of percussion music's dynamics, which was measured by means of manipulating the potentiometer by both the blind and visual listening groups, one can assume that the results obtained from this experiment indicate the level of sensitivity to rhythmic variations, twists, and changes by both groups. The first experiment resulted in understanding that blind listeners revealed a much higher level of sensitivity towards music's dynamics reflected in the changes, peaks, and plateaus registered more accurately and more diversely by the respondents. The present observation may be explained through the lens of Boros and Toops' (1996) idea that despite the fact that gestures and visual information provide an opportunity for listeners to perceive music idiosyncratically, reduction of musical perception to visual and aural cues only leads to emptiness in music. Opposite to the commonplace opinion that visual cues provide the richness of listening experience, the authors indicated that in fact, visual cues may distract the listeners from perceiving music only, in its pure form. Miclaus (2011) agreed with the researchers in this aspect by assessing the visual component in music as destructive, and by assuming that inclusion of visual cues distorts the listeners' perception of music, adding the unnecessary details that may distract the audience from crucial musical elements and aspects.

In addition, the findings from the first experiment related to the blind listening group imply the need to refer to the findings of Thompson et al. (2005) who indicated that listeners with professional musical schooling tend to rely more on visual cues for affective meaning. Though the researchers attributed a large extent of confidence in the need to use visual cues, it is notable that they emphasized the importance of the latter for the affective meaning, which is emotion and not dynamics. Therefore, it is logical to assume that in case visual cues are regarded as more helpful for communication of emotion, more objective and unchangeable aspects of a musical performance such as dynamics can be perceived better and more sensitively without visual cues, that is, by the visual listening group. The ideas of Schutz and Kubovy (2006) are also relevant in this regard, as the authors found out that the length of percussionists' gesture does not influence the duration of a note, which enables the blind listening group to assess the performance's dynamics much more objectively that the

visual group can. Such difference stems from the visual perception of gestures' variation, which may make the visual group falsely assume that different gestures may produce musical sounds of varying dynamics, which is reflected in the diagram of visual group's potentiometer indicators. In this situation, the blind listening group unable to see the variation of percussionists' movements is in a much better position regarding production of the objective assessment of the performance's dynamics. However, at the same time, the visual listening group revealed an interesting tendency of anticipating certain elements of music dynamics because of the ability to see the visual cues provided by the performer. The present findings can be proven by the fact that the visual listening group's participants registered the changes in musical dynamics before they actually occurred, which is consistent with the research of Blades (1992), Dahl et al. (2009), Kalani (2008), and Kühl (n. d.) claiming that percussionists' gestures help to visualize music for the audience and other musicians. Moreover, Bresin and Dahl (2003) stated that percussionists usually make certain movements not only to produce sound, but also to prepare for it. Consequently, people familiar with the peculiarities of percussion music can be knowledgeable about such preparations, and can anticipate and register the changes in musical dynamics before they actually take place because they know what certain gestures mean.

The difference in visual and blind listening groups' perception of the musical performance may be partly explained by the findings of Ryan (2007) about the musical narrative representing a story, which is an image with certain spatial, temporal, mental, and pragmatic components. In this context, the musical performance (if one follows the logic of Barthes (1981)) possesses the feature of textuality, which is the interplay or weaving of codes. These statements, coupled with the observation of Leman (2008) about music representing a polysemantic unit making sense of several codes simultaneously provides an additional understanding of the reasons for which the participants of blind and visual listening groups manage to hear the percussion performance differently.

To understand the ability of anticipating musical dynamics by visual listeners, one should refer to the findings of Clarke (2002) who claimed that musical gestures are a construction of signification in music. Signification is the creation of meaning, which, in case it is coupled

with the ideas of Ryan (2007), Barthes (1981), and Leman (2008), provides an image of music as a narrative, a story with its own plot and development of action. If such an analogy is drawn, a musical performance may be perceived as text, and reading a text always involves anticipating the further actions of characters. The listeners' anticipation may come true or be false, but in any case, visual perception of a performance involves thinking in advance about the musical twists, changes, peaks, and silence, while blind listening still involves the factual perception of music only after it has been produced by percussionists with the help of certain movements.

5.4.2 Interpretation of Experiment 2

The second experiment revealed some interesting peculiarities of musical perception between the blind and visual listening groups of respondents as well. As one can see from the survey results, the blind group of respondents evaluated the tempo of performance and its rhythmic content higher than the non-blind group did. The present peculiarities of perception for blind listening participants may be explained as follows: first, the visually enhanced listening process is considered to be more holistic, and the concentration on the tempo of the performance may be not typical for such a mode of listening. Percussion performances are traditionally not melodic but rhythmic, so the blind listening group's participants may be more focused on the rhythm and tempo because of their inability to see the rich visual cues of the performers.

Following the idea of Ryan (2007) about the musical narrative containing a story, an image of music with spatial, temporal, mental, and pragmatic constituents, one can infer that the blind group unable to see the story does not perceive it in its wholeness, but focuses on the purely musical features thereof instead. Such perception is also valuable, especially in the musical terms, but it prevents the listeners from receiving the whole range of messages communicated to the audience by the performers, thus resulting in the almost exclusive focus on the rhythm and tempo of music. This idea is supported by the claims of Todorov (1969) that there must be a shift from the surface level of text-based musical narrative to the underlying logical and structural properties of the narrative (following the postulates of narratology). Hence, to achieve such a purpose, the musician should communicate meaning through multiple

channels, and should ensure that the performance is coded polysemantically, as Leman (2008) offered.

Interesting findings have been obtained in terms of observing the behavior of the visual listening group during the second experiment. This way, the non-blind group's participants gave a more precise, higher evaluation of the variation of tone/timbre, dynamic range of the composition, and had a higher overall impression from the composition. The present survey results may be supported by the vision of Abbate (1991) that the concentration on structure more than on representational details can help music theorists to articulate the common qualities of the musical composition and narrative. In other words, by perceiving the performance-related information through multiple channels and obtaining access to varying aspects of its perception such as both visual and aural cues, the audience can get a much deeper and systematized impression about the performance. Moreover, a better impression about the composition voiced by the visual listening group is consistent with the idea of Tarasti (1979) about the manifest and immanent levels of the musical performance, each containing a certain portion of music-related information, and each providing the listeners with a certain structural, technical, cultural, or communicative aspect of the performance's features. Only by perceiving both levels of performance, the audience may grasp musical isotopies of spatial, temporal, and auctorial nature contributing to the wholeness of impression from the performance.

It is also possible to assume that the higher evaluation of performance given by visual listening participants of the experiment may be explained by their ability to grasp the musical plot of the performance, as explained by Davidson (1980). According to the researcher, comprehension of the musical plot is closely connected with the ability to analyze the listener's capacity of interpreting the musical events to which he or she is exposed anthropomorphically, that is, visually and aurally. Stories are seen as actions performed by the musicians, and being unable to see those actions limit the potential ability of perceiving the whole story. Davidson (1980) even compared the right and left hand of the performer with characters interacting or conflicting with each other, and contributing to the development of the musical narrative. Hence, blind listening excludes the opportunity of

involving into exploration of the musical narrative in visual cues, thus impairing perception and reducing the level of the overall impression received from the percussion performance. Moreover, it is necessary to draw connections between the overall impression from the musical performance and the concept of emotion. As it has repeatedly been noted by numerous researchers such as Bardwell and Thompson (2008), Clarke (2002), Boros and Toops (1996), Delalande (1996), Leman (2008), etc., gestures serve as a representation of emotion, and play a crucial role in conveying the meaning to narrative interpretation and perception. Therefore, they are the key components of musical signification, thus contributing to the communication of emotion. Vines et al. (2011) supported that idea by stating that experience of emotion in music is the interaction between musical, personal, and situational factors, and visual components contribute to that issue by strengthening the perceptual impact of performed music. The main advantage of visual components during a musical performance is in their ability to convey affective information, which is literally emotion from the performance. Therefore, it is understandable why the visual listening group's participants did not assess some musical aspects as adequately as they could reveal their positive impressions about the performance.

This finding is supported by Platz and Kopiez (2012), Deutsch (2013), Bhatara et al. (2011), Juslin and Persson (2002), and other researcher indicating that musical expressivity is the prime contributor to the audience's emotional response to the performance, and by means of using certain gestures and behavior, performers can even manipulate the audience's emotions. Much attention has been paid to the importance of facial expressions and gestures by Thompson et al. (2005); the researchers claimed that these visual cues help performers exert influence on their audience in such aspects as focusing the listeners' attention on some listening moments, modifying musical intelligibility, and sharing their understanding of some musical fragments' importance. The visual group's responses to the survey are also better understood in the light of Nusseck and Wanderley's (2009) and Schutz's (2009) findings because they show that visual cues contain both conceptual and emotional information, which is the key to understanding the nature of visually enhanced performance's impact on the audience.

5.4.3 Interpretation of Experiment 3

According to the results of the third experiment conducted within the framework of this study, the blind listening group did not reveal any significant biometric responses sensitive to the changes in the musical fabric. The present evidence suggests that the impact of visual cues on the perception of any performance is a feasible, scientifically registered fact that can be explored in more detail on the basis of research of biometric parameters' changes connected with emotional states. Rink (2002), Givens (2008), Auslander (2009), Armontrout et al. (2009), and Schutz and Lipscomb (2007) found out the relationship between the musician's gestures and perception of music by the audience at the perceptual and emotional levels. McNeill (n. d.) connected this finding with the rise of interest to the psycholinguistic approach to musical gestures, and many recent research endeavors have demonstrated that gestures indeed represent communicative movements and become the key to understanding the musical meaning and working out an emotional response to it. The first biometric indicator measured in the third experiment was the heart rate of respondents; as Cochrane, Fantini, and Schers (2013) indicated, cardiac activity of a human being is not under voluntary control, but is regulated through both sympathetic and parasympathetic channels of the autonomic nervous system. The human heart rate increases with emotional arousal, but it is true only for some specific emotions, e.g., anxiety, surprise, anger, etc. Such emotions as contentment, sadness, or disgust usually cause an opposite reaction of heart rate reduction (Cochrane et al., 2013).

There has been extensive research on music, emotion, and bodily reactions of people. Thus, for instance, Juslin and Sloboda (2011) reported the findings of Krumhansl (1997) about the ability of sad music to produce the largest changes in the heart rate, blood pressure, skin conductance, respiration, etc.; the reaction was much more pronounced than for happy musical performances. Similarly, Gomez and Danuser (2007) indicate the connection between the rhythmic articulation and the differentiation between high and low arousal, positive and negative valence, etc. Pelliterri (2009) even claimed that based on the music physiology's findings, therapists can use sedative or stimulative music to create the desired physiological states in their clients.

In regard to the impact of music on emotion, Witchel (2010) described the emotivist argument stating that it is doubtable that music makes people feel emotions. From their viewpoint, the primary stimulus is of musical nature, and it causes an emotional response, which further leads to the physiological response to the musical piece. However, the cognitivist view of the process is a bit different; these theorists believe that a musical stimulus causes thoughts influenced by personal and situational factors in the audience, and these thoughts usually result in the formation of a verbal report of apparent emotions (Witchel, 2010). Consequently, there is an issue regarding the primacy of emotions and thoughts about them. At present, there is still a high level of disagreement on the roots and causes of heart rate fluctuations during the process of listening to a musical performance. Thus, Cochrane et al. (2013) stated that some studies report the ability of music to decrease the audience's heart rate, while other experiments have characterized the musical tempo as an influential factor driving changes in the heart rate. Moreover, the criterion of music's pleasantness affects the ways in which cardiac activity of the audience changes. Speaking about skin conductance, this biometric parameter has also been widely associated with emotion, and emotional responses to music may also be connected with conductance rates. According to the research findings of Juslin and Sloboda (2011), skin conductance reflects mental activity of mental nature, and under arousal conditions, skin conductance shows a tendency to increase. Therefore, even under the conditions of varying and sometimes even conflicting findings on the connection between emotion caused by music and skin conductance, one can assume that there is a direct relationship, which has been additionally revealed in the third experiment.

It is notable that the participants of the visual listening group exhibited the changes in skin conductance rates, especially in the periods of high emotional tension during the performance. The present evidence is supported by the study of Gorzelanczyk, Podlipniak, and Walecki (2012) who studied the impact of tempo and musical intensity on skin conductance. The authors' findings indicate the largest number of skin conductance peaks during participants' exposure to "mute" (decrescendo) musical stimuli, which was considerably different from the "volume up", that is, crescendo, stimuli. A similarly strong response was displayed towards a part of the mass music as opposed to the basic theme,

"slowing down" (diminuendo), and "slowing down and mute" (diminuendo and descrescendo) fragments of the musical performance. Such findings have allowed Gorzelanczyk et al. (2012) to conclude that there is a clear nervous response to musical stimuli reflected in the skin conductance of the audience. However, the researchers pointed out that the clear responses of the sympathetic nervous system should not always be perceived as related to emotions, since they may be an unconscious part of musical experiences not tied to emotional responses to music.

Finally, the respiration rate fluctuations should be discussed in relation to the medical viewpoint on connection between respiration and emotional responses to music. According to Cochrane and Sloboda (2011) who conducted an extensive study of biometric responses to music, increased respiration rates are associated with the state of elevated arousal or discrete emotions (e.g., fear, anger, happiness). As for decreased respiration, it is associated with low arousal, and such emotions as sadness and content. Hence, in cases when music is highly arousing, there is a feasible increase in the respiratory effort among the experiment's participants, while relaxing music may contribute to the reduction of respiration rate. Moreover, as Cochrane et al. (2013) noted, the temporal features of music are connected with respiratory activity, as some participants were detected to adapt their respiratory cycles to the tempo of the music to which they were listening.

5.5 Chapter Summary

The present chapter was dedicated to the analysis of results of three different experiments held with different groups of respondents to understand the impact of blind and non-blind listening to the percussion performance on the perception thereof. The first experiment was held with the help of a potentiometer and aimed at measuring the ways in which participants exposed to blind and non-blind listening evaluated the performance's dynamics. This experiment showed that blind listening involves a much more sensitive and deep perception of music's dynamics, with respondents indicating the presence of certain dynamics even during the pauses when no music is played. One interesting peculiarity of non-blind group's behavior was noted in the early indication of upcoming music dynamics because of the

ability to see and anticipate the percussionist's movements. In regard to these research findings, the research team inferred that blind listening is obviously more sensitive in terms of perceiving certain musical peculiarities of each given performance, but visual cues enhance the perception of dynamics as well, though not through audio but through visual observations and conclusions. The second experiment was held with two groups with the further purpose of filling in the survey on the impressions from the performance, as well as assessment of certain features thereof. The present step of data collection also proved highly helpful in designating the differences in perception of blind and non-blind listening groups. The overall impression from the performance turned out to be much higher for the non-blind group, since it was enriched with visual cues and was perceived more holistically alongside with the percussionist's movements and the surrounding context. However, the blind listening group participants were able to assess the tone and rhythmic content of the performance much better because of their concentration on specific musical features, and not on the visual performance. The third experiment aimed at measuring the biometric indicators of listeners such as their heart rate, conductance, and respiration with the help of specialized biometric equipment. The present experiment provided data on the fit between the presence of an opportunity to watch the performance and adequate biometric reactions to it. Blind group's participants were unable to react appropriately and in a timely manner to the changes in the performance, and showed sensitive reactions only to the cases in which an abrupt change of the performance's fabric took place. Nevertheless, the visual listening group managed to react according to the changes in the performance, and their biometric indicators changed significantly with the changes in the performance's density, which implies that there is a direct relationship between the ability to see the performance and the intensity of emotional reactions to it.

Chapter 6

Conclusions

In early 1980s, musical television emphasized the popularity of music videos that immediately became the center of a controversy, as the opinions of specialists on their effectiveness were different. Some specialists claimed that an accompanying video was likely to decrease the appeal of a musical piece since it imposed a particular interpretation limiting the imagination of a listener. Others argued that watching a video assigned to a musical piece was to fully realize the aesthetic potential of music by leading the listeners towards the intended meaning of a song. Music videos maintain the audience's interest when musical pieces are ambiguous and open to a multitude of interpretations (Boltz, Ebendorf & Field, 2009, p. 44).

The visual component of music has always been deemed significant. Before the era of technology advancement, which gave people the opportunity to use equipment to record and reproduce musical pieces listening to music, was for the most part quite a visual experience. Listening to music normally meant seeing the performer. Further on, technologies allowed people to isolate the image from the sound, which, on the one hand, made music more accessible, but on the other hand, restricted the possibilities of interpretation to those which relied on the aural channel of perception exclusively. As Thomson, Graham and Russo (2005) described it:

> As videos evolved, the aesthetic field of visual information expanded, becoming more intricate, complex, expensive, and dominant. In most music videos today, the aesthetic field of visual information is far more expansive and expensive than that of the music. The listener's attention is focused on visual details; their attention to the music is less focused and they are left with only sketchy and generic impressions. (2005, p. 222)

Though this observation refers to the popular culture, it is possible to extend the sphere of the interaction of the visual and audial channels to less mainstream and more artistically sophisticated musical pieces. For example, percussion music has very strong rhythmic and dynamic constituents. The perception of this kind of music may be influenced by the visual element of a musical performance, and this study sought to establish if this connection exists and how strong it is in case it does.

The existence of a strong link between music and the visual component of its performance can be said to manifest itself in the further development of technologies, since the age of multimedia witnessed an extensive use of the media possibilities to enrich the listening experience by adding visual components to it. There is a tradition of assigning videos to music in the popular culture for artistic purposes. The connection also works in the opposite direction, which is why music is an important element of the film narrative. It is a crucial part of the film language, which allows the film-producers to emphasize some aspects and convey the mood of specific scenes.

The idea that gestures are an important component of the perception of music and impression created by a musical piece is not new. Specialists agree on the existence of a connection between the aural and visual channels of perception, and the research of literature focusing on this range of issues has confirmed this belief. Alongside musical sounds, gestures, facial expressions, and body movements are all essential for the creation of an impression. Musical compositions appear to produce a profound effect on the audience if they are provided with an opportunity to see the bodily manifestations of human emotions and feelings. Music is a unique artistic realm, and since visual stimuli are known to play a significant role in other arts, such as narrative or drama, it is logical to assume that perception of music with and without visual signals is likely to be different.

Recent years have seen a lot of research focusing on the music-gesture interface. Results of numerous studies show that musical gestures might be created, experienced and understood by individuals in a variety of ways. Moreover, all these processes depend heavily on the combination of various signs that operate at different levels: aural, visual, physical, even

conceptual. Specialists studying the relation between music perception and gestures took steps to describe and explain the existing functions, intensities, magnitude, and experiences of performance-related gestures as they are linked to the process of producing music, the personalities of performers and the mood and overall vein of the musical piece itself. Studying these issues helps increase understanding of music as a unique artistic form and a type of cultural experience that reflects society's view of beauty and harmony. The abovementioned connection is studied in musicology, psychobiology, ethnology, music technology, human movement studies, and anthropology in general.

If one looks at music from the perspective of semiotics, it can be regarded as a sign or system of signs. The relationships between the elements within this system can be explained by referring to a variety of models and theories. On the one hand, the processes of performing and perceiving music can be understood within the framework of the communication model, where the composer and performer play the role of the sender of a certain message. The message itself is the musical piece and all the ideas, emotions, feelings, and values that the sender intends to communicate to the receiver, whose functions are performed by the audience. Such a semiotic system is a meaningful unity where the harmonious connection between various channels of transmitting relevant information is the key to successful communication.

Similarly, music as a polysemantic unity utilizes aural and visual codes in order to create the so-called audio image. The overall 'image' created by a musical piece is composed of a number of separate images created by different signs. The intensity of this image depends on the degree of congruency between the elements of the music-image relationship. The separate images shaping and contributing to the overall music image are created by narrative, synchronization, tempo, pitch, and other relevant constituents. Another important aspect is the context of the performance, the cultural background, and experience of the audience.

The model of music and myth draws on the idea of both having developed from the language. In accordance to this theory, music can be seen as a language without objects to signify. When listening to musical pieces, individuals feel the urge to assign meanings to it, and thus

additional clues provided by the visual channel of perception help the music-makers and the audiences infer and perceive similar meanings of the music played. Music is an emotional language that conveys mental states triggering corresponding affective moods in the brain. Visual elements of a performance are a supplementary domain that extends messages and signs of the aural component. Music has a coherent structure that has similarities with that of the language, as inferred and perceived meanings unfold gradually as elements organized into a hierarchy form the image of the musical piece. There is a distinction, however: whereas language names specific objects or ideas and gives them the verbal form, music is a reflection of life in the most abstract form, operating at the level of emotions and empathy rather than accurate information. At the same time, involvement of emotion in music tends to strengthen the perceptual impact of the musical piece.

The role of gestures in the processes of performing and interpreting music is extremely important. Gesture movements are composed of certain patterns that are conceptualized in the listeners' minds as single units. This makes musicians' gestures structured interactions, as these conceptualized gesture units are stored in performers' as well as listeners' minds. Gestures can be classified, categorized and united into hierarchies for the purpose of structuring information about the music performed.

Musical gestures are musical acts, and understanding and perceiving them involves the physicality that is used in their production. However, a gesture is much more than mere physicality when it comes to meaning construction. As David Lidov stated,

> The variables of pulse are speed and intensity. Speed is exciting. Intensity is involving. The values of simple pulse are fairly obvious: strong, foreground pulse as in folk dances and marches controls movement directly. Attenuated pulse is a factor in the sublimation of somatic force. (as cited in Cox, 2006, p. 45)

Therefore, artistic movements carried out by performers who utilize the kinetic potential of their bodies to communicate additional information are an important element of the artistic image in general and music performance as such.

Quite logically, all the abovementioned operations concerning conceptualization and storing gesture information are culture-specific; therefore, the knowledge of the cultural context is crucial for the comprehension and accurate interpretation of gestures. However, there is a difference between a human gesture as such and an artistic gesture. Even if this movement is carried out without intention, it still may be regarded as artistic if it has the potential for a meaningful interpretation. Such non-verbal signals as musicians' postures, nods, manual gestures, and winks are all viewed as common ways to achieve a desirable effect on the audience.

The expressive power of musical performance may communicate to the audience the emotional state of the performer, be it sadness, fearfulness, anxiety, excitement, or happiness. Studies indicate that at the emotional level audiences are capable of perceiving these states even if the musical piece itself or the performer belong to a different culture. There is an opposing viewpoint, according to which a listener can be moved by a specific performance only if he or she is moved by the musical piece itself and its inherent characteristics such as volume and tempo. If this requirement is met, the visual elements of a performance serve to strengthen the impression. However, this study has shown that in the case of percussion music the visual component has been critical for interpretation, performing a major role in the process rather than secondary.

Simultaneously, emotions are an elusive category that is extremely hard to measure or define, although there are indicators that allow researcher to register changes in the emotional state of the listeners. This is conditioned by the fact that emotions are complex psychomotor manifestations that involve many components: physiological reactions, cognitive appraisal, and subjective expression. This study was based on the assumption that the visual components, in particular gesture movements of performers are crucial for the perception of both musical and non-musical characteristics of performed pieces, which was confirmed by a set of quantitative experimental studies. Application of the quantitative research design is aimed at eliciting measurable data that is quite specific and unequivocal in answering the question if a connection between the studied variables exists or not. Using the perception of the audience as the dependent variable presupposed studying the way listeners responded to

music mentally, emotionally, and physiologically. Objective data on how the listeners involuntarily responded to music was obtained by measuring the physiological reactions with special equipment. Listeners were also given an opportunity to assess acuteness and accuracy of their perception subjectively, which showed how the connection between music and image worked at the level of conceptualization. Finally, using equipment that allowed the experiment subjects maintain control over the measurement of musical characteristics of the utilized pieces showed their responsiveness to them in their connection with the visual component. The independent variable was the presence of the visual channel of communicating information to the audience. The chosen research design helped confirm the connection between the aural image and the visual image. The latter appeared essential for the performance of percussion music, whatever professional background, or age of the audience was. It also addressed the issue comprehensively, utilizing both the cognitive and physiological aspects of music perception. The results obtained in the process of analyzing the elicited quantitative data showed that the independent variable is a significant influence on the speed and intensity of response to shifts in music dynamics, mental processing of a musical piece as a coherent image, as well as involuntary physiological reactions to music that are associate with emotions. This study allowed building a complex model of relations between the two variables as they manifest themselves in terms of percussion music.

The hypothesis for the first experiment was that the audience that was exposed to the musical performance and therefore perceiving the musical piece in progression by activating two channels of perception was to demonstrate different responsiveness to music dynamics than the audience who could only hear the musical result. All participants were subdivided into two groups - Blind listening and Visual listening - that were equal in all other aspects apart from the experimental stimulus, which served to testify to the validity of the obtained results. The audience was to listen two musical works, the first being *Sen VI* by Toshio Hosokawa and the other – *Vox Sum Vitae* by João Pedro Oliveira for Vibraphone. The specific of both pieces are such that they are strongly associated with multimodality, media diversity and a strong visual component. These works are not conventional music pieces in their traditional understanding. All participants were provided with a 10K potentiometer which they were

asked to use in order to show how they perceive music dynamics during a solo percussion performance.

The results of this experiment have shown that there is a significant difference between the patterns of perception of the two groups. First, the group that was exposed to blind listening clearly demonstrated a greater sensitivity of perception of music dynamics than the group that was exposed to video performance. This appears understandable, since the listeners were concentrating on the aural information, and since dynamics is an inherent characteristic of a musical piece as inextricably linked to the hearing process as the tempo, volume, or pitch. Therefore, the blind group was in an advantageous position in terms of dynamics perception, since their attention was not distracted by additional signals. The group exposed to the visual performance, on the other hand, tended to be less focused in terms of responding to purely aural signals, as they were also concentrating on the visual signals that provided additional perception possibilities but did not contribute to more sensitive perception of purely audial signals. Therefore, one could assume that intensity of perception of exclusively musical characteristics of a piece can be achieved by the withdrawal of the visual component of the music performance.

This finding is also confirmed by the tendency of the group that was exposed to video performance to correlate the magnitude of gestures and movements with music dynamics. In other words, the participants in the experimental group expected the changes in dynamics of the performers' movements to correspond to changes in the dynamics of music. This expectation also works in the opposite direction – changes in music dynamics are expected to find reflection in the movements of the performer. This tendency demonstrated by the experimental group shows that the narrative potential of gesture is extremely high and tends to dominate the audience's perception in case if the visual element of music performance is included into the listening experience.

The truthfulness of the abovementioned conclusion is further confirmed by the fact that the experimental group turned potentiometer value to zero if no movement was carried out by the performer. Therefore, they directly associated music dynamics with the expressiveness of the

visual element and regarded those parts of the performance where the aural information was not supported by the visual signals non-dynamic. The blind listening group, on the other hand, remained quite accurate in registering variations in music dynamics and resonances.

Therefore, it is quite clear that percussive gesture significantly influences musical perception. Moreover, listeners tend to rely more on the visual information if there is a discrepancy in the information perceived from the aural and visual channels. However, another finding concerns the accuracy of such interpretations. Since the quantitative research design deals extensively with statistical tools and instruments, a look at the variance of the obtained data shows that interpretation of music dynamics by the blind group listeners was more homogeneous and, therefore, more accurate. Referring to the visual semiotic level for the interpretation of purely aural characteristics of music gave the audience a wide space for additional interpretation and misinterpretation.

Overall, one might conclude that gesture has a significant influence on how music is perceived. However, while adding to width and narrative richness on the music performance by utilizing an additional level of signs, the visual element simultaneously makes the perception of the objective sound characteristics of a musical piece less intense. Therefore, in case if the task of the listener is to deduce the objective and inherent characteristics of a music piece, such as intensity and dynamics of the sound, the visual channel of perception interferes with the accuracy of such perception.

This finding complies with the logic of understanding gesture patterns as narrative modes. Gestures, movements, and expressions are kinetic means that tell a story and have a long tradition of utilization in ballet, pantomime, or silent movies alongside the music narrative that accentuates, stresses, and brings out the visual elements of the narrative. Therefore, gestures are expected to play a crucial role in the perception and interpretation of the narrative in music or music-associated arts. However, they are essential elements of the construction of the overall image, signification of the musical piece and not the perception of physical characteristics of music. Therefore, one may conclude that the aural and visual channels do not necessarily run parallel to each other in their schemes and patterns. They

employ different sets of tools to narrate a story that form a harmonious unity. The visual channel, however, may accent the emotional and storytelling characteristics of music but prevent the listeners from perceiving acutely all the physical characteristics of a musical piece. Visual performance extends and enriches audial perception rather than sharpens it.
The narrative content of a gesture constitutes the prospect for future research, as its elusive and abstract nature needs further study and explanation in order to use it optimally and in the most efficient way to enhance the audience's perception and the effectiveness of the communication model applied to music composition and perception.

The second experimental research design involved the same set of dependent and independent variables, but was conducted in a different setting with different study subjects in order to ensure further applicability of the obtained results and their validity. The participants were also subdivided into visual and blind listening groups consisting of the same number of people. Both groups were exposed to Beau Sivers' *Spatial Network* for multipercussion, which was accompanied by a video of the performance demonstrated to the experimental group. The hypothesis for this stage of the experiment was that the listeners' self-assessed perception of musical expressive components differed for the blind listening and the visual listening groups. The data obtained from the subjects was based on their subjective judgments about various characteristics of the musical pieces the groups were exposed to.

The characteristics that the students were asked to assess through the prism of their perception included the duration of the performance, the average pitch region of the composition, the variation of the tone or timbre of the composition, the tempo, the dynamic range, as well as the rhythmic content of the musical piece. The final entry of the questionnaire concerned the overall evaluation of the performance. The results of the data processing provided a clear picture of the variations between blind and non-blind listening modes that appeared to be significant.

First of all, whereas the average indices of the duration perception appeared to be unaffected by the independent variable, reflection of the participants on their perception of such

characteristics as pitch region, tine/timbre variation, tempo, dynamic range and rhythmic content showed that there is a correlation between the effect of the experimental stimulus and the audience's reaction to it. Musical performance accompanied by a video recording was considered more varied in terms of its tone or timbre and especially dynamics and quicker in tempo. However, blind listening group considered the piece a little higher in terms of pitch frequency, though both groups rendered the pitch range average; they also felt the piece was faster in terms of tempo than their counterparts from the non-blind listening group, and the most drastic difference consisted in the audiences' perception of the rhythm of the piece. Blind listening appeared to emphasize the rhythmical element. Overall evaluation of the piece appeared to be more favorable when conducted after a non-blind listening session, as the experimental group tended to find the performance extremely interesting, whereas the comparison group assessed it as average.

The findings of this stage of the experiment are consistent with the measurable statistical data obtained at the first stage. The questions of the survey can be subdivided into two groups:

1) those drawing on the objective perception of the music characteristics;
2) those which are based on the impression the listeners obtained.

As for such characteristics as rhythm, frequency, and tempo, the accuracy of their perception is likely to be higher in the blind listening group, which may be called specifics of the percussion music performance, as this contradicts the following belief that found confirmation in a variety of studies:

> At the most general level, the mere presence of visual information, regardless of its affect or format, enhanced certain musical dimensions such that melodies were heard as faster, more rhythmic, louder and more active than the same melodies heard by themselves. (Boltz, Ebendorf, & Field, 2009, p. 51).

Percussion music is highly intense in its nature, and its objective musical characteristics can be perceived in a completely different way than, for example, features of a classical

instrumental piece. In this respect, Tolentino's (n.d.) opinion can be useful – according to it, blind listening may actually contribute to more focused and intense perception of the rhythm and vibrations of a musical piece if it is performed without the visual component.

However, it might be interesting to look at the participants' perception of music dynamics in the first and the second experiment and draw parallels and distinctions between the two tendencies demonstrated by the statistical data. It is essential to keep in mind that whereas during the first stage of the experiment the listeners had to respond to dynamics variations immediately as they heard them, during the second phase they rather expressed their impression as to the dynamic range of the piece performed. In other words, while blind listening is likely to give listeners the opportunity to perceive and respond to changes in the dynamics more acutely, they form an impression that the pieces accompanied by the visual image are more dynamic. Therefore, visual elements tend to contribute to the audience's favorable reaction to a piece, forming an emotional response rather than correctness and accuracy of registering fluctuations in the music characteristics. The non-blind listening group also considered that the piece was rich in tone or timbre variations in comparison with the blind listening group who believed that this characteristic was not outstanding in its manifestations.

The abovementioned conclusion is also supported by the fact that the audience found the piece more interesting if it was performed using the visual media. One and the same piece was rated as average by the blind listening group and interesting to very interesting by the non-blind group listeners. Therefore, one may conclude that the visual component is critical in forming the overall impression of a musical piece. Even if the objective data suggests that the acuteness of perception of the aural information is higher for the blind listening mode, the listeners perceive it the other way round – they tend to be biased in their assessment of the characteristics of the pieces they hear, thinking that their interpretation of these features benefits from the visual component.

Finally, the third stage of the experiment involved obtaining data from the involuntary reactions of listeners from both the blind listening and non-blind listening groups. The

hypothesis for this phase of experiment was that the involuntary physiological reactions of the audience reflecting their emotional response to the performed pieces would be different for the experimental and comparison groups. These physiological reactions that a person cannot control provide the researcher with the objective measurable data that shows the effect of the visual component on the perception of musical pieces at the most basic, physiological level. Biometric parameters that change under the influence of the shifts in the listeners' emotional state can be captured and measured with the aid of special equipment. The relevant data was obtained by using blood volume pulse sensors, skin conductance and respiration sensors. The data was collected before the listening experience and after it. These biometric parameters were chosen for a purpose. Heart rate is quite a reactive metric promptly responding to a variety of stimuli. Galvanic skin response measures electrical conductivity of the skin that is affected by an individual's perspiration. It is a proven fact that perspiration caused by the increased activity of sweat glands is linked to increased emotion, attention, or arousal. Respiration frequency is the third metric that was used at this stage of the experiment, as this parameter appears to be equally strongly affected by changes in the emotional stage of the listener. Even if neither the researcher, nor the experiment subject is aware of slight changes in the biometric parameters, special equipment can record every minor fluctuation. Therefore, this research design allowed the researcher to study the subconscious reaction of the listeners to the effects of the experimental stimulus as opposed to the responses and evaluations that they were conscious of. Moreover, these responses were mostly based on the emotional aspect of the listeners' perception, which gave an opportunity to compare the data pertaining to this aspect with the perception of aural characteristics of musical pieces.

The results of this quantitative study showed a small average variance between blind and visual listening modes in terms of blood pressure. The difference constituted 9 b.p.m, whereas the significant variance makes 10 b.p.m. There was, however, a meaningful variation in the skin conductivity rates and respiratory metrics.

Overall, the non-blind listening group demonstrated more active involuntary reactions than the blind listening group. Moreover, the intensity of involuntary physiological reactions

tended to depend on the density of the performed piece. Those parts of the performance which required more physical action from the performer that the experimental group could witness appeared to evoke a stronger response in the research objects. The biometrical parameters tended to show an increase in heart rate, skin conductivity, and respiration in the dense parts of the musical performance.

At the same time, the blind listening group showed small insignificant changes that were in no way related to the movements of the musical text. Changes in the physiological parameters of the representatives of the blind listening group did not match the density of the musical content and did not rely on the development of the musical narrative, so the climaxes were not accompanied by changes in the biometrics. The only probable connection consisted in the reaction to the dynamics of the music performed. Therefore, there is a clear dependency between the emotional reaction manifest in the physiological response of the body to fluctuations in the intensity of the music itself and the gesture movements carried out by the performers.

All these findings are consistent with the conclusions voiced before. The reliance of the physiological responses on the intensity of the image accompanying the listening experience operates at the level of feelings and emotions which showed a strong link with the visual component unlike the objective perception of the musical characteristics of a piece. These emotions affect the audience at a very basic level, since the interpretation of a musical piece in terms of its emotional loading relies heavily on the experience of the listener. As Stevens described it, “music-videos often have an openness to interpretation that gives the audience the space to determine the meaning of the music and images to suit their own emotional and intellectual requirements, and to construct their own personal meaning” (2009, p. 54).

Many performers use the ability to move listeners and evoke emotions in them when performing their musical pieces. However, it is still quite difficult to establish the determinants of emotional reactions. For example, dynamics modulation may be one of the critical factors for producing influence on listeners. However, gestures, posture, movements, and mimics also appear quite important as they start to interact with the listeners’ empathy.

Emotional contagion can be the process that accounts for a more favorable evaluation of the musical performance accompanied by the visual component. Emotional contagion is a process whereby the listener's emotion is triggered by music because the listener perceives the emotional expression of the music and then starts experiencing this emotion – for instance, music expressing sadness makes the listener sad (ed. Juslin & Sloboda, 2010).

Overall, sound materiality and sound signification are inextricably linked in music nowadays, and multimodality of the contemporary music only seems to strengthen this connection, suggesting new ways and new semiotic levels to enrich musical signification and provide new space for interpretation. Culture-specific and individual gesture patterns seem to play an important role in the process of perceiving and interpreting a musical piece by a listener.

One could say that three independent stages of experimental research have proven the initial hypothesis of the study – the visual component of a musical performance exerts influence on how audiences perceive musical pieces. Moreover, the findings of the study suggest that, first of all, the perception of the objective aural information revealing the tone, pitch, or tempo characteristics and perception of the musical piece in terms of gesture and musical narrative, emotional loading and the listeners' general assessment are not influenced by the performers' gestures the same way. Whereas the visual component intensifies the perception of the latter, it may interfere with the perception of the former. However, a look at the existing literary sources also indicates that the specifics of the percussion music determine to an extent the accuracy of perceiving the rhythm, dynamics, tempo, timbre and pitch features of a musical piece performed. As this research shows, it is possible to answer positively to the initial questions and confirm the existence of a narrative process in the percussive gesture, and it´s influence on the musical discourse perception.

The prospects for future research may lie in the utilization of the qualitative research design in order to compare not only measurable, but also conceptual aspects of the relationship between the music perception and gesture movements. Since the statistical data are used to test a hypothesis as for the existence of a relationship between two variables,

utilization of the qualitative research methodology could give the study of this relationship depth and insight, contributing to further understanding of the relevant elements of this connection. Moreover, future studies may concern the interaction of other instrumental modes with the percussion music in order to see the extent to which the perception of the inherent music characteristics depends on the instruments musicians use.

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APPENDIX

Appendix A

Survey used in experiment two.

Dear Participants, after listening the performance of Beau Sievers' Spatial Network, you are asked to evaluate your impressions about certain aspects of the performance, including your overall impression about the performance. Please keep in mind that the rating you will be giving to the heard piece is the Likert scale evaluation, the 5-point scale in which number 1 means the lowest level of impression, and number 5 means the highest level of impression. Thank you for attention and participation.

Questions	**Answers**
- How did you percept the duration of the performance? (1 the shortest 5 the longest)	4
- How did you percept the average pitch region of the composition? (1 low frequency 5 high frequency)	4
- How would you classify the variation of the tone/timbre of the composition? (1 poor variation 5 rich variation)	5
- How did you percept the tempo (bpm) of the composition? (1 slow tempo 5 fast tempo)	3
- How did you percept the dynamic range of the composition? (1 low range 5 high range)	4
-How did you percept the rhythmic content of the composition? (1 less rythmical 5 more rhythmical)	4
How would you overall evaluate the performance you listened to? (1 not interesting 5 very interesting)	4

Blind Listening

Dear Participants, after listening the performance of Beau Sievers' Spatial Network, you are asked to evaluate your impressions about certain aspects of the performance, including your overall impression about the performance. Please keep in mind that the rating you will be giving to the heard piece is the Likert scale evaluation, the 5-point scale in which number 1 means the lowest level of impression, and number 5 means the highest level of impression. Thank you for attention and participation.

Questions	**Answers**
- How did you percept the duration of the performance? (1 the shortest 5 the longest)	4
- How did you percept the average pitch region of the composition? (1 low frequency 5 high frequency)	4
- How would you classify the variation of the tone/timbre of the composition? (1 poor variation 5 rich variation)	3
- How did you percept the tempo (bpm) of the composition? (1 slow tempo 5 fast tempo)	2
- How did you percept the dynamic range of the composition? (1 low range 5 high range)	3
-How did you percept the rhythmic content of the composition? (1 less rythmical 5 more rhythmical)	5
How would you overall evaluate the performance you listened to? (1 not interesting 5 very interesting)	3

Blind Listening

Dear Participants, after listening the performance of Beau Sievers' Spatial Network, you are asked to evaluate your impressions about certain aspects of the performance, including your overall impression about the performance. Please keep in mind that the rating you will be giving to the heard piece is the Likert scale evaluation, the 5-point scale in which number 1 means the lowest level of impression, and number 5 means the highest level of impression. Thank you for attention and participation.

Questions	**Answers**
- How did you percept the duration of the performance? (1 the shortest 5 the longest)	4
- How did you percept the average pitch region of the composition? (1 low frequency 5 high frequency)	3
- How would you classify the variation of the tone/timbre of the composition? (1 poor variation 5 rich variation)	3
- How did you percept the tempo (bpm) of the composition? (1 slow tempo 5 fast tempo)	4
- How did you percept the dynamic range of the composition? (1 low range 5 high range)	3
-How did you percept the rhythmic content of the composition? (1 less rythmical 5 more rhythmical)	4
How would you overall evaluate the performance you listened to? (1 not interesting 5 very interesting)	3

Blind Listening

Dear Participants, after listening the performance of Beau Sievers' Spatial Network, you are asked to evaluate your impressions about certain aspects of the performance, including your overall impression about the performance. Please keep in mind that the rating you will be giving to the heard piece is the Likert scale evaluation, the 5-point scale in which number 1 means the lowest level of impression, and number 5 means the highest level of impression. Thank you for attention and participation.

Questions	**Answers**
- How did you percept the duration of the performance? (1 the shortest 5 the longest)	3
- How did you percept the average pitch region of the composition? (1 low frequency 5 high frequency)	3
- How would you classify the variation of the tone/timbre of the composition? (1 poor variation 5 rich variation)	5
- How did you percept the tempo (bpm) of the composition? (1 slow tempo 5 fast tempo)	3
- How did you percept the dynamic range of the composition? (1 low range 5 high range)	2
-How did you percept the rhythmic content of the composition? (1 less rythmical 5 more rhythmical)	4
How would you overall evaluate the performance you listened to? (1 not interesting 5 very interesting)	4

Blind Listening

Dear Participants, after listening the performance of Beau Sievers' Spatial Network, you are asked to evaluate your impressions about certain aspects of the performance, including your overall impression about the performance. Please keep in mind that the rating you will be giving to the heard piece is the Likert scale evaluation, the 5-point scale in which number 1 means the lowest level of impression, and number 5 means the highest level of impression. Thank you for attention and participation.

Questions	**Answers**
- How did you percept the duration of the performance? (1 the shortest 5 the longest)	3
- How did you percept the average pitch region of the composition? (1 low frequency 5 high frequency)	4
- How would you classify the variation of the tone/timbre of the composition? (1 poor variation 5 rich variation)	3,5
- How did you percept the tempo (bpm) of the composition? (1 slow tempo 5 fast tempo)	2
- How did you percept the dynamic range of the composition? (1 low range 5 high range)	2
-How did you percept the rhythmic content of the composition? (1 less rythmical 5 more rhythmical)	4
How would you overall evaluate the performance you listened to? (1 not interesting 5 very interesting)	3

Blind Listening

Dear Participants, after listening and viewing the performance of Beau Sievers' Spatial Network, you are asked to evaluate your impressions about certain aspects of the performance, including your overall impression about the performance. Please keep in mind that the rating you will be giving to the heard and viewed piece is the Likert scale evaluation, the 5-point scale in which number 1 means the lowest level of impression, and number 5 means the highest level of impression. Thank you for attention and participation.

Questions	**Answers**
- How did you percept the duration of the performance? (1 the shortest 5 the longest)	4
- How did you percept the average pitch region of the composition? (1 low frequency 5 high frequency)	4
- How would you classify the variation of the tone/timbre of the composition? (1 poor variation 5 rich variation)	5
- How did you percept the tempo (bpm) of the composition? (1 slow tempo 5 fast tempo)	2
- How did you percept the dynamic range of the composition? (1 low range 5 high range)	4,5
-How did you percept the rhythmic content of the composition? (1 less rythmical 5 more rhythmical)	1
How would you overall evaluate the performance you listened to? (1 not interesting 5 very interesting)	5

Visual Listening

Dear Participants, after listening and viewing the performance of Beau Sievers' Spatial Network, you are asked to evaluate your impressions about certain aspects of the performance, including your overall impression about the performance. Please keep in mind that the rating you will be giving to the heard and viewed piece is the Likert scale evaluation, the 5-point scale in which number 1 means the lowest level of impression, and number 5 means the highest level of impression. Thank you for attention and participation.

Questions	**Answers**
- How did you percept the duration of the performance? (1 the shortest 5 the longest)	3,5
- How did you percept the average pitch region of the composition? (1 low frequency 5 high frequency)	3
- How would you classify the variation of the tone/timbre of the composition? (1 poor variation 5 rich variation)	5
- How did you percept the tempo (bpm) of the composition? (1 slow tempo 5 fast tempo)	3
- How did you percept the dynamic range of the composition? (1 low range 5 high range)	3
-How did you percept the rhythmic content of the composition? (1 less rythmical 5 more rhythmical)	3
How would you overall evaluate the performance you listened to? (1 not interesting 5 very interesting)	5

Visual Listening

Dear Participants, after listening and viewing the performance of Beau Sievers' Spatial Network, you are asked to evaluate your impressions about certain aspects of the performance, including your overall impression about the performance. Please keep in mind that the rating you will be giving to the heard and viewed piece is the Likert scale evaluation, the 5-point scale in which number 1 means the lowest level of impression, and number 5 means the highest level of impression. Thank you for attention and participation.

Questions	**Answers**
- How did you percept the duration of the performance? (1 the shortest 5 the longest)	4
- How did you percept the average pitch region of the composition? (1 low frequency 5 high frequency)	3
- How would you classify the variation of the tone/timbre of the composition? (1 poor variation 5 rich variation)	4
- How did you percept the tempo (bpm) of the composition? (1 slow tempo 5 fast tempo)	2
- How did you percept the dynamic range of the composition? (1 low range 5 high range)	3,5
-How did you percept the rhythmic content of the composition? (1 less rythmical 5 more rhythmical)	2
How would you overall evaluate the performance you listened to? (1 not interesting 5 very interesting)	4,5

Visual Listening

Dear Participants, after listening and viewing the performance of Beau Sievers' Spatial Network, you are asked to evaluate your impressions about certain aspects of the performance, including your overall impression about the performance. Please keep in mind that the rating you will be giving to the heard and viewed piece is the Likert scale evaluation, the 5-point scale in which number 1 means the lowest level of impression, and number 5 means the highest level of impression. Thank you for attention and participation.

Questions	Answers
- How did you percept the duration of the performance? (1 the shortest 5 the longest)	3.5
- How did you percept the average pitch region of the composition? (1 low frequency 5 high frequency)	3.5
- How would you classify the variation of the tone/timbre of the composition? (1 poor variation 5 rich variation)	4
- How did you percept the tempo (bpm) of the composition? (1 slow tempo 5 fast tempo)	2
- How did you percept the dynamic range of the composition? (1 low range 5 high range)	3
-How did you percept the rhythmic content of the composition? (1 less rythmical 5 more rhythmical)	4.5
How would you overall evaluate the performance you listened to? (1 not interesting 5 very interesting)	3.5

Visual Listening

Dear Participants, after listening and viewing the performance of Beau Sievers' Spatial Network, you are asked to evaluate your impressions about certain aspects of the performance, including your overall impression about the performance. Please keep in mind that the rating you will be giving to the heard and viewed piece is the Likert scale evaluation, the 5-point scale in which number 1 means the lowest level of impression, and number 5 means the highest level of impression. Thank you for attention and participation.

Questions	**Answers**
- How did you percept the duration of the performance? (1 the shortest 5 the longest)	3
- How did you percept the average pitch region of the composition? (1 low frequency 5 high frequency)	3
- How would you classify the variation of the tone/timbre of the composition? (1 poor variation 5 rich variation)	4
- How did you percept the tempo (bpm) of the composition? (1 slow tempo 5 fast tempo)	2
- How did you percept the dynamic range of the composition? (1 low range 5 high range)	4
-How did you percept the rhythmic content of the composition? (1 less rythmical 5 more rhythmical)	3
How would you overall evaluate the performance you listened to? (1 not interesting 5 very interesting)	4

Visual Listening

Appendix B

Music scores used in the present research

(except the work *'Xcuse me while I kiss the sky,* by Pedro Junqueira Maia, which format is unprintable)

Vox Sum Vitae

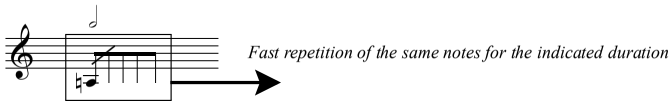
for vibraphone and electronics

João Pedro Oliveira

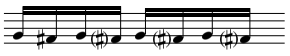
2011

Commissioned by Atelier de Composição and Oficina Musical
Premiered by Nuno Aroso: Italy, June 2011

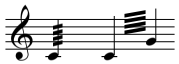
Duration: 9′ 30″



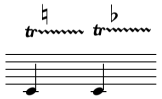
Fast repetition of the same notes for the indicated duration



Accidentals apply only to the note to which they are attached except in case of repeated notes and patterns.



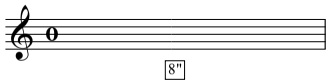
Tremolos and repeated notes are always played very fast and not measured.



Trilling note is indicated by the small accidental above the trill line.

The number of notes to be played in these accellerandi or ritardandi groups is free, but the overall duration should be respected

In measures without time signature, time is indicated in seconds and graphical measuring applies to unmeasured notes.



Mallets:

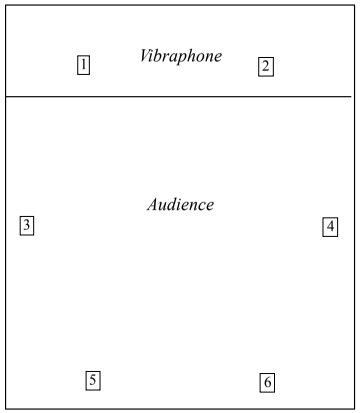
Hard

Medium

Soft

Knitting Needles

Stage setup



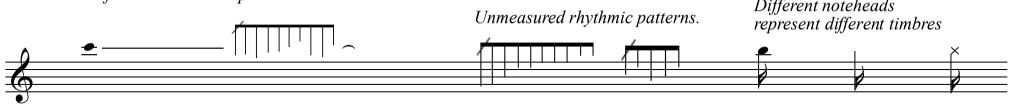
Audio channels 1 to 6 should be assigned to the loudspeaker position indicated above.

Tape Notation:
The performer must understand all tape cues written in the score.
These cues are rhythmically and melodically as accurate as possible.
For practical reasons some effects in the tape are not notated.

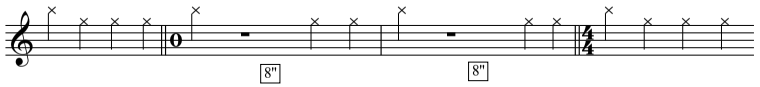
Prolongation with delay or reverb of the same note or pattern .

Unmeasured rhythmic patterns.

Different noteheads represent different timbres



Using the click-track:
Click-track plays every beat.
In measures without time signature click-track does not play.
Cue to next measure is given two beats before.

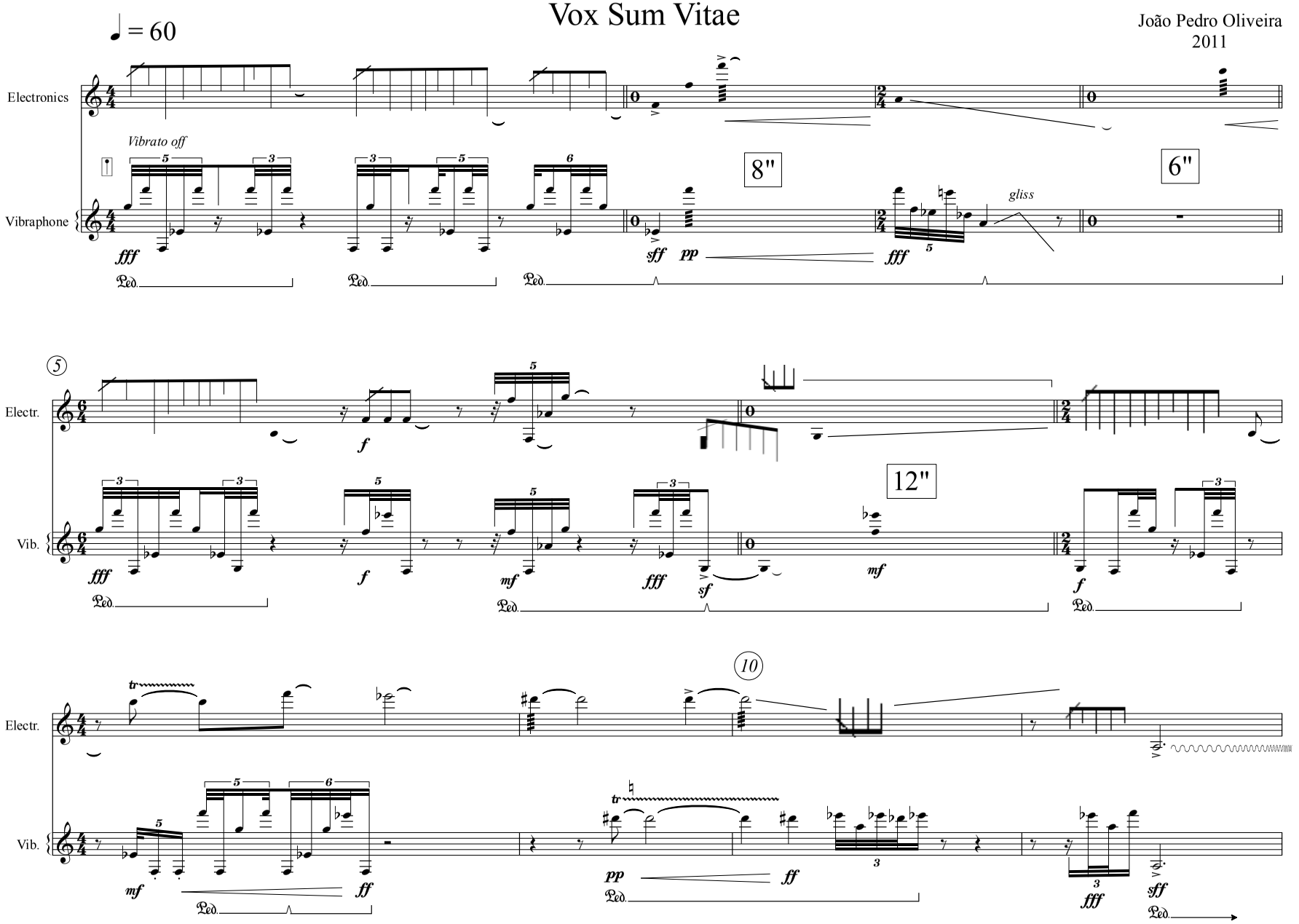


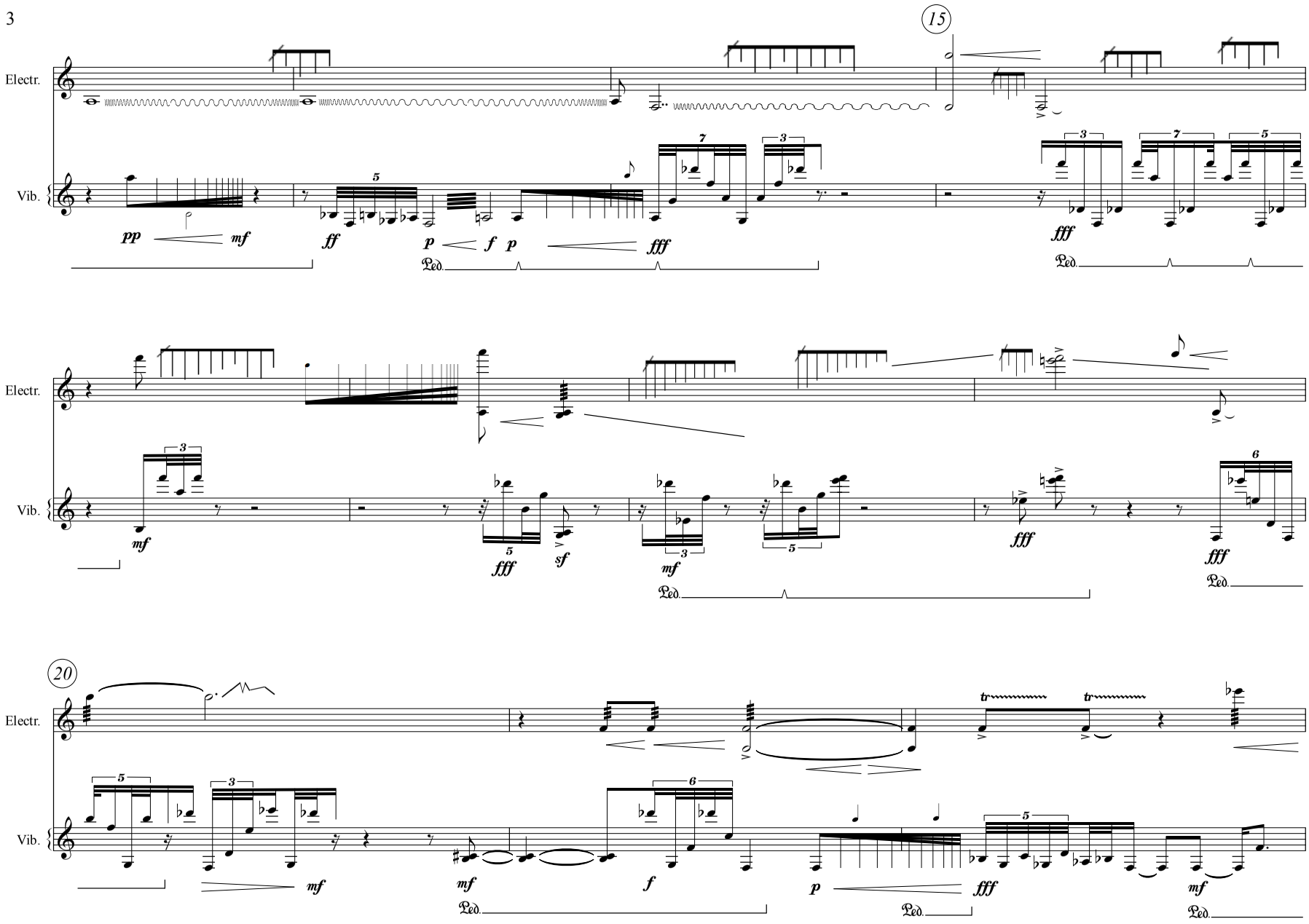
etc.

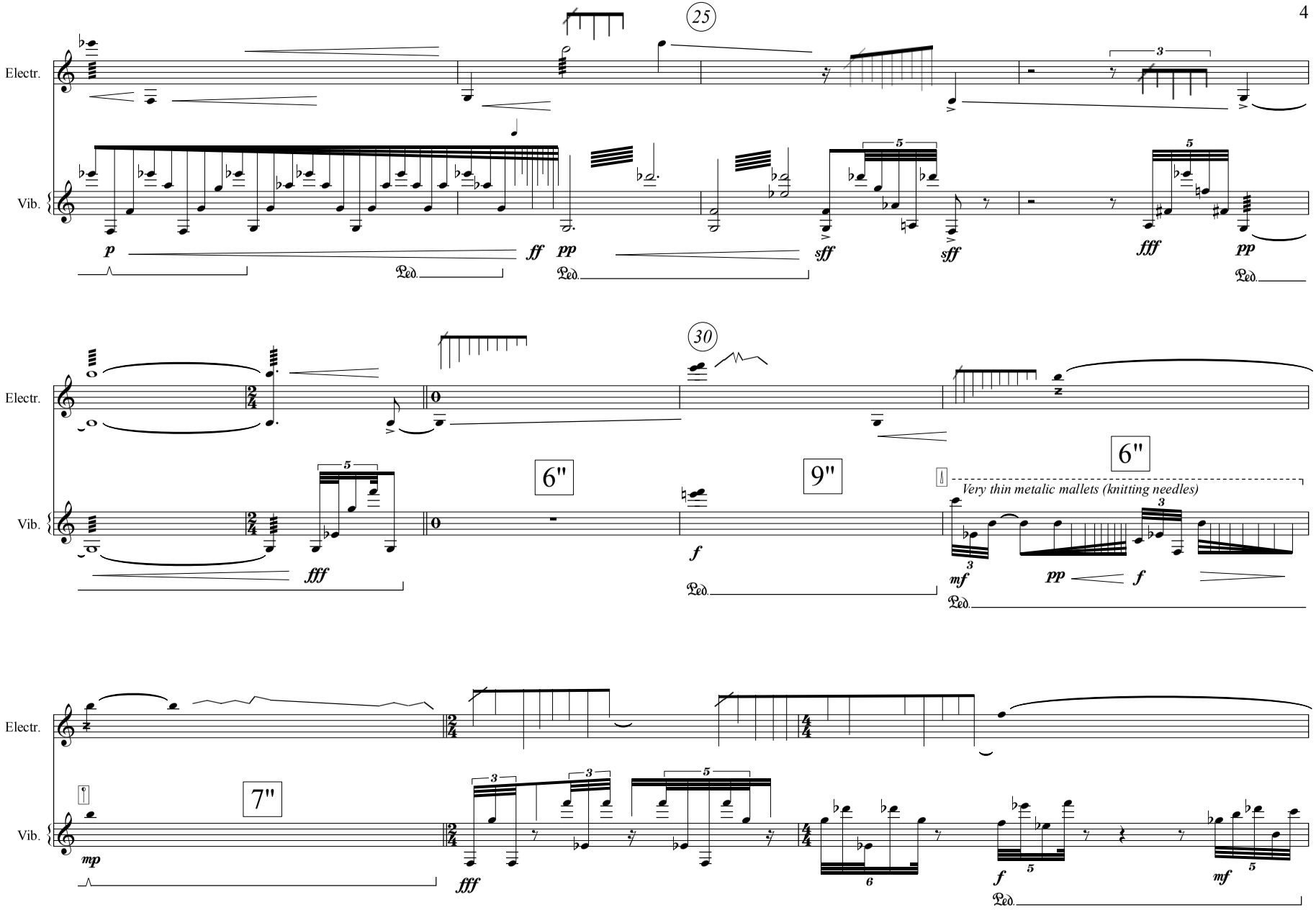
Other indications are written in the score.
Depending on the conditions of the concert hall, vibraphone may eventually need amplification to blend better with the electronic sounds.

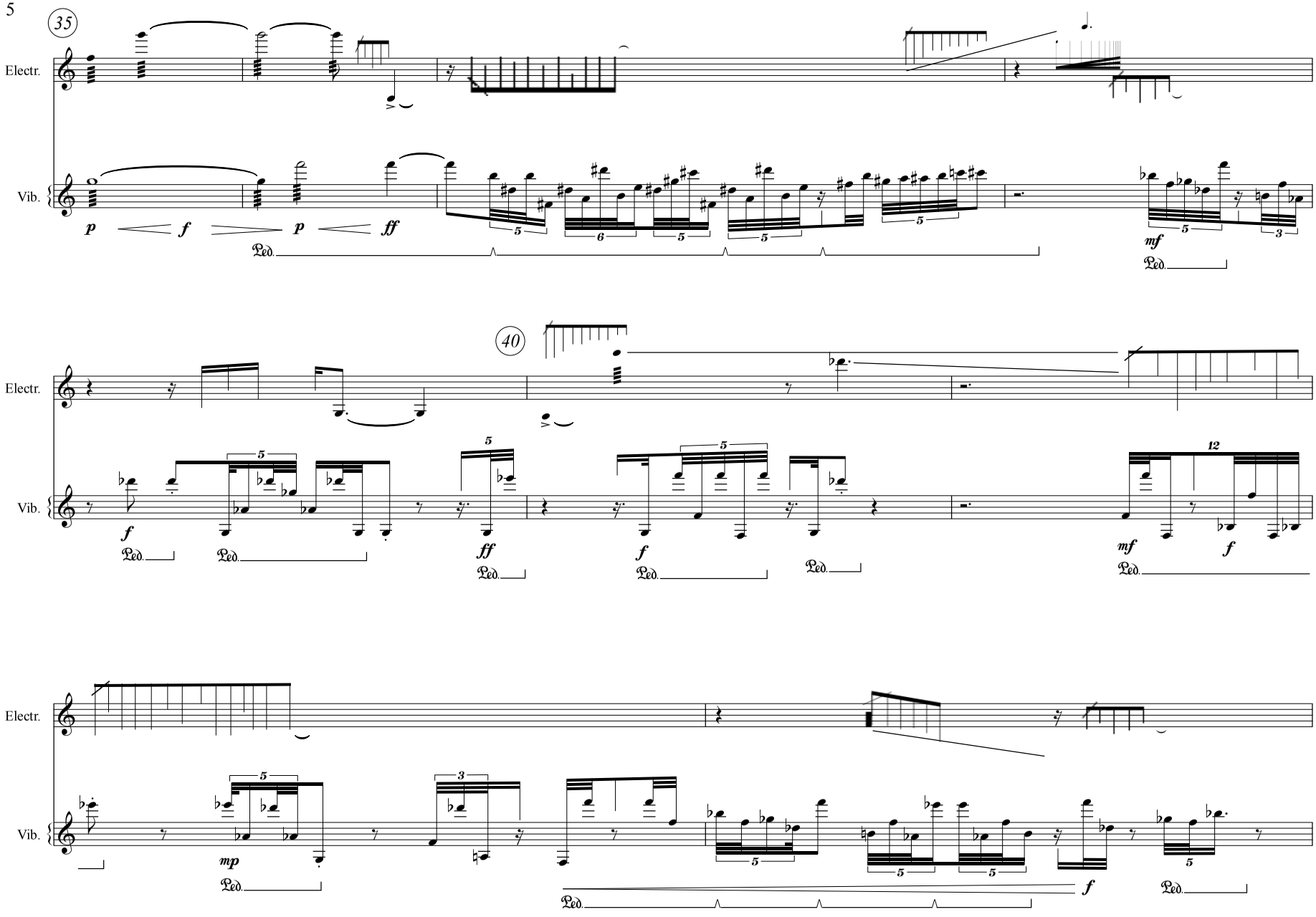
Vox Sum Vitae

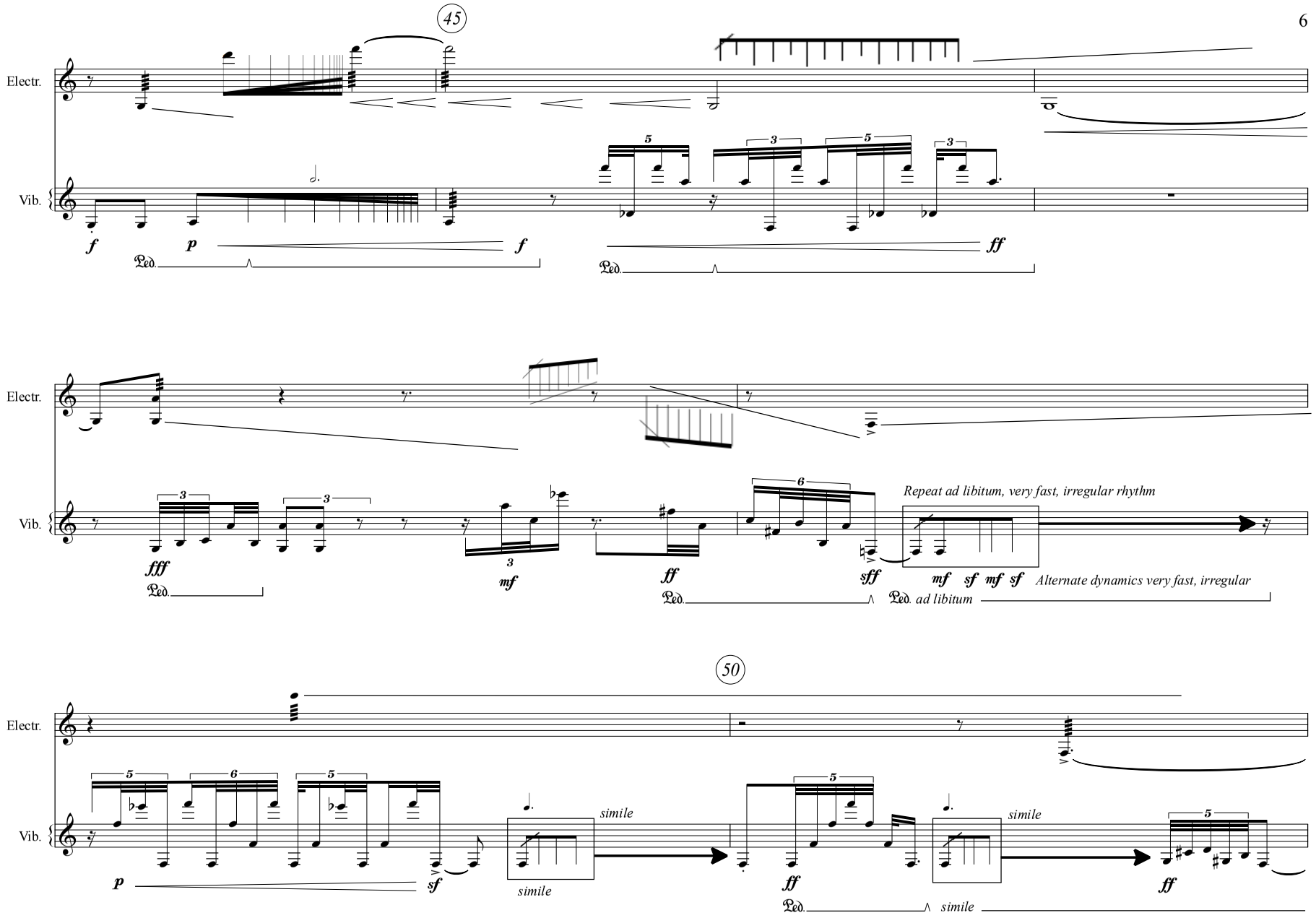
João Pedro Oliveira
2011

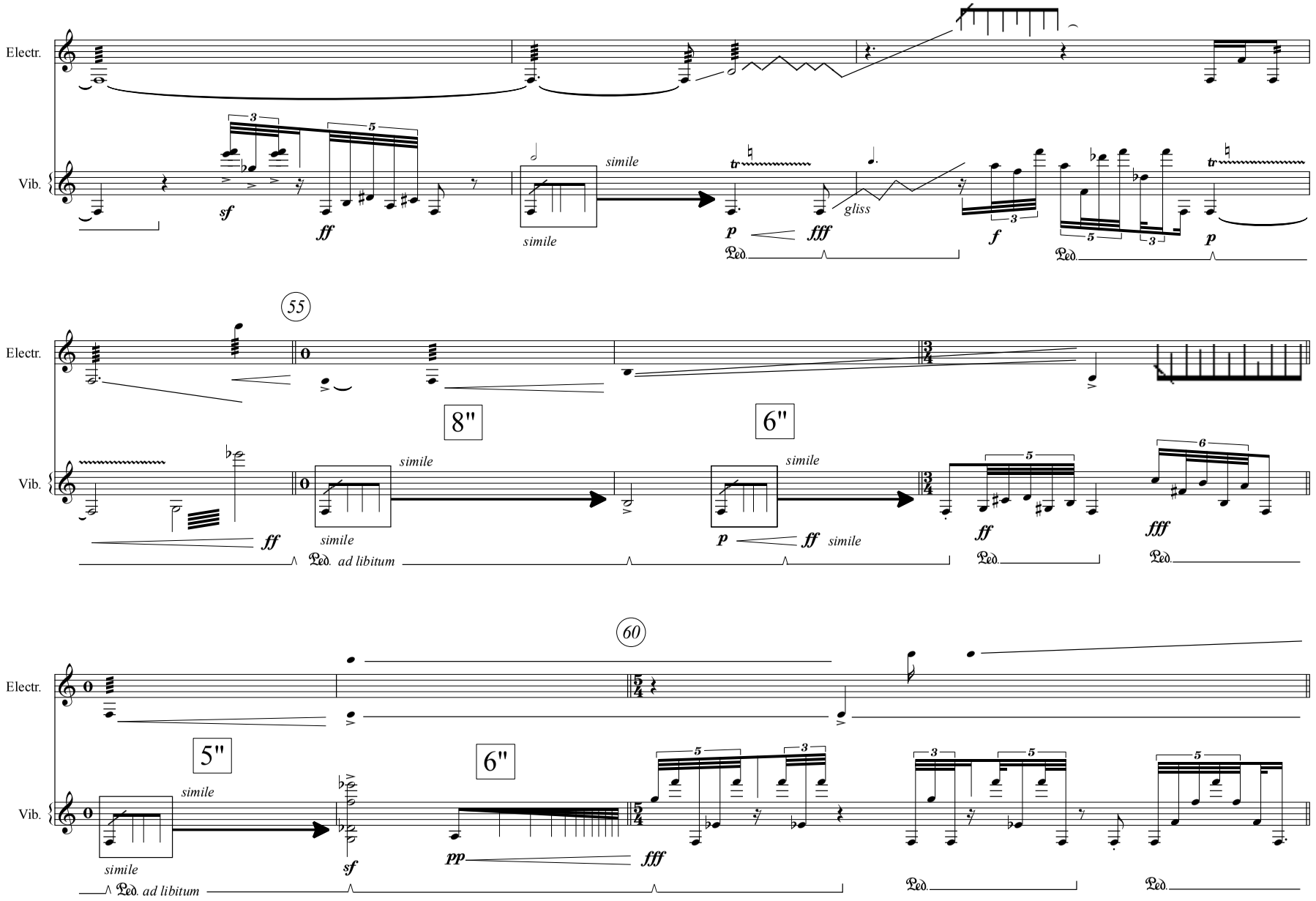


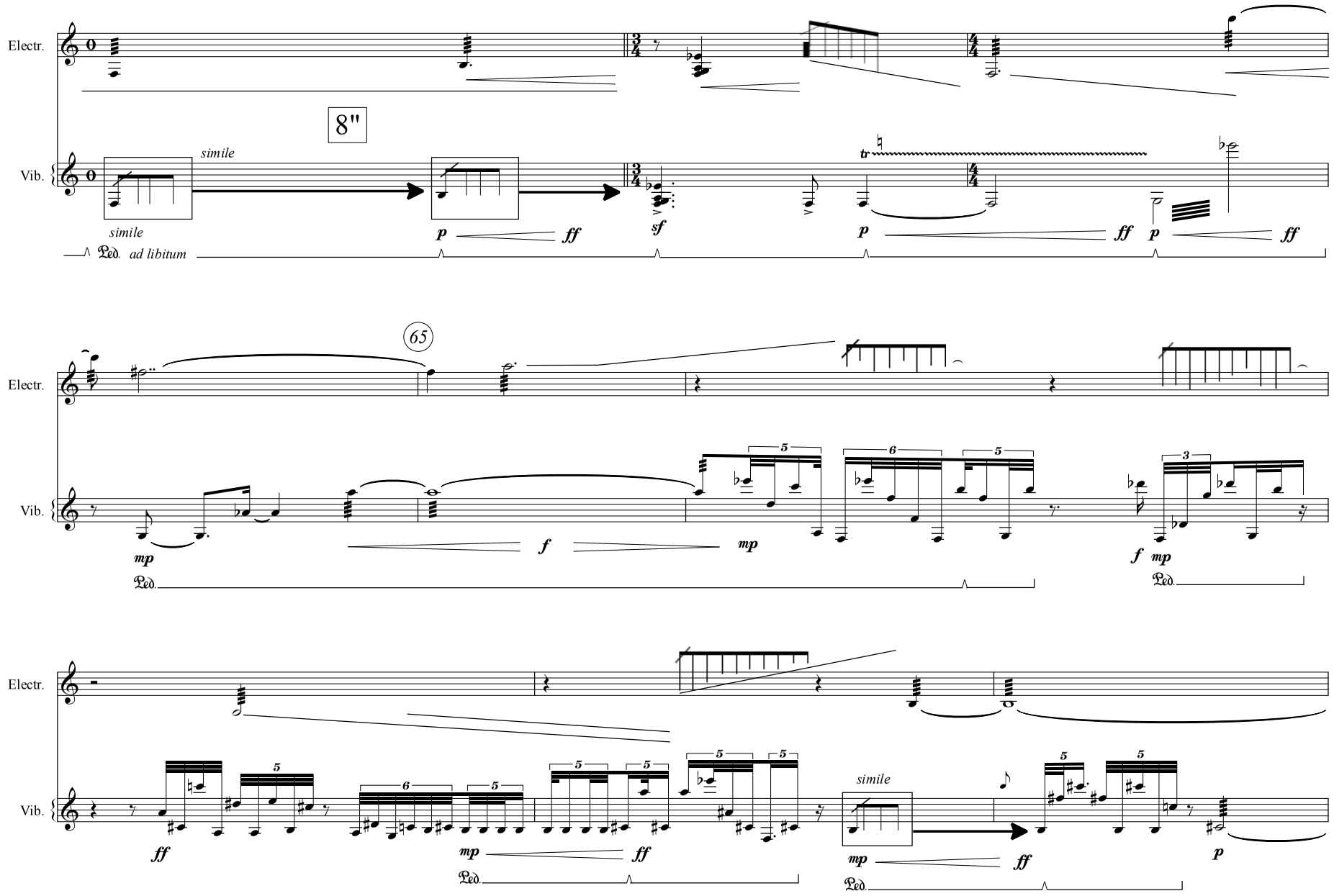

15
Electr.
Vib.
pp
mf
ff
p
f
p
fff
fff
Ped.
Electr.
Vib.
mf
fff
sf
mf
fff
fff
Ped.
20
Electr.
Vib.
mf
mf
f
p
fff
mf
Ped.
Ped.
Ped.

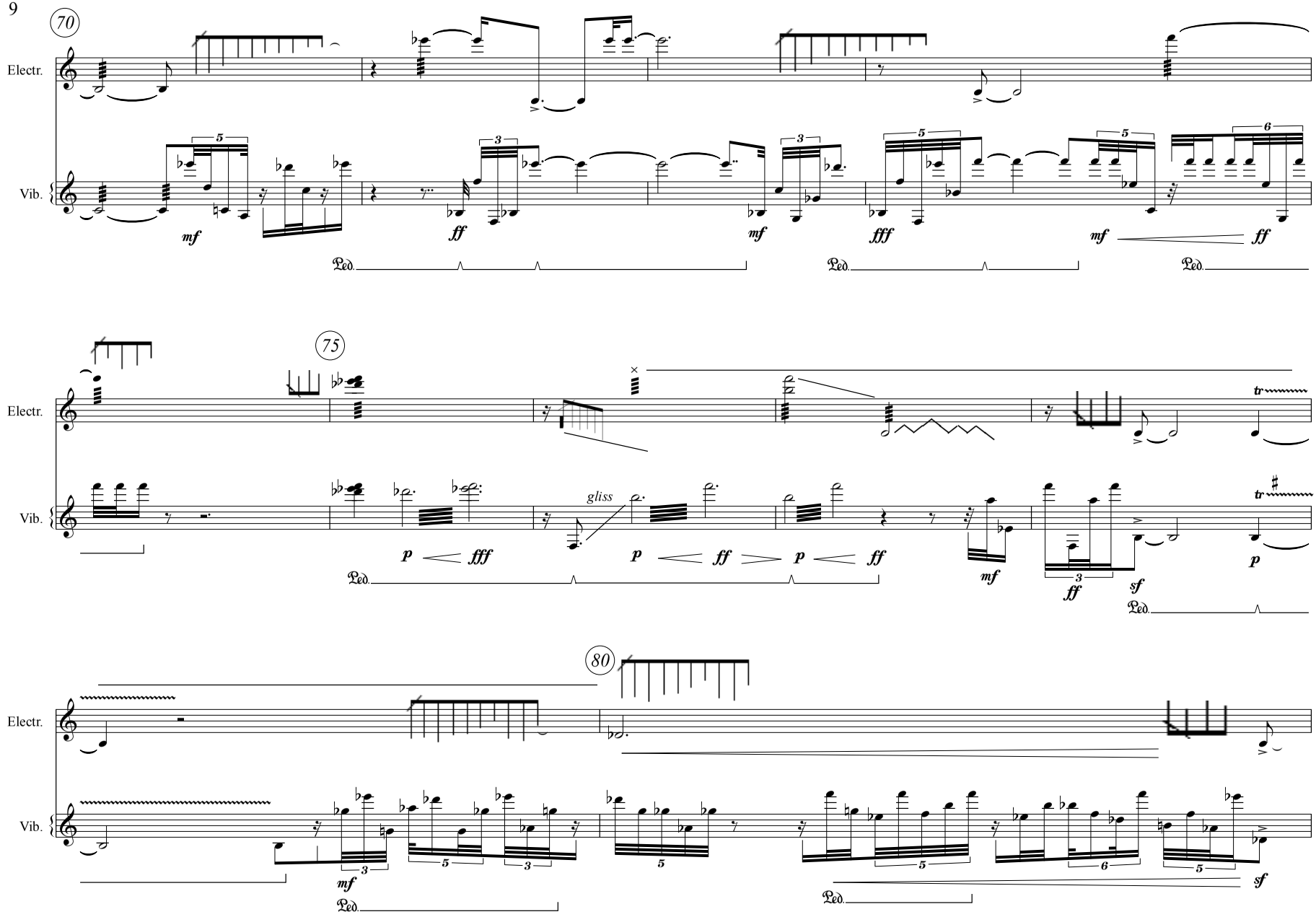

25
Electr.
Vib.
p
ff
pp
sff
sff
fff
pp
Ped.
30
Electr.
Vib.
fff
6"
f
9"
6"
Very thin metalic mallets (knitting needles)
mf
pp
f
Ped.
Electr.
Vib.
7"
mp
fff
f
mf
Ped.

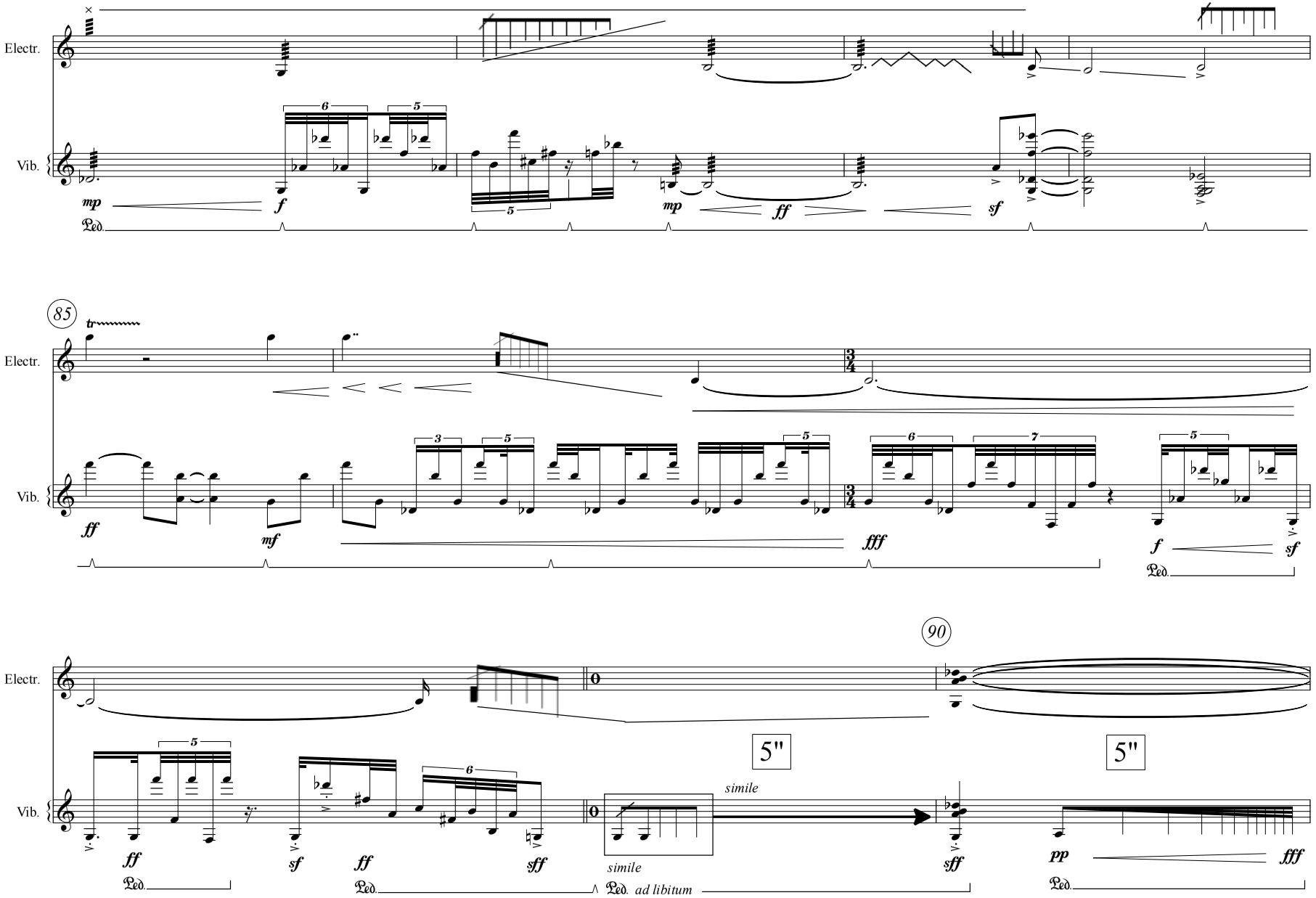

35
Electr.
Vib.
p
f
p
ff
Ped.
mf
Ped.
40
Electr.
Vib.
f
Ped.
Ped.
ff
Ped.
f
Ped.
Ped.
mf
f
Ped.
Electr.
Vib.
mp
Ped.
Ped.
f
Ped.

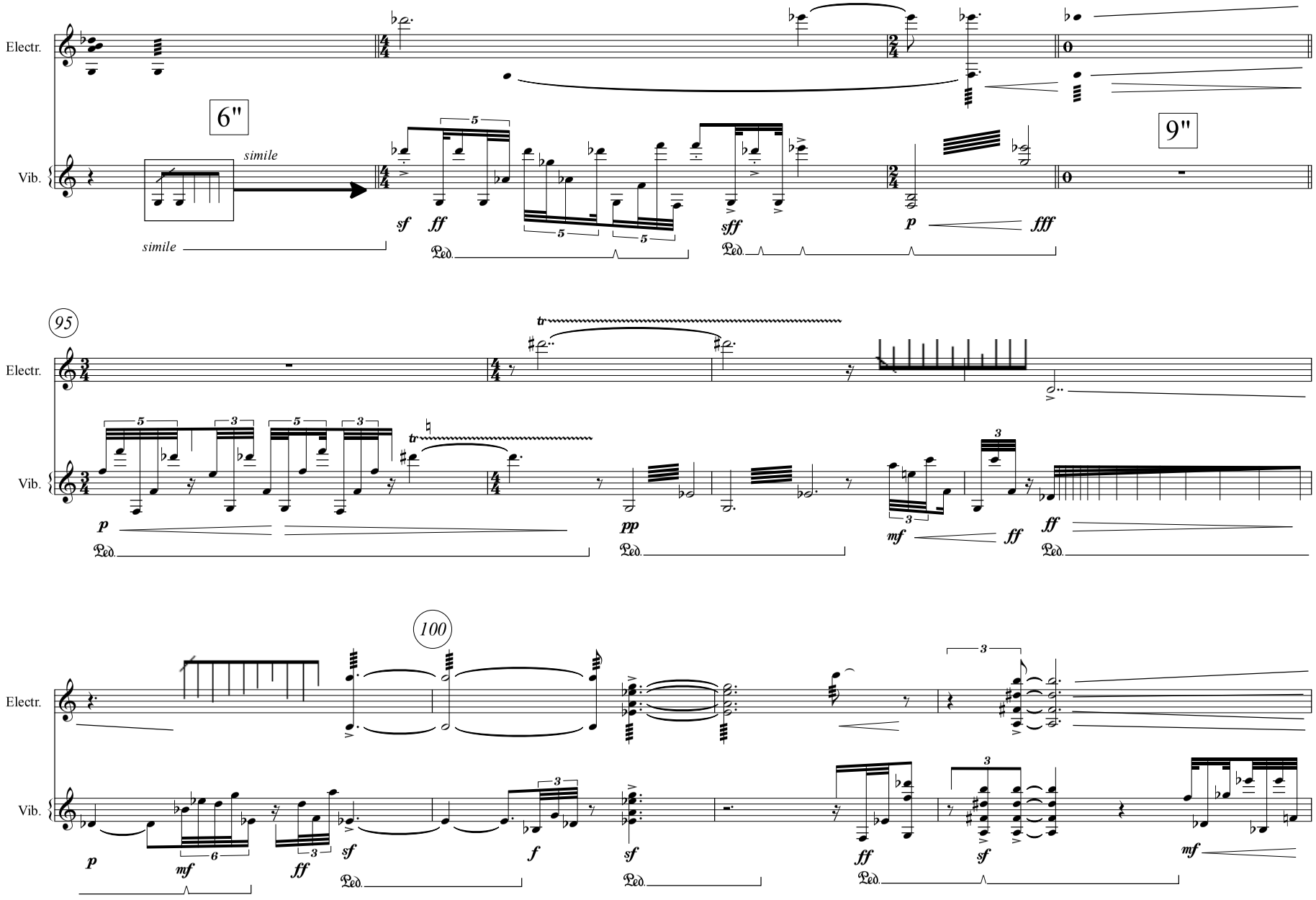

45
Electr.
Vib.
f
p
f
ff
Ped.
Electr.
Vib.
fff
mf
ff
sff
Repeat ad libitum, very fast, irregular rhythm
mf sf mf sf
Alternate dynamics very fast, irregular
Ped.
Ped. ad libitum
50
Electr.
Vib.
p
sf
simile
simile
ff
simile
simile
ff
Ped.

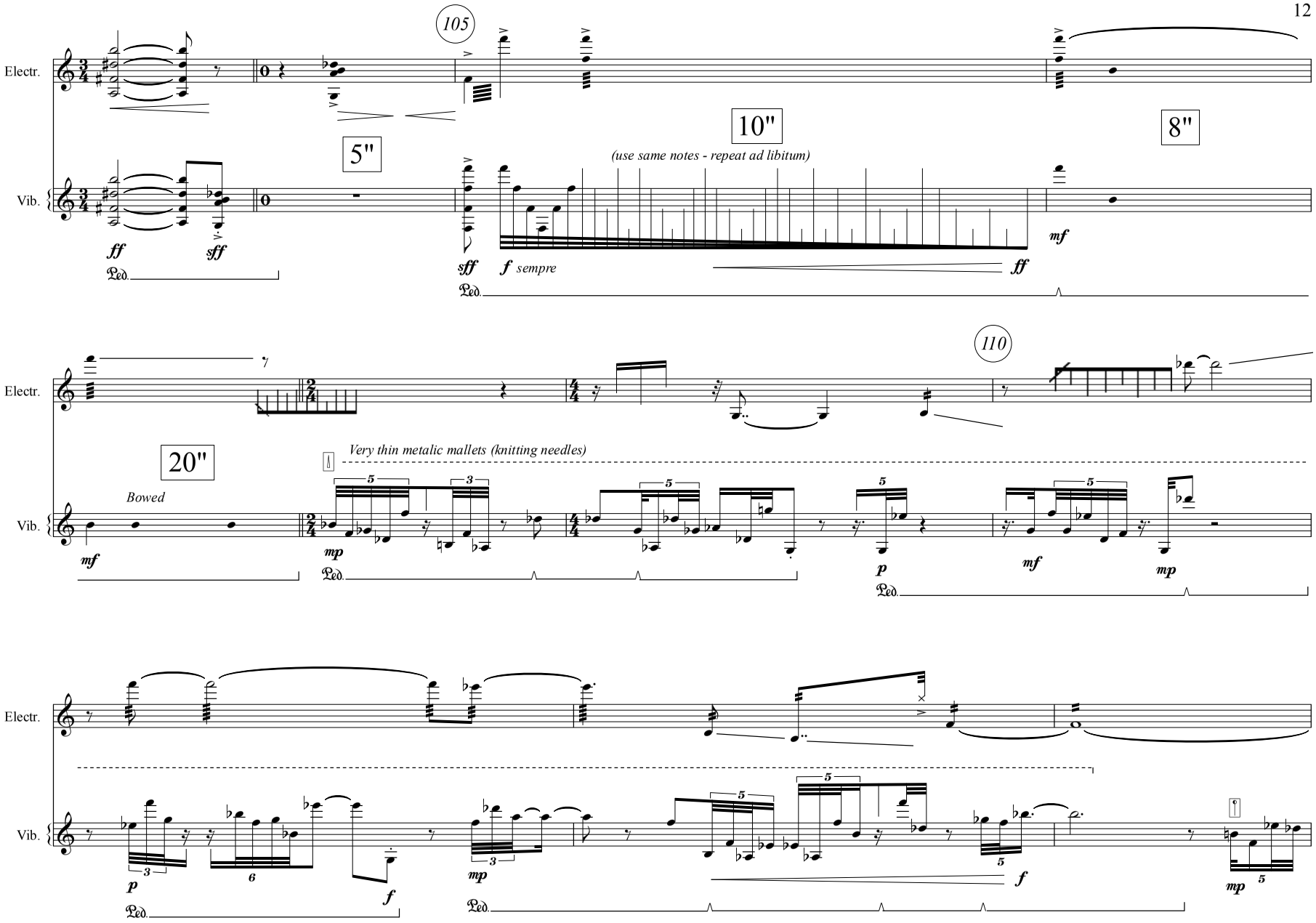

Electr.
Vib.
sf
ff
simile
simile
p
fff
gliss
f
p
Ped.
55
8"
6"
simile
simile
simile
ff
simile
p
ff
simile
ff
fff
Ped. ad libitum
Ped.
Ped.
60
5"
6"
simile
simile
sf
pp
fff
Ped. ad libitum
Ped.
Ped.


Electr.
Vib.
8"
simile
simile
p
ff
sf
tr
p
ff
p
ff
Ped.
ad libitum
65
Electr.
Vib.
mp
f
mp
f
mp
Ped.
Electr.
Vib.
ff
mp
ff
Ped.
simile
mp
ff
p
Ped.

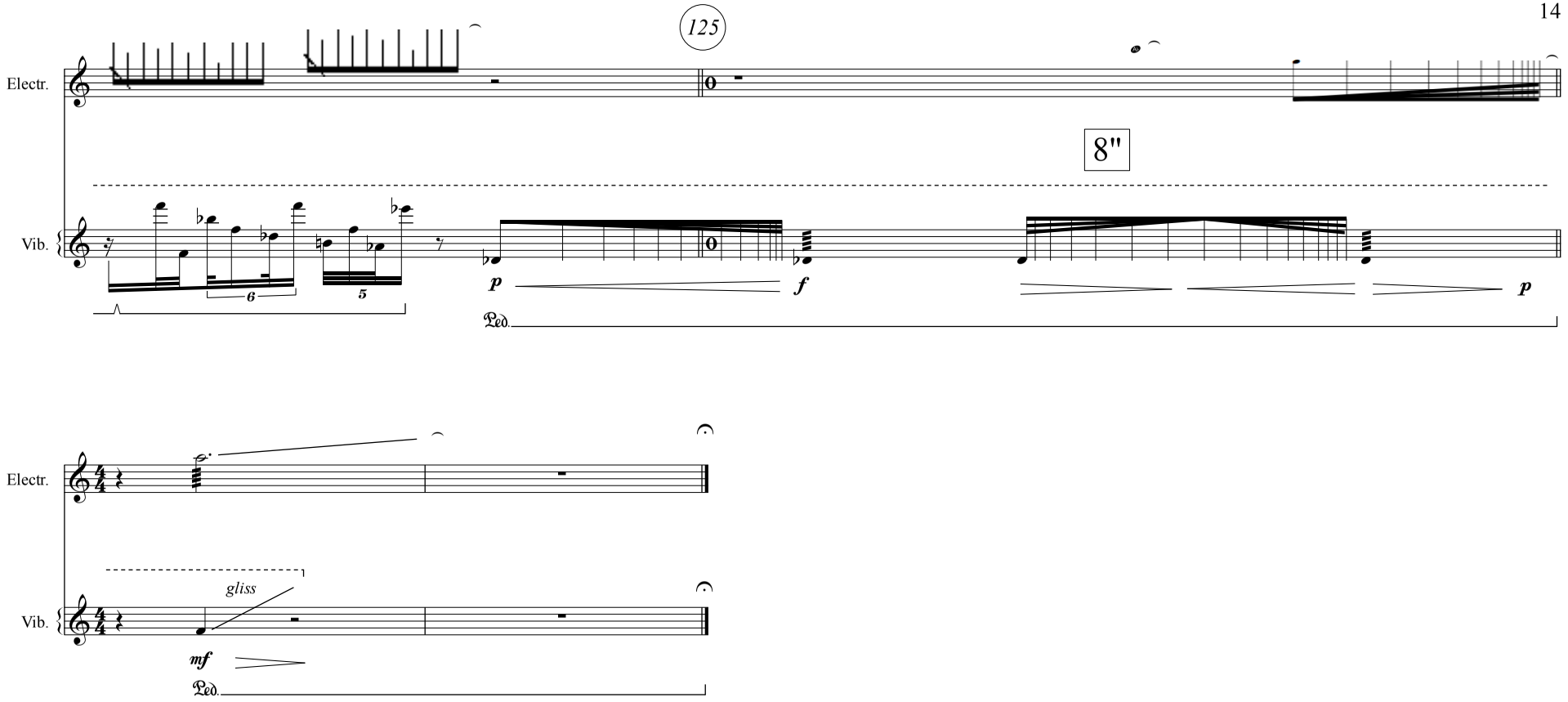

70
Electr.
Vib.
mf
ff
mf
fff
mf
ff
Ped.
75
Electr.
Vib.
gliss
p
fff
p
ff
p
ff
mf
ff
sf
tr
p
Ped.
80
Electr.
Vib.
mf
sf
Ped.


Electr.
Vib.
mp
f
mp
ff
sf
Ped.
85
tr
ff
mf
fff
f
sf
90
5"
5"
simile
simile
ff
sf
ff
sff
sff
pp
fff
Ped.
ad libitum


Electr.
Vib.
6"
simile
simile
9"
sf
ff
sff
p
fff
Ped.
95
tr
p
pp
mf
ff
100
mf
ff
sf
f
sf
ff
sf
mf

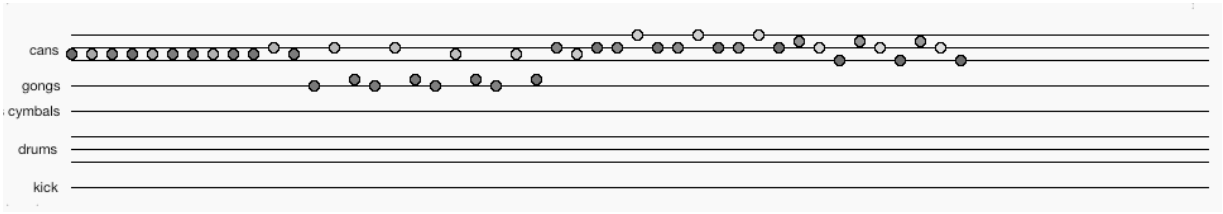

105
Electr.
Vib.
5"
10"
8"
(use same notes - repeat ad libitum)
ff
sff
sff
f sempre
ff
mf
Ped.
110
20"
Very thin metalic mallets (knitting needles)
Bowed
mf
mp
p
mf
mp
Ped.
p
f
mp
f
mp
Ped.


115
Electr.
Vib.
Very thin metalic mallets (knitting needles)
8"
120
6"
Very thin metalic mallets (knitting needles,

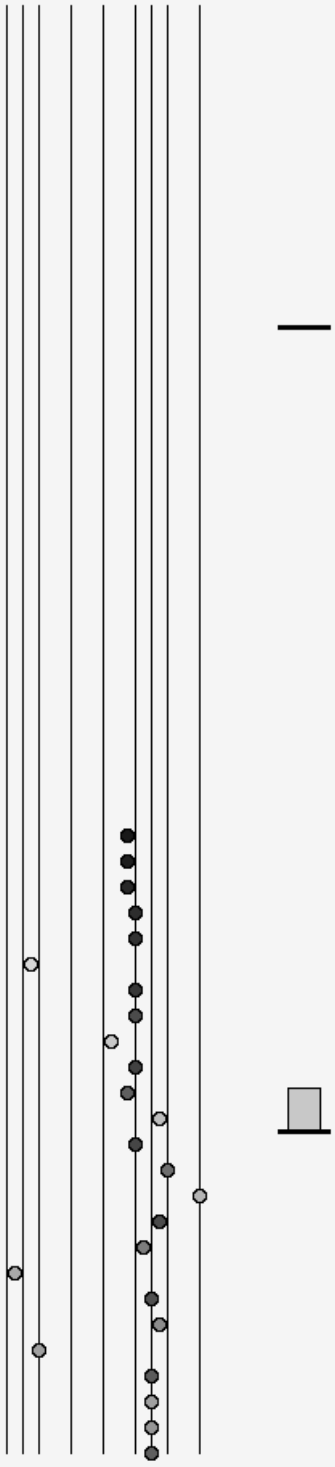

125
Electr.
8"
Vib.
6
5
p
f
p
Ped.
Electr.
gliss
Vib.
mf
Ped.

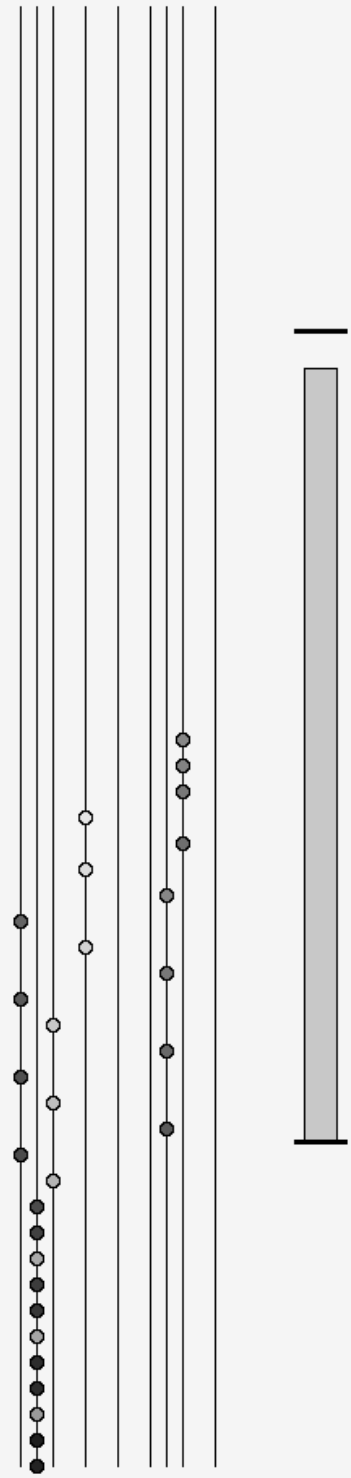
Spatial Network

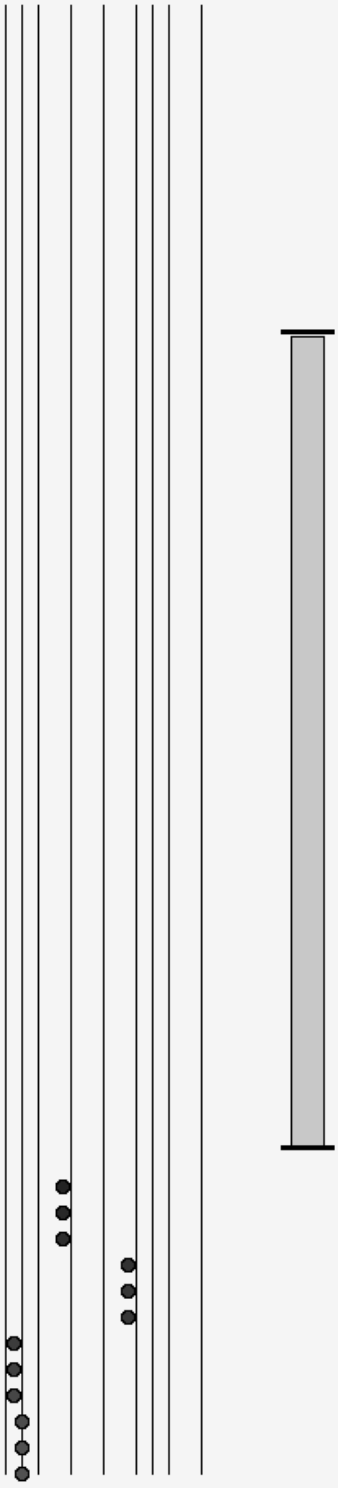
By Beau Sievers

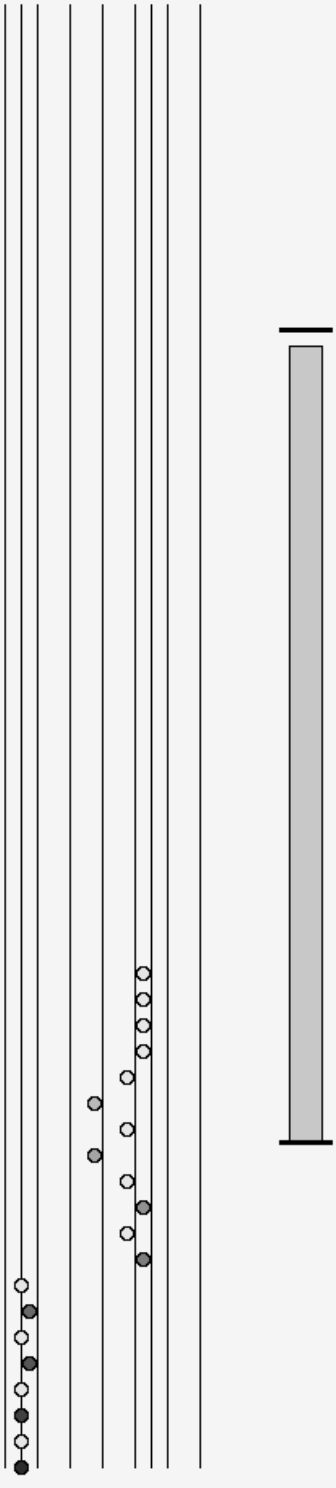


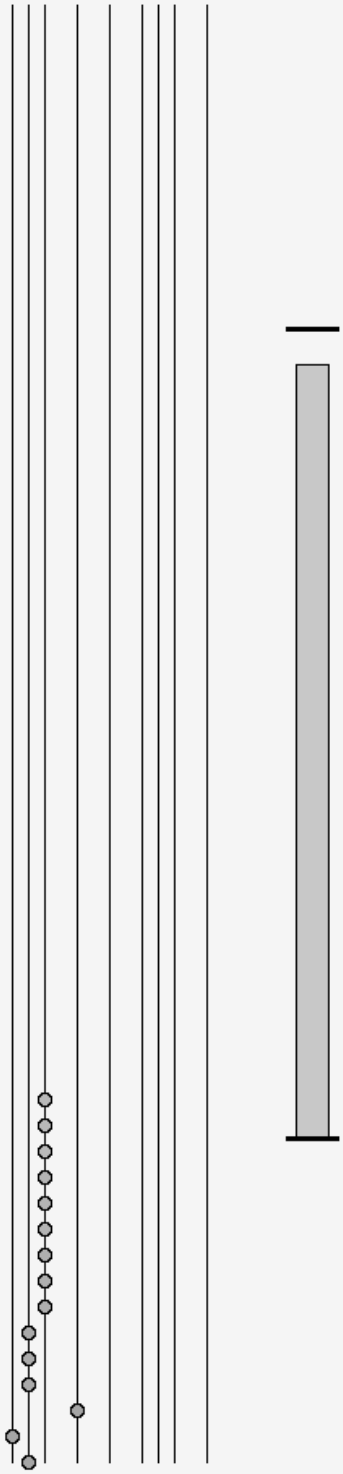
Instruments distribution scheme.

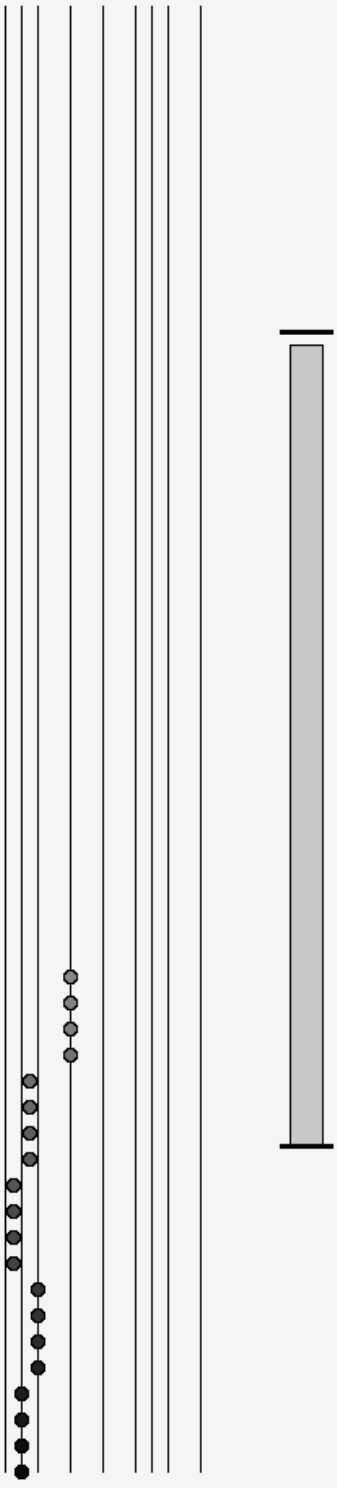


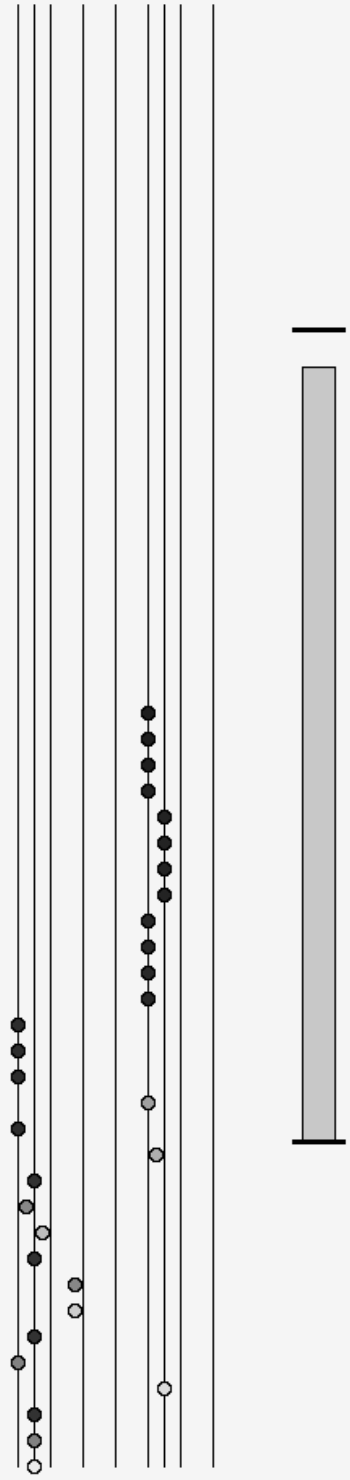


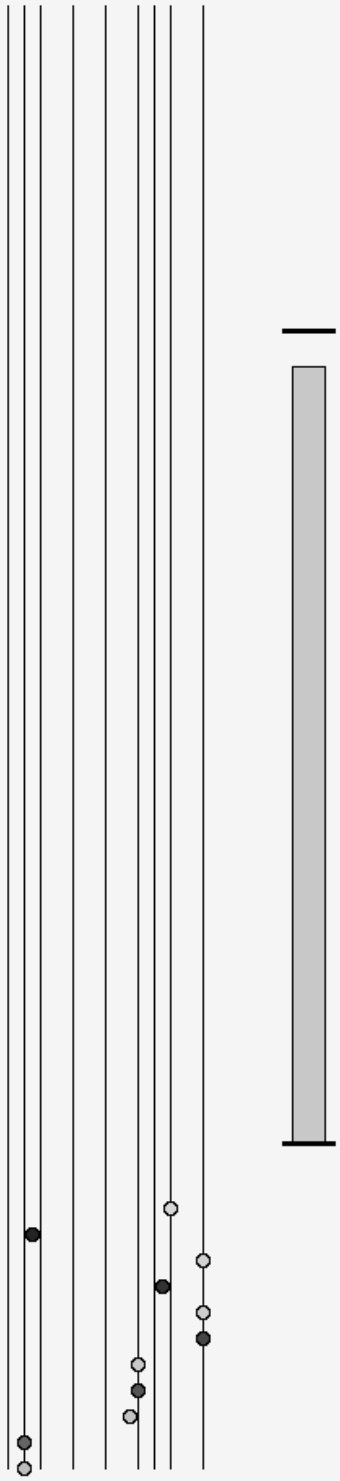


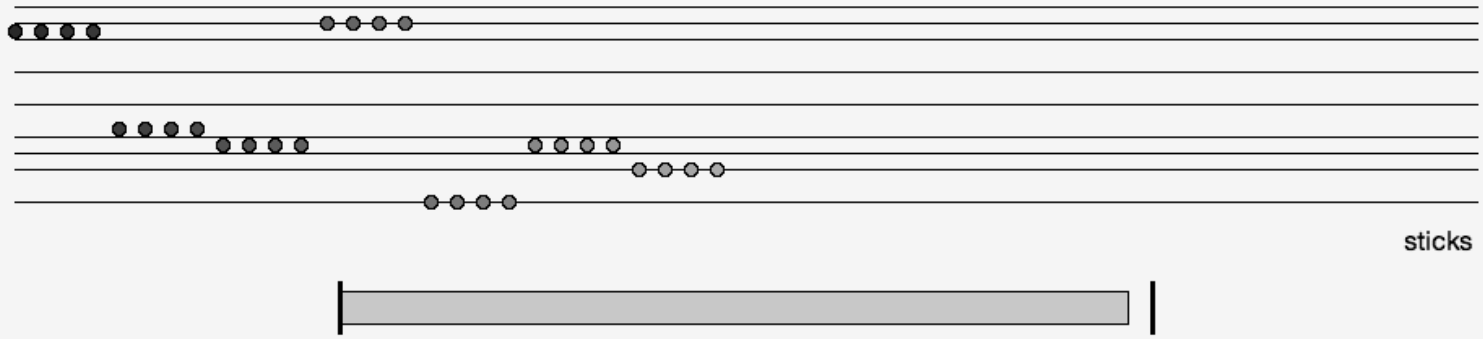








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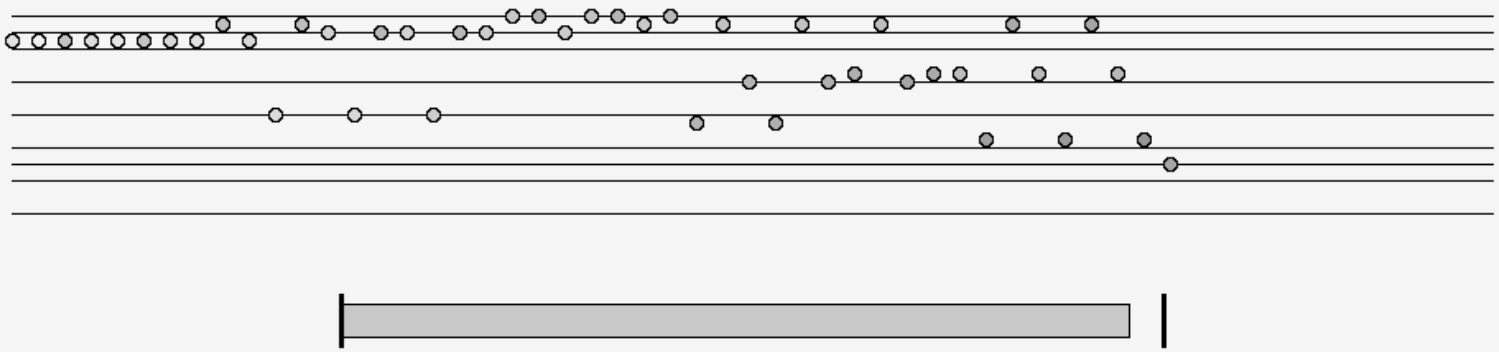

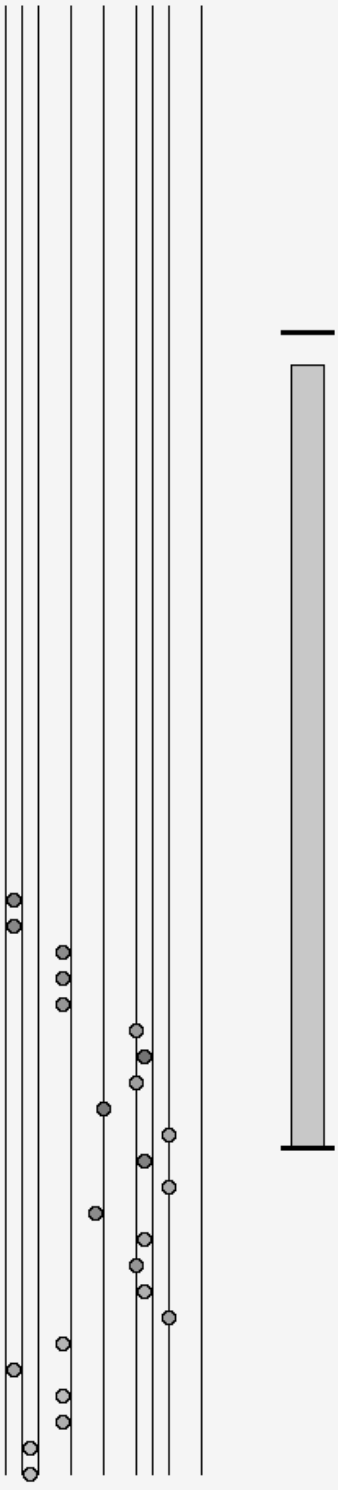

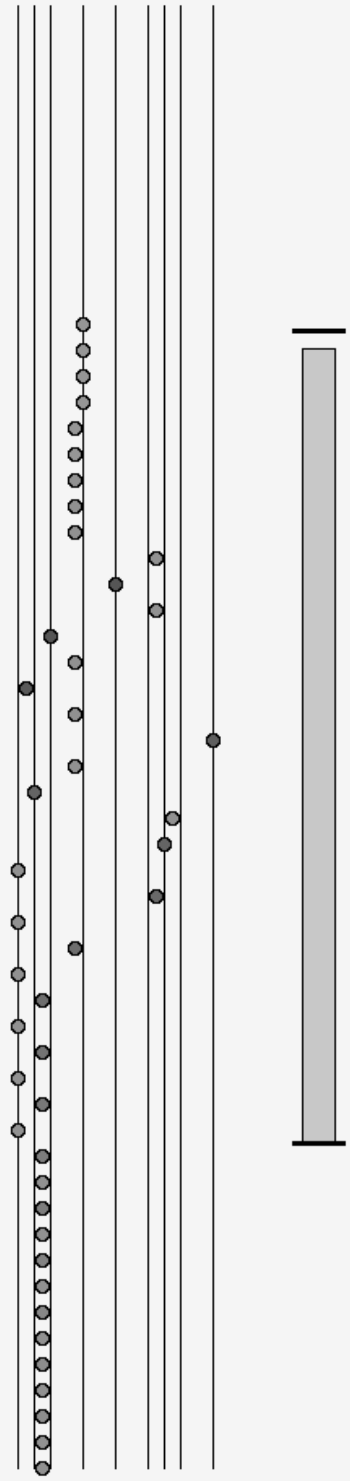

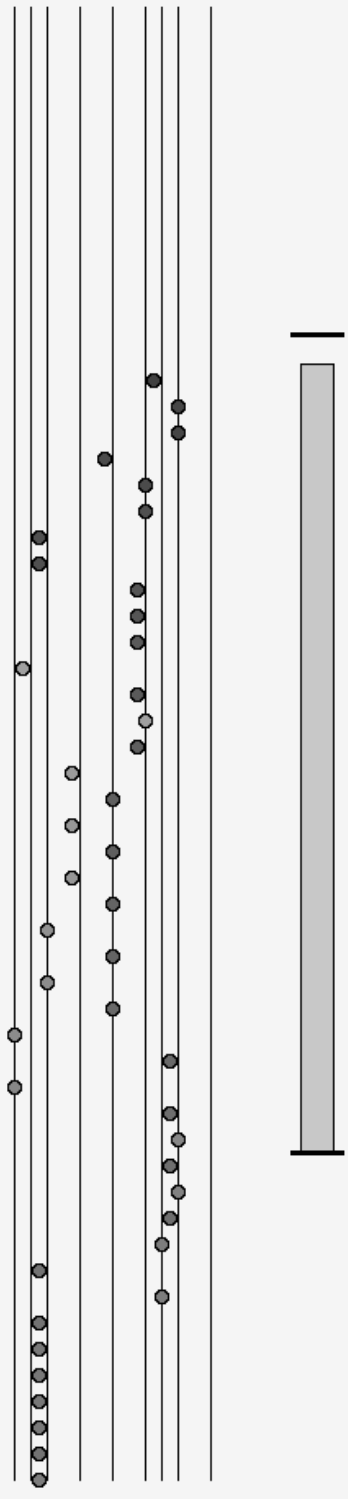

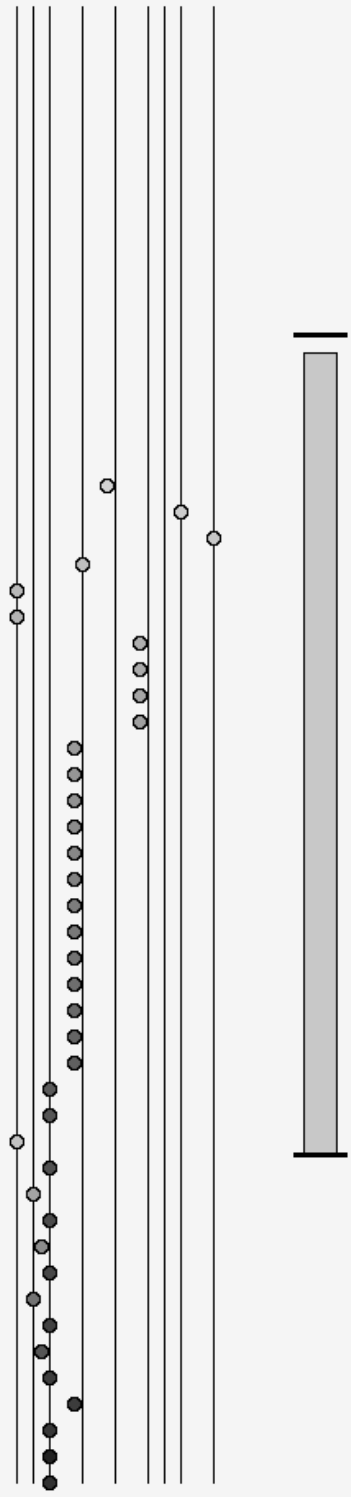

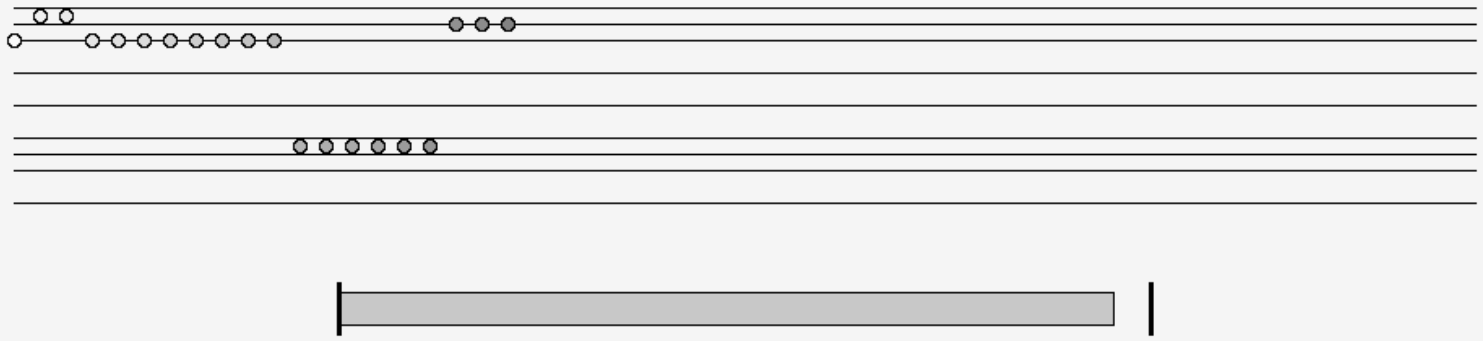

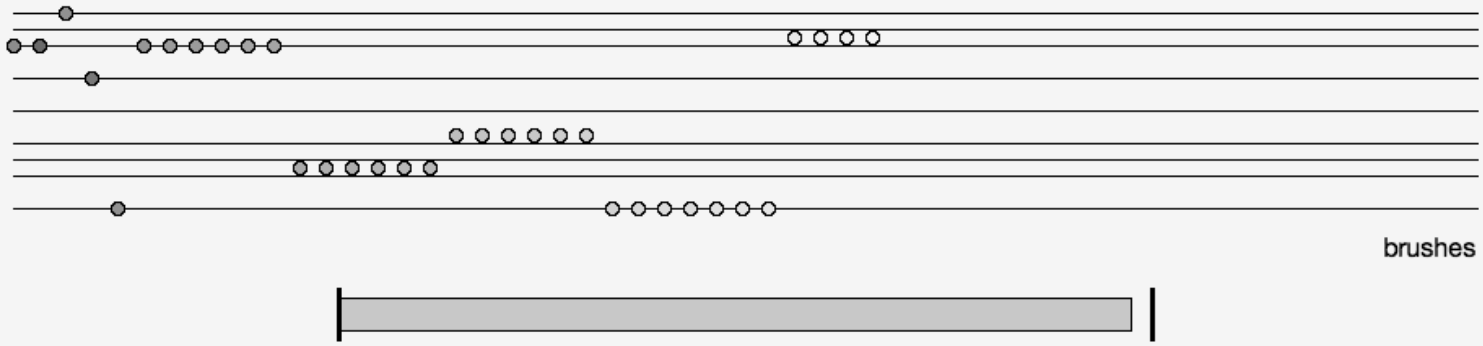
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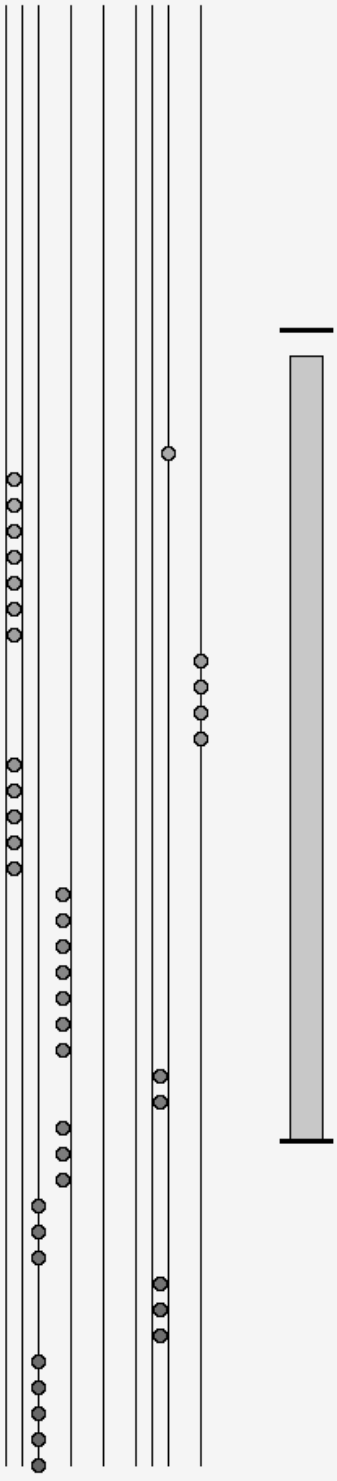

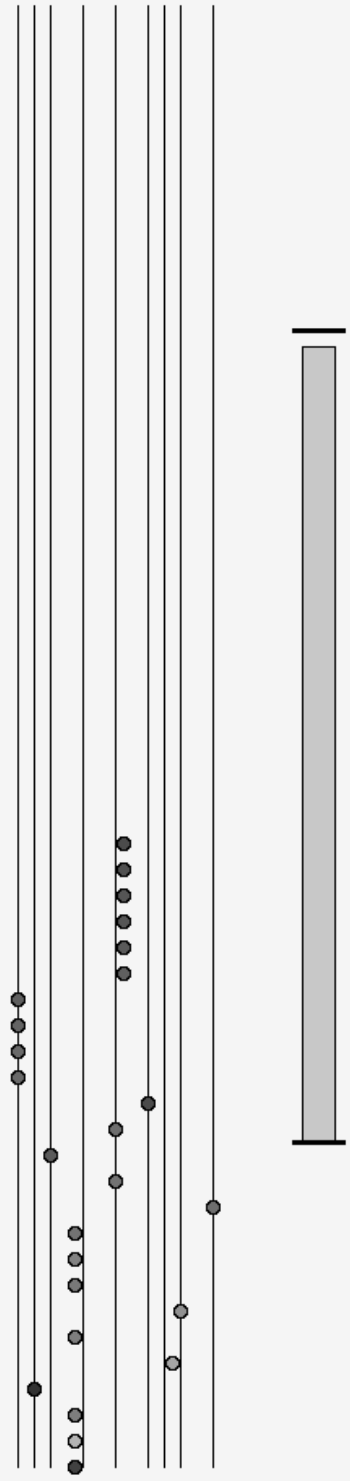

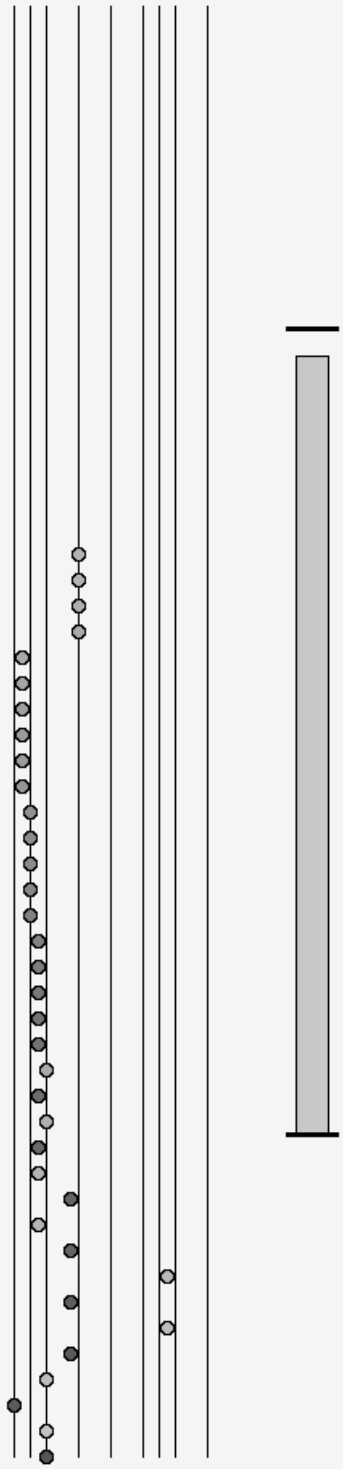

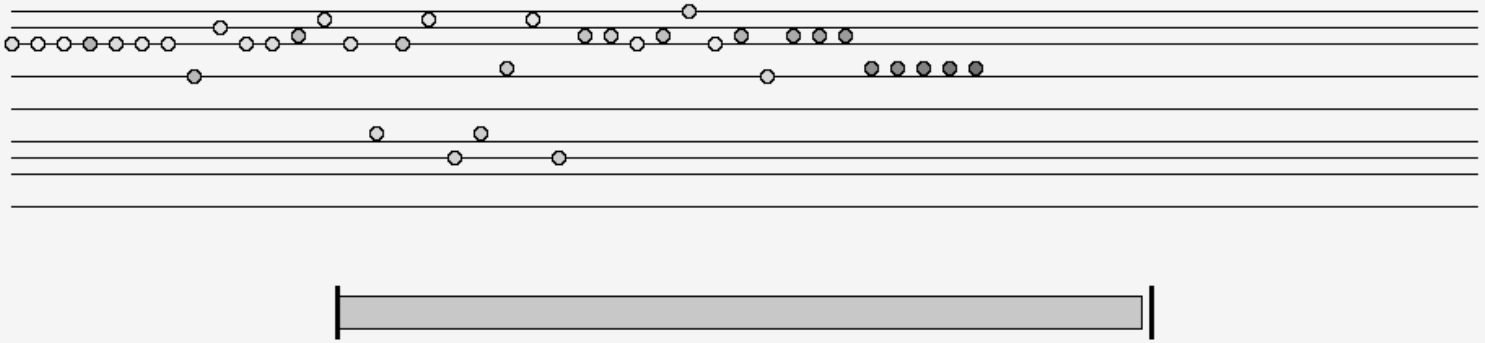

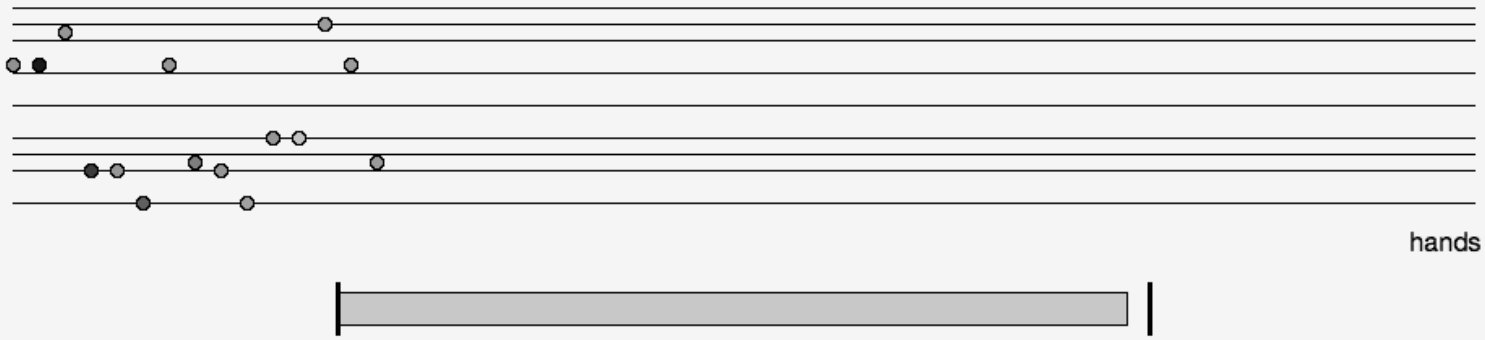
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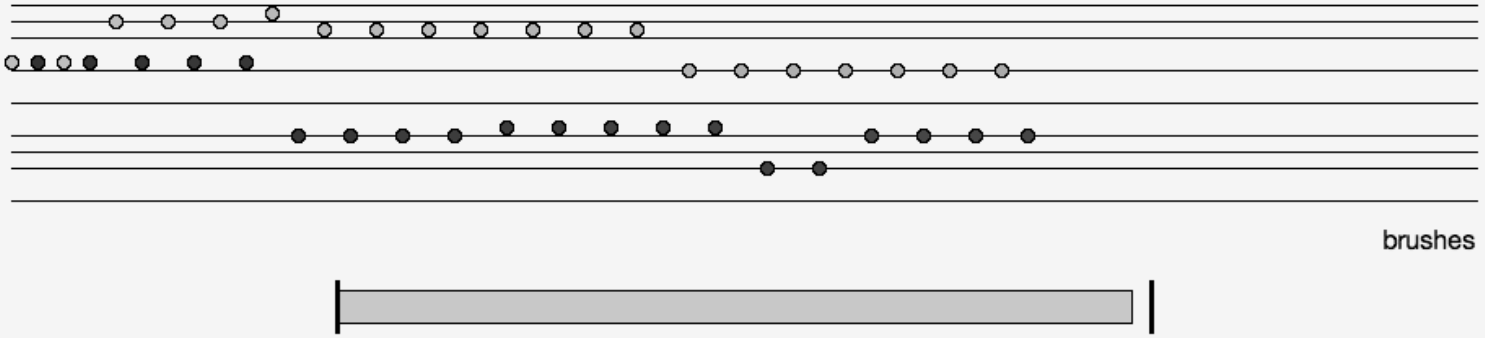
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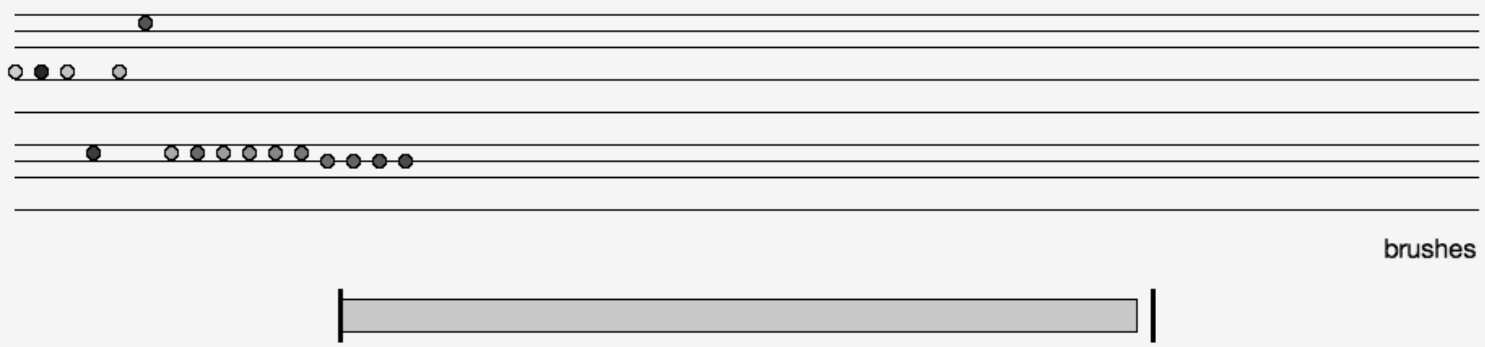
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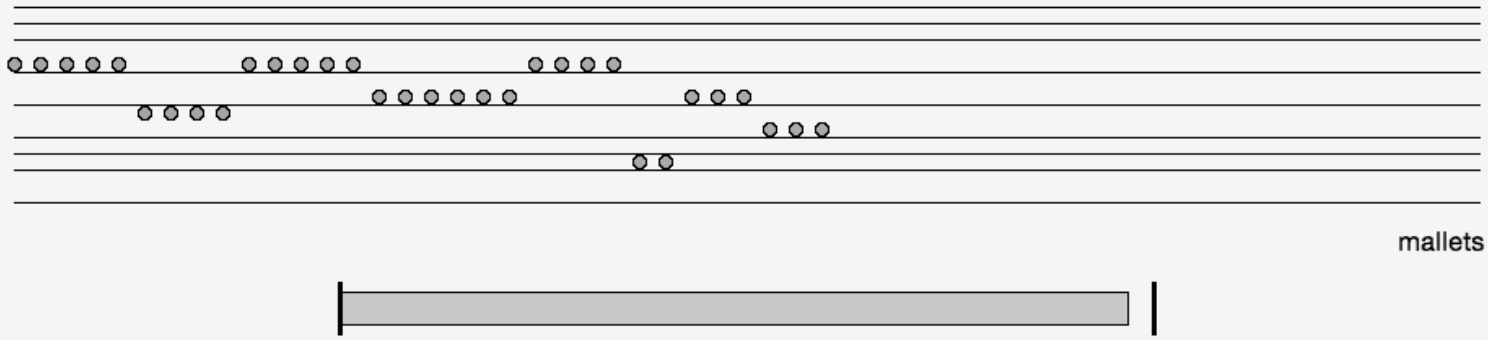
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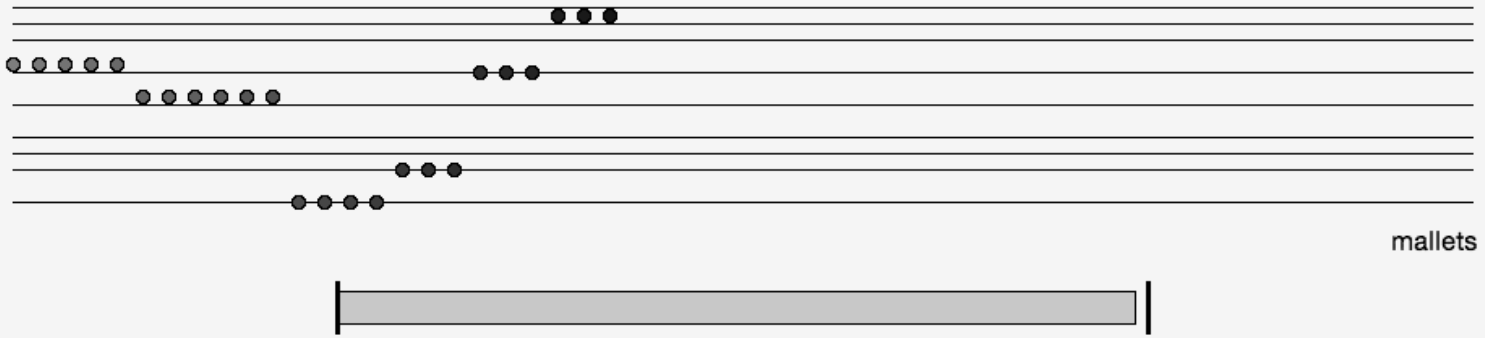
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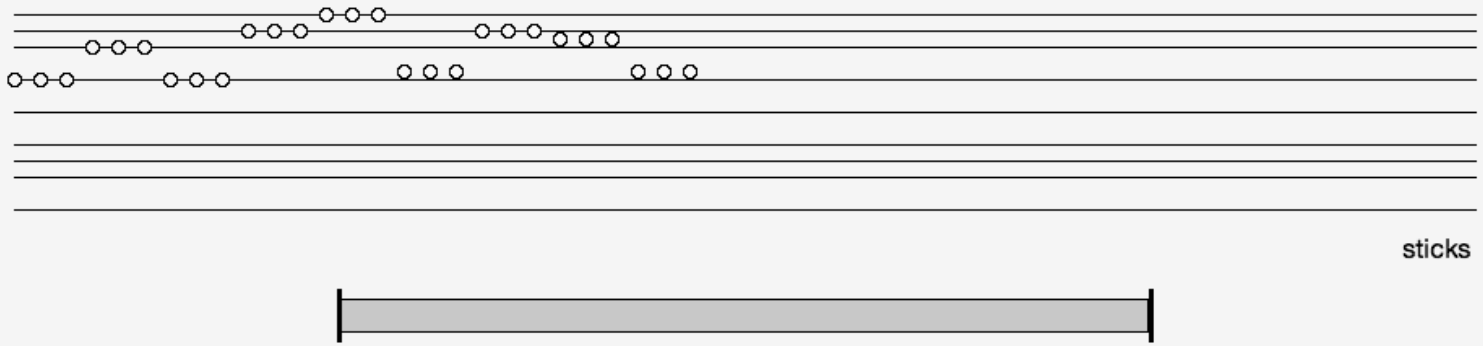
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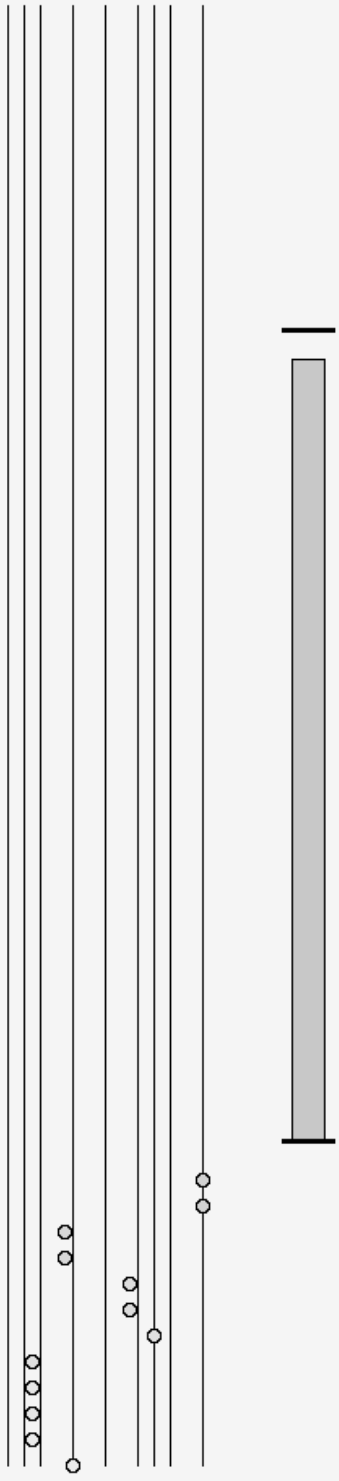

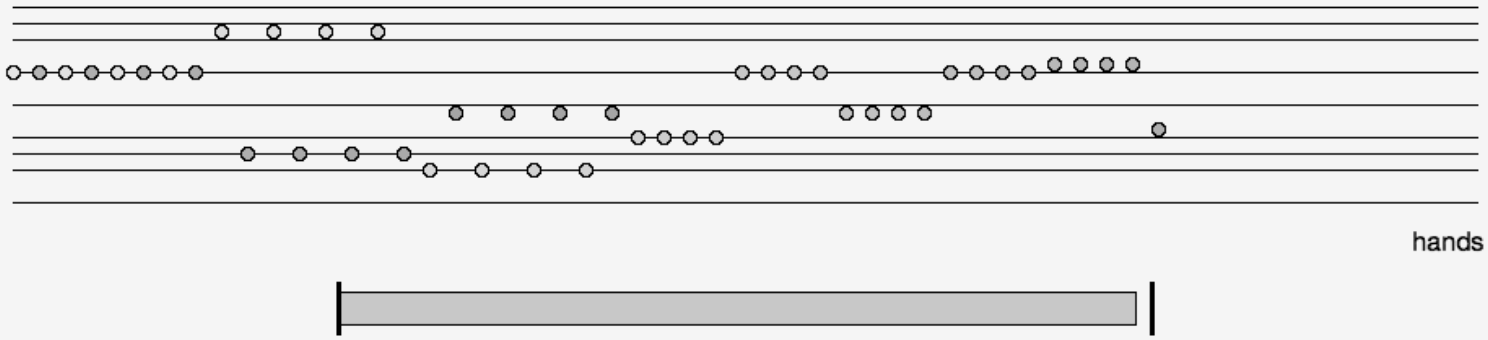
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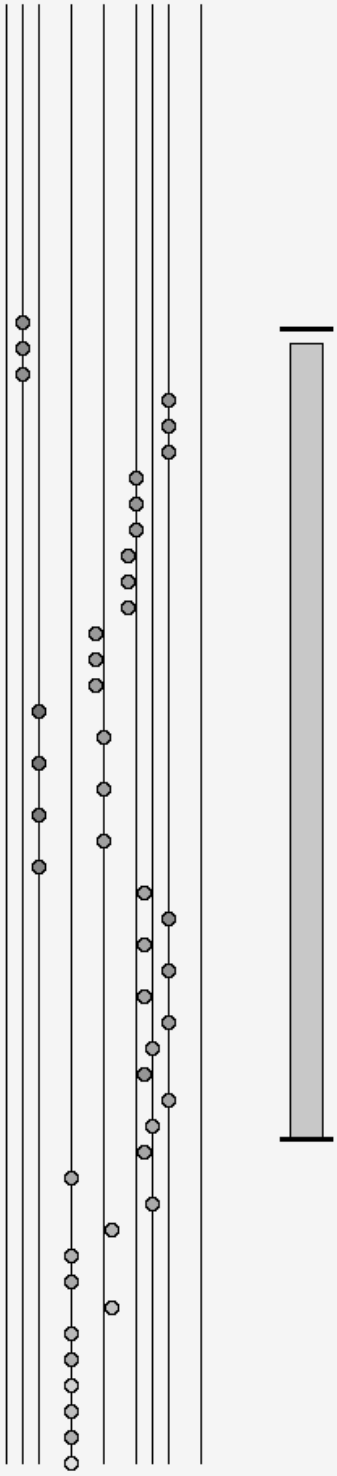

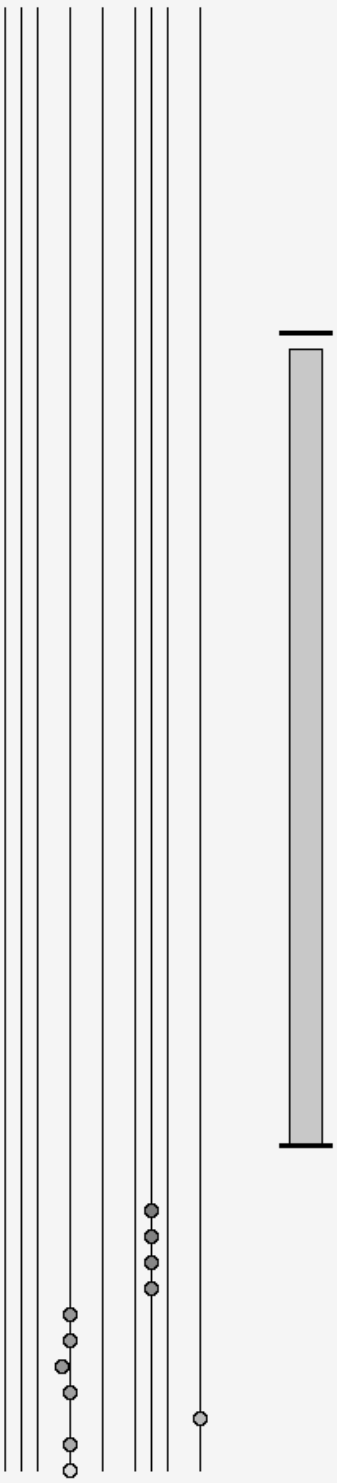

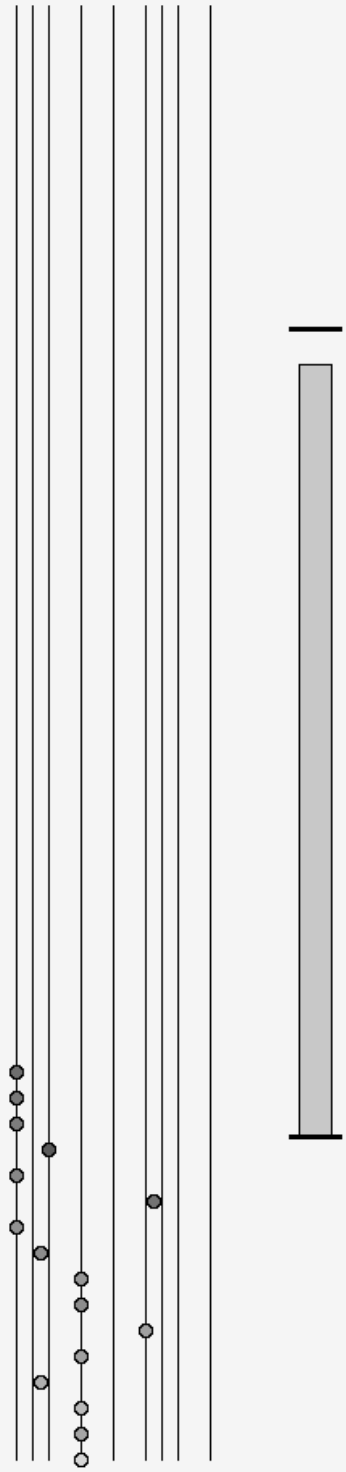

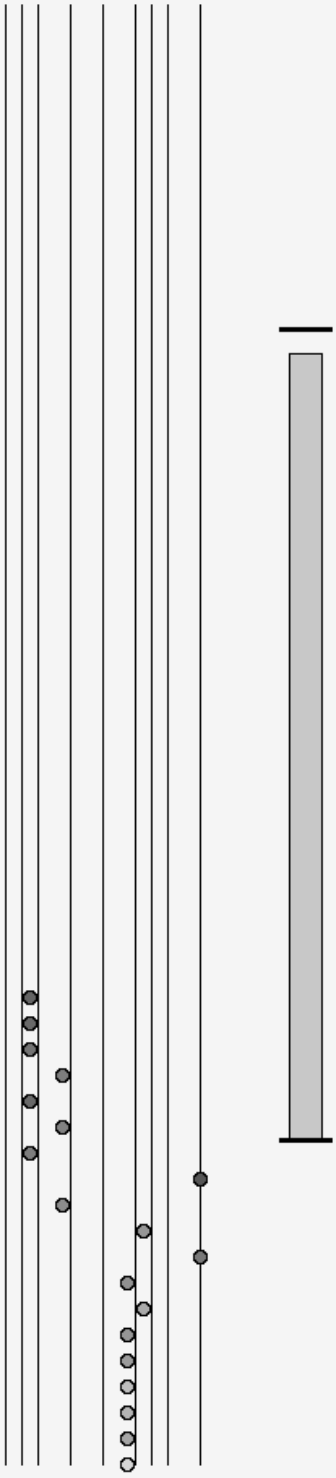

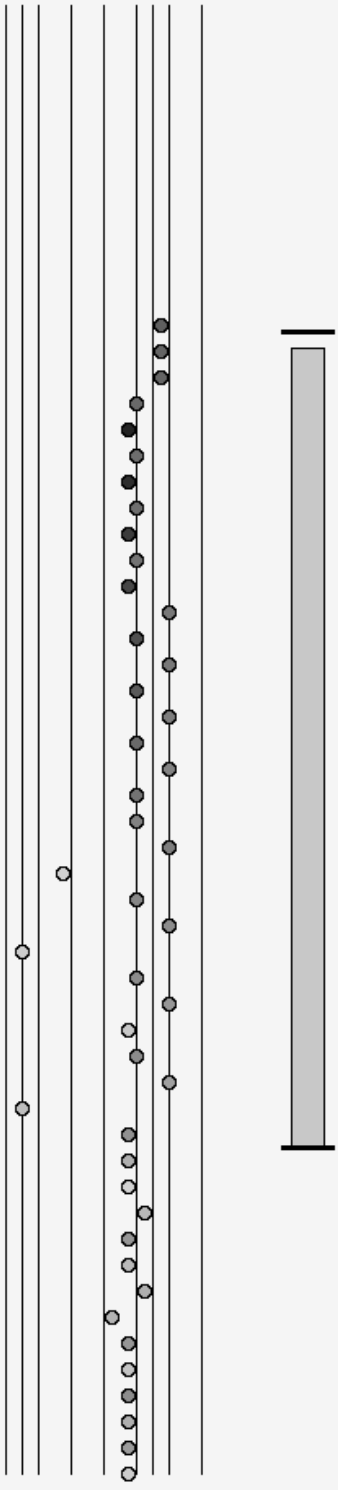

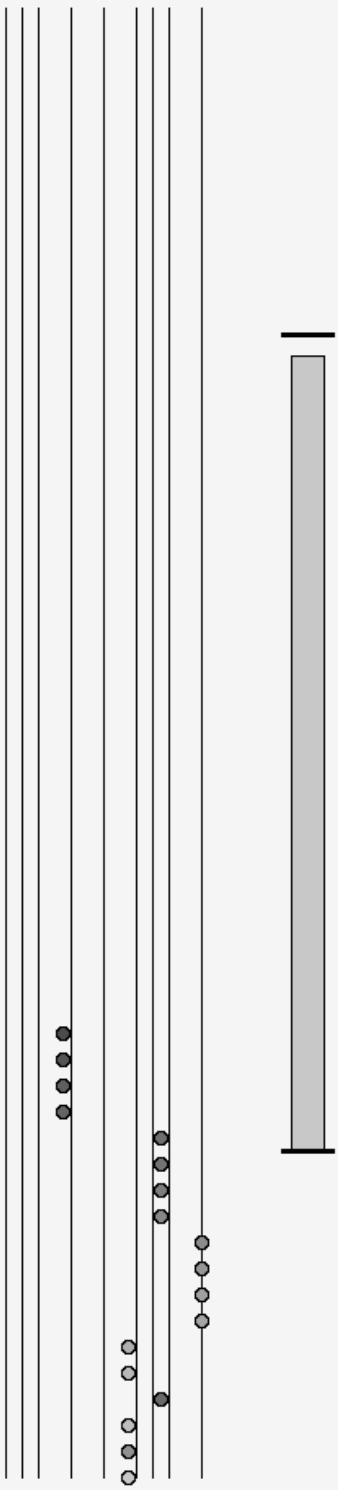

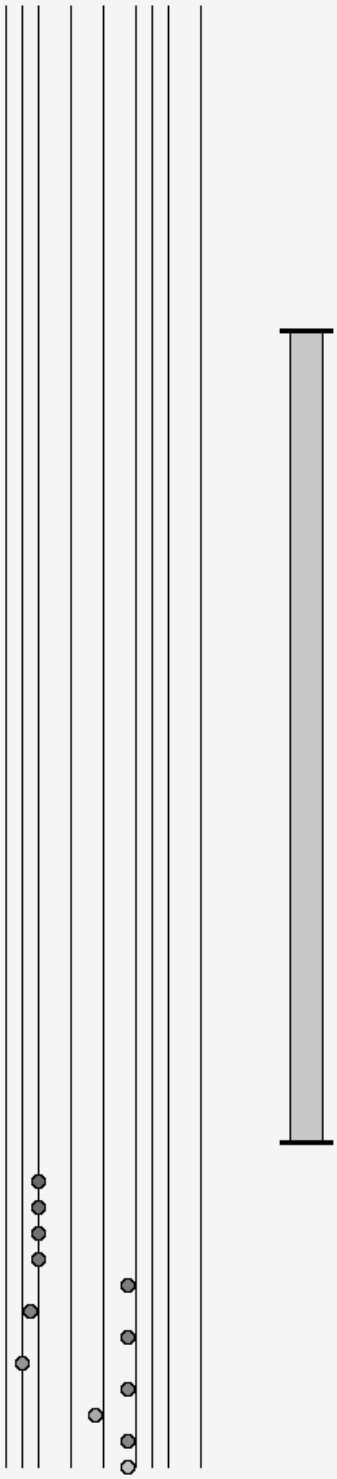

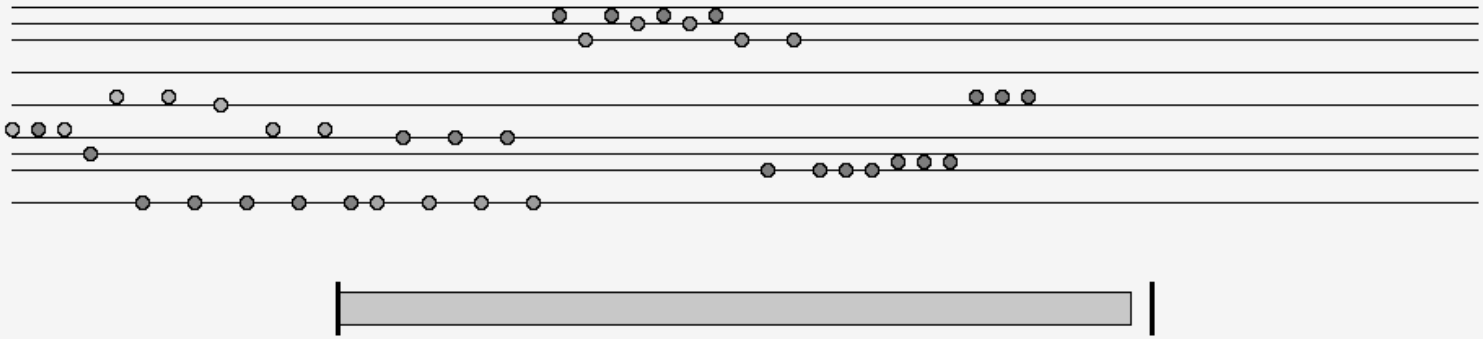

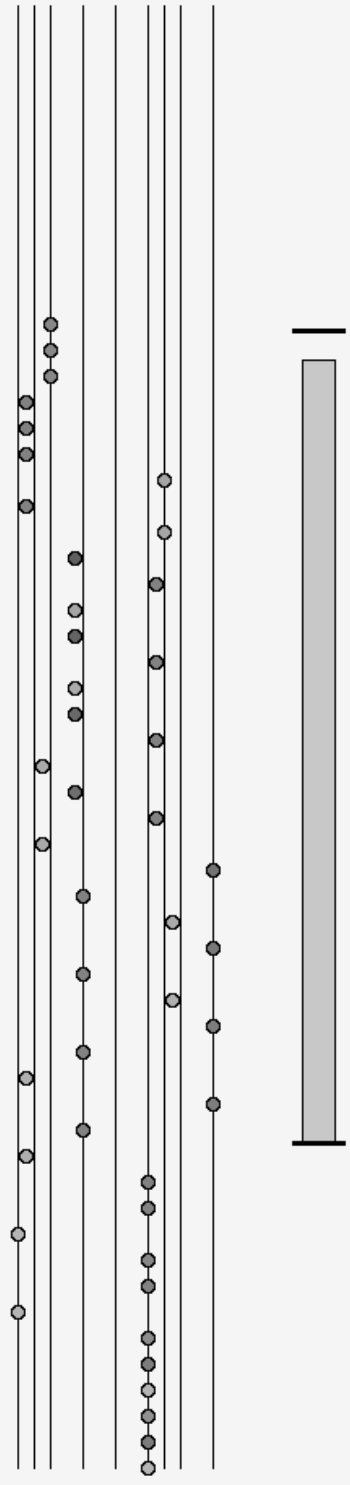

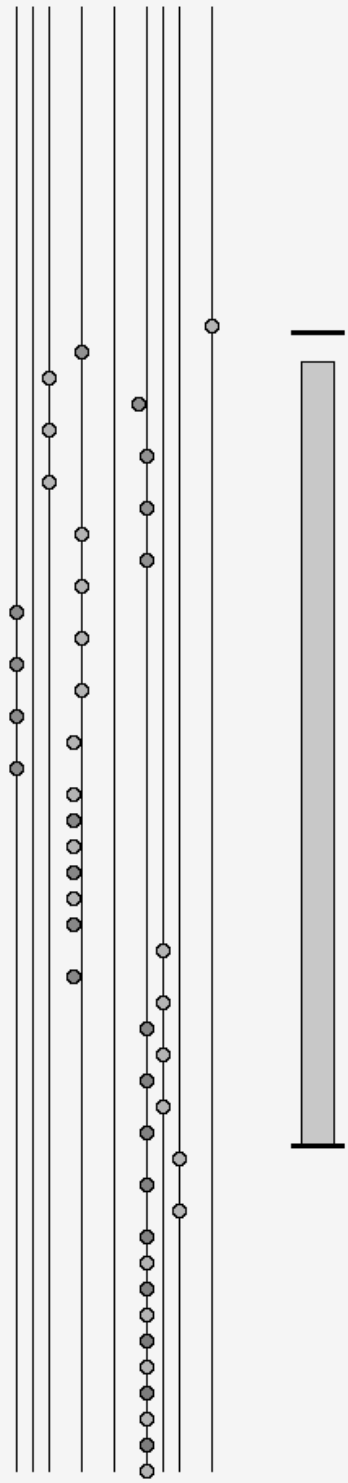

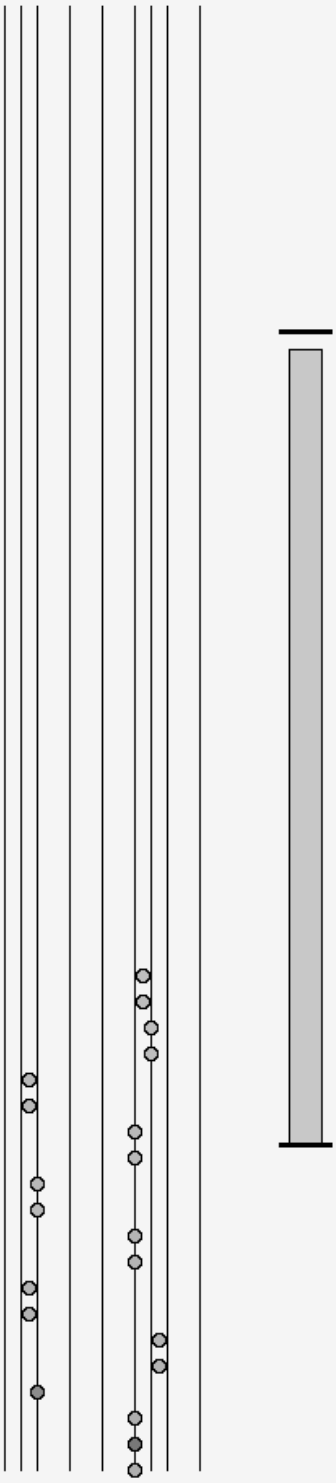

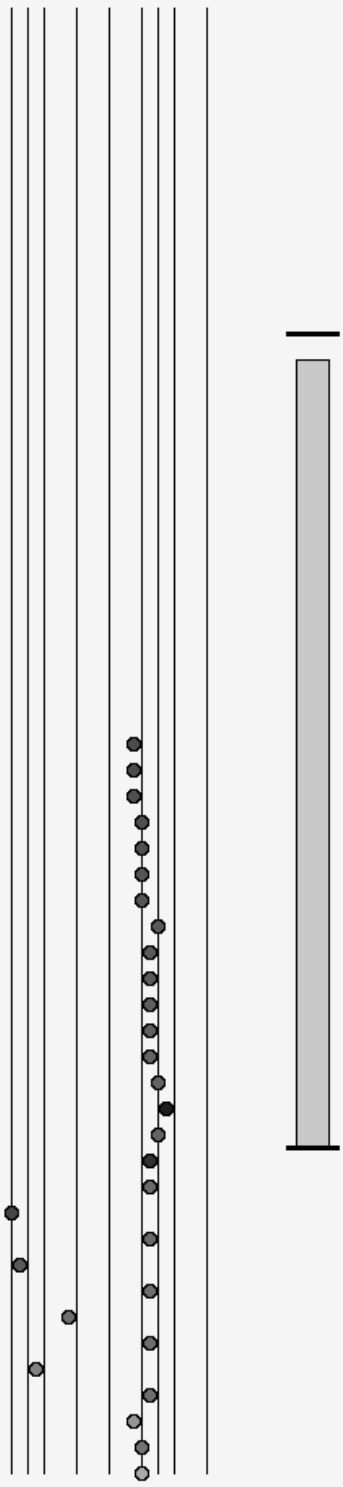

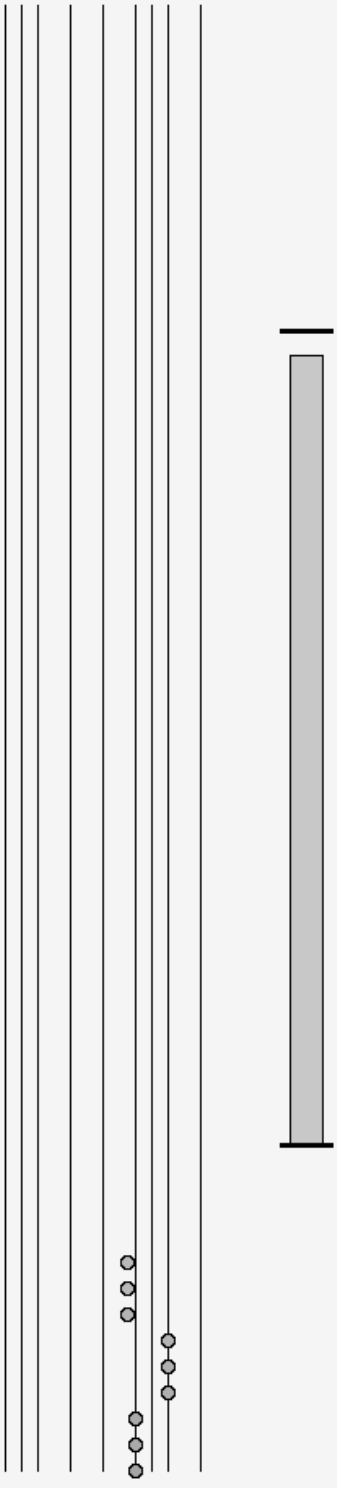

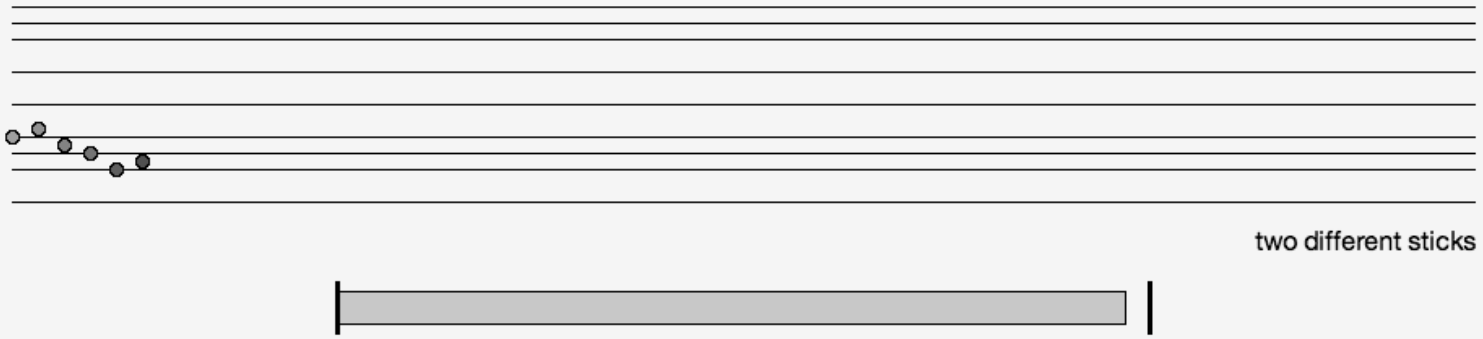
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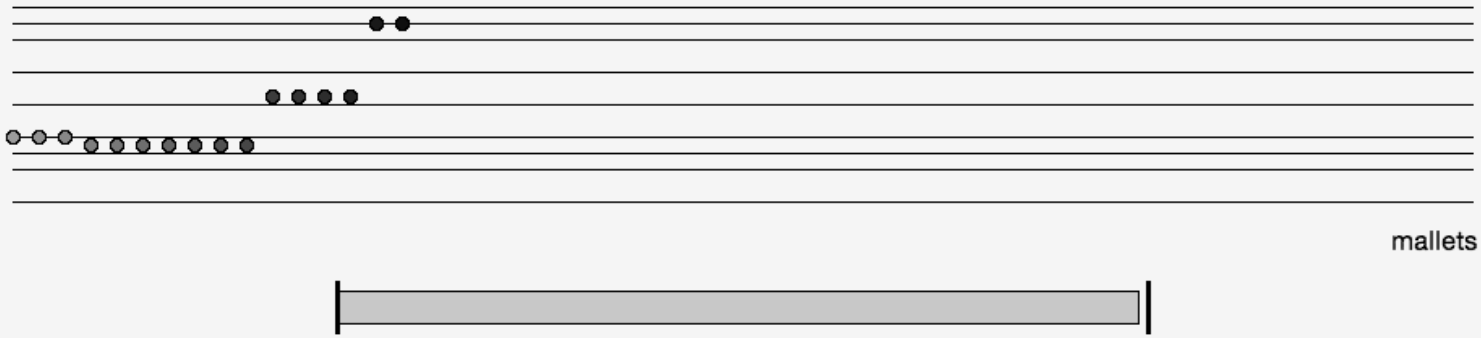
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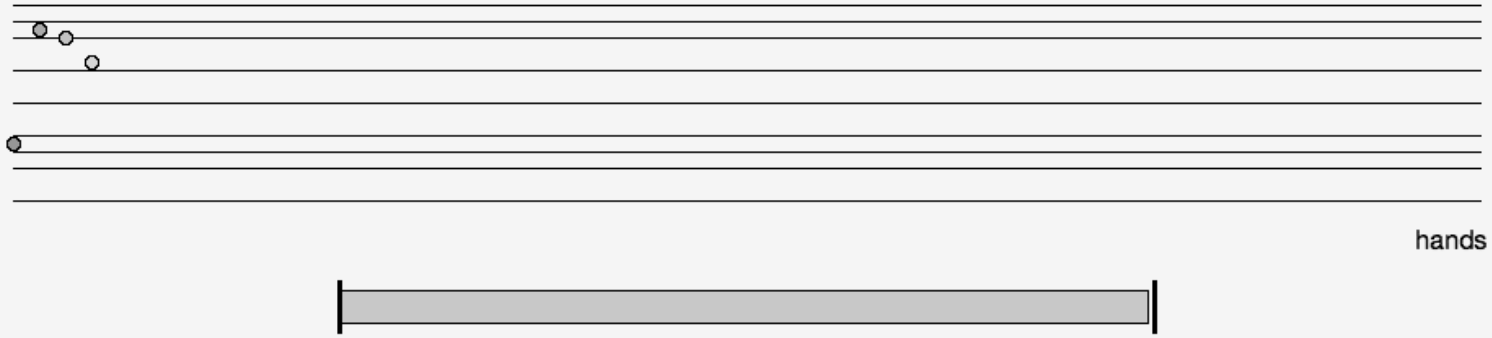
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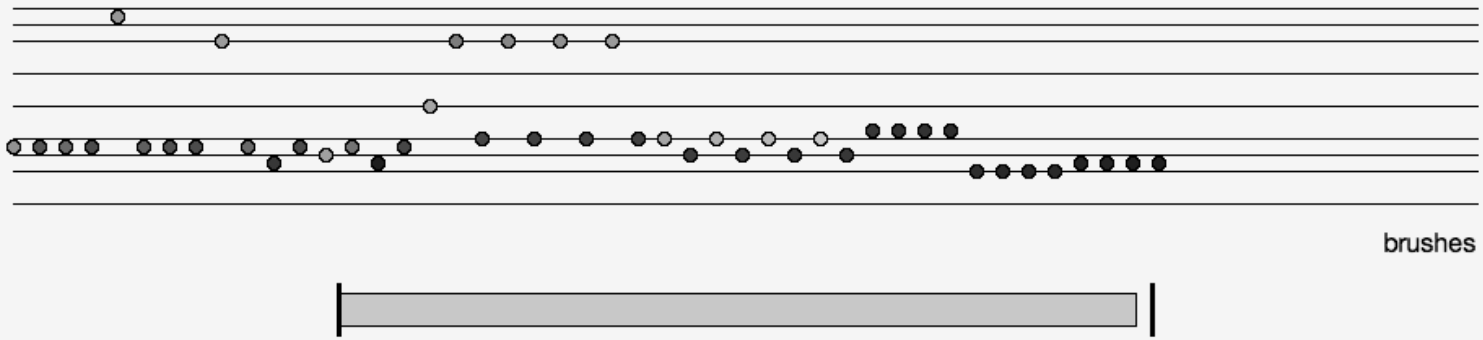
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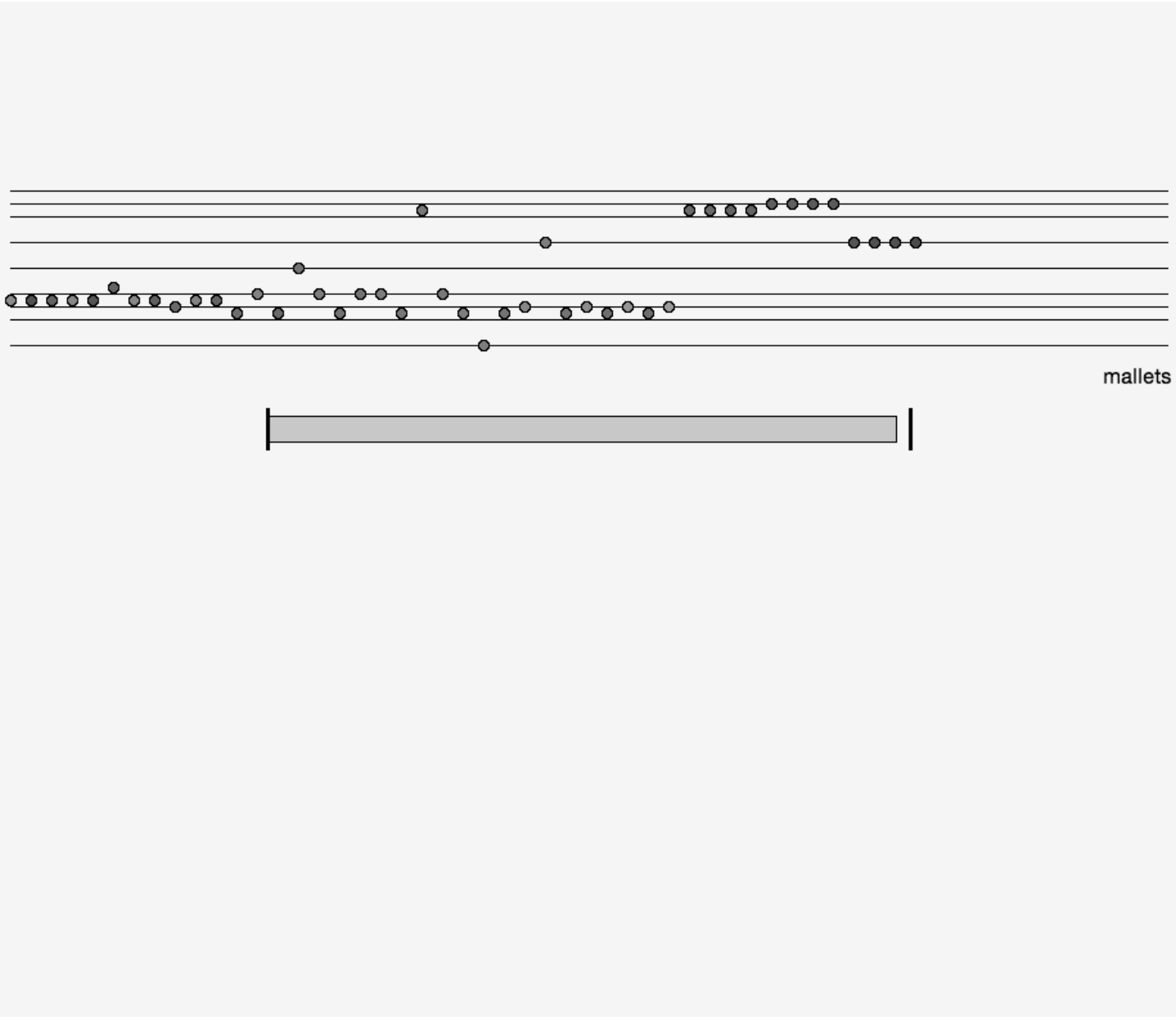
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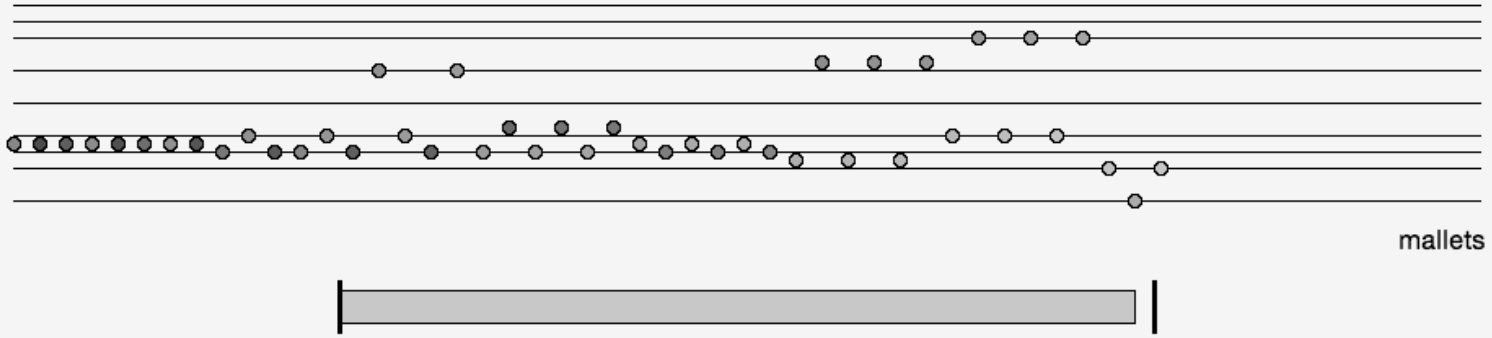
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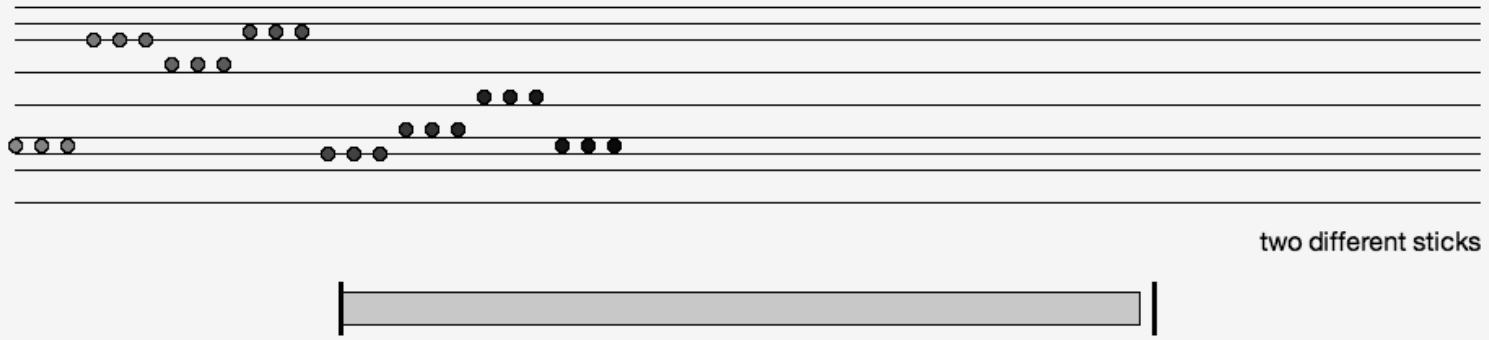
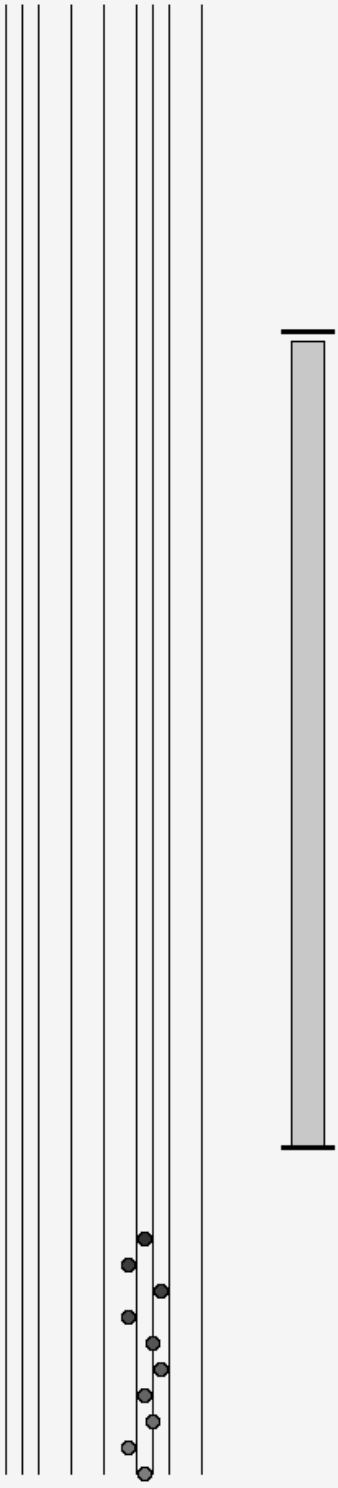
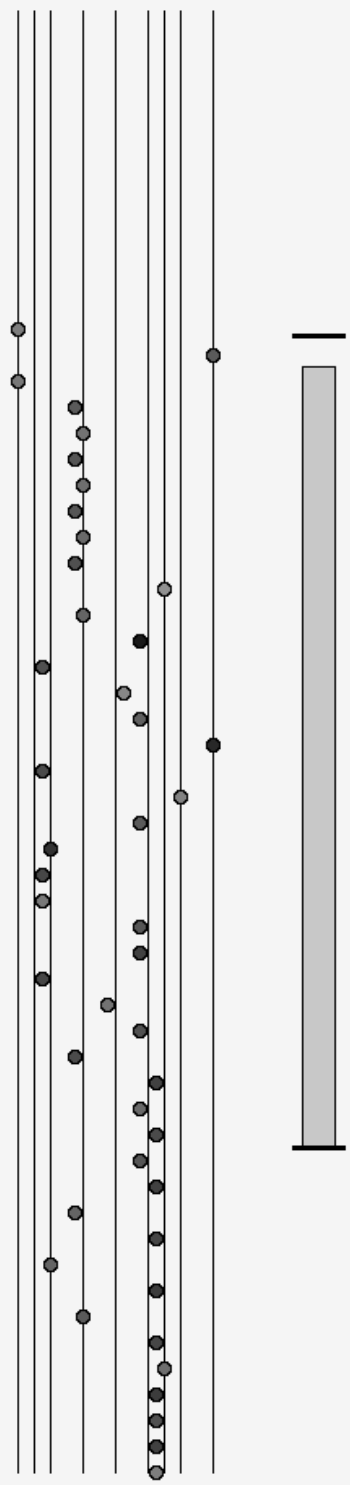
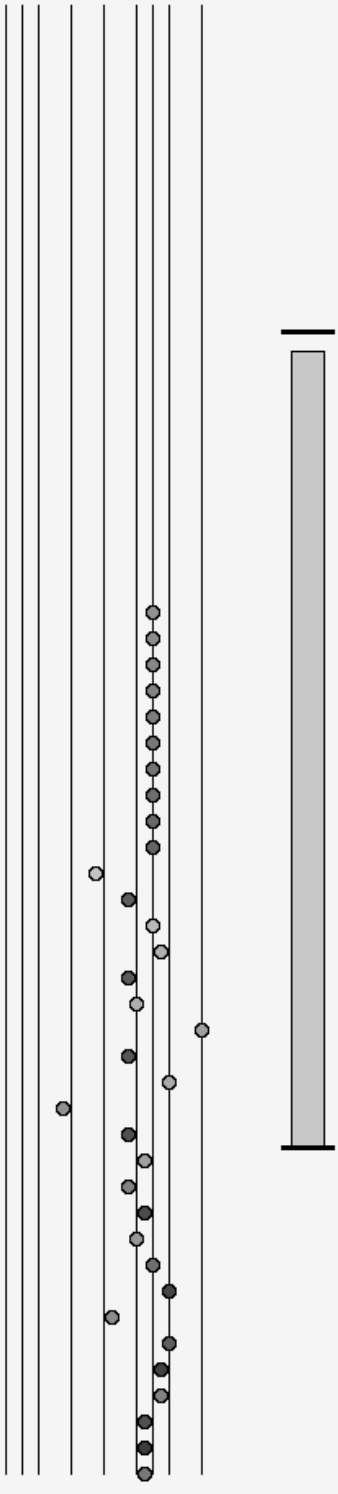
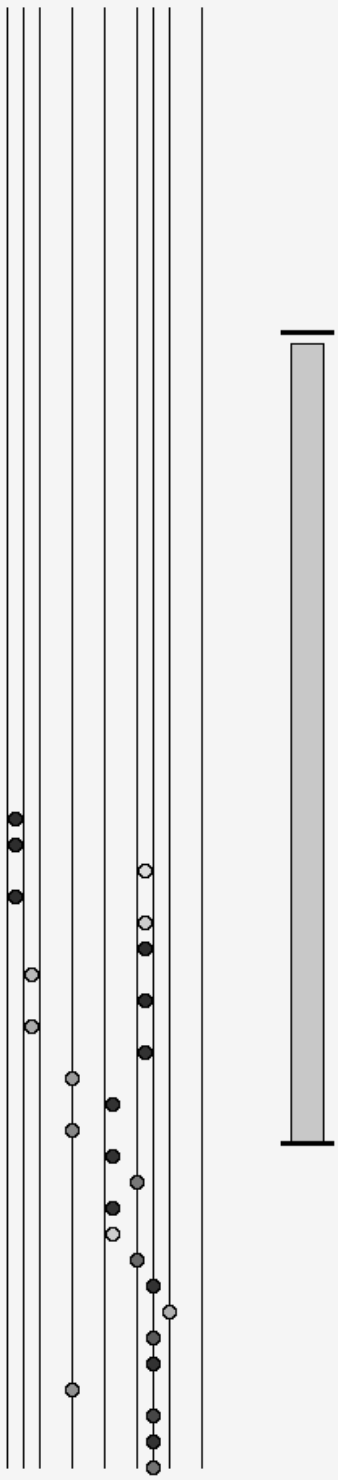
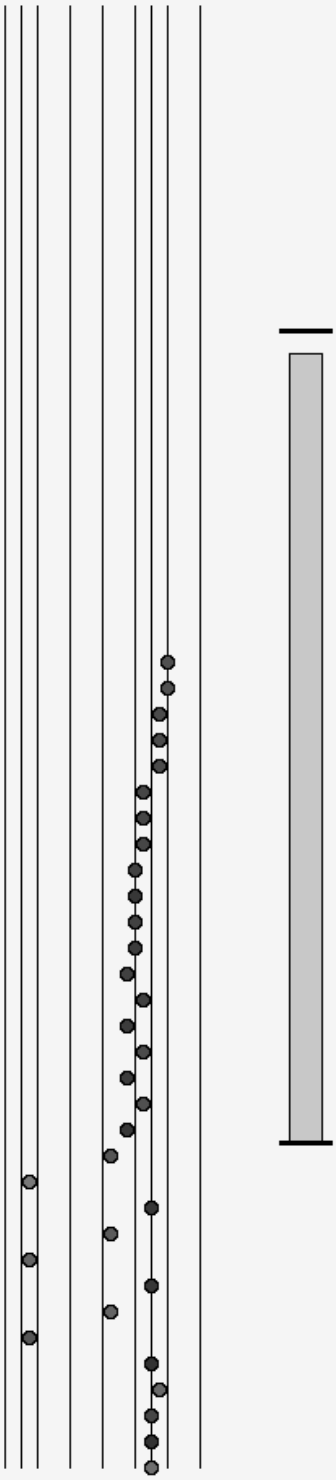

two different sticks

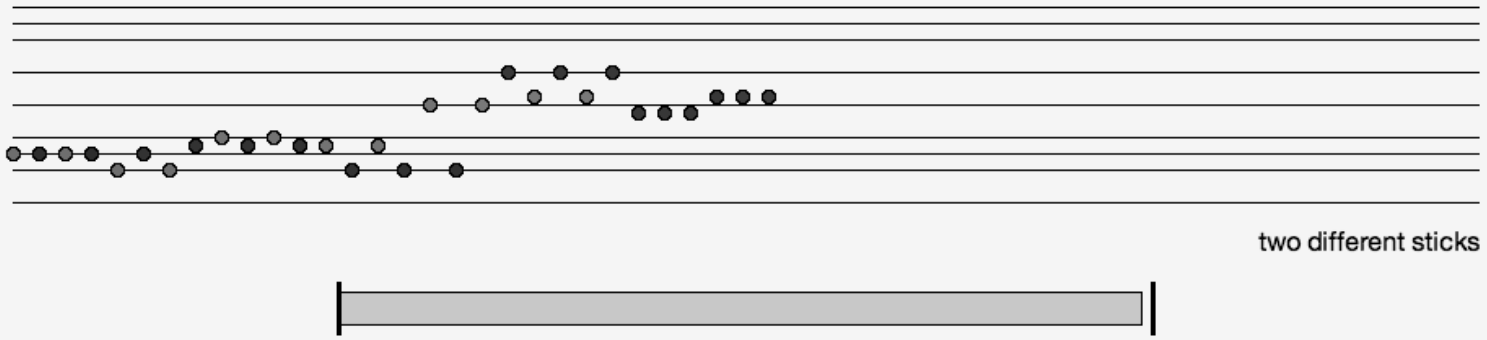


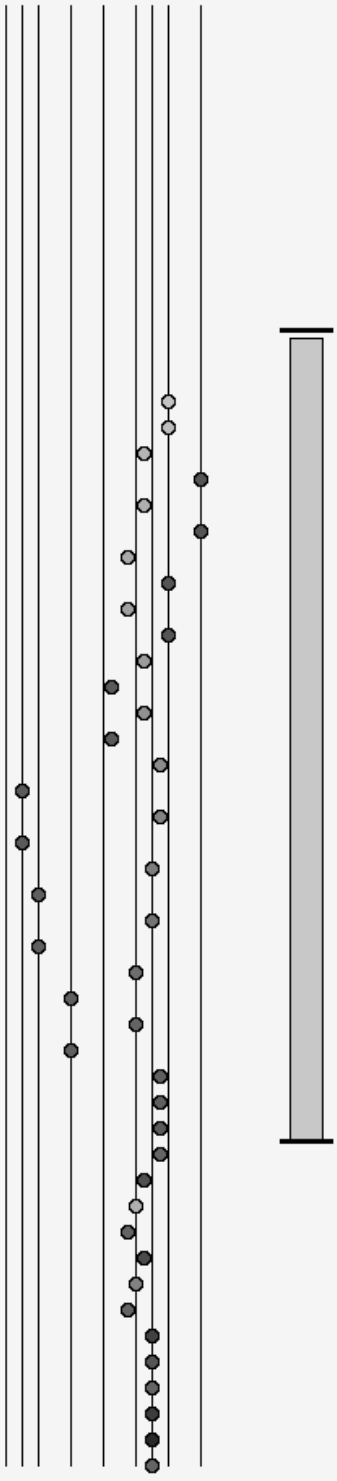


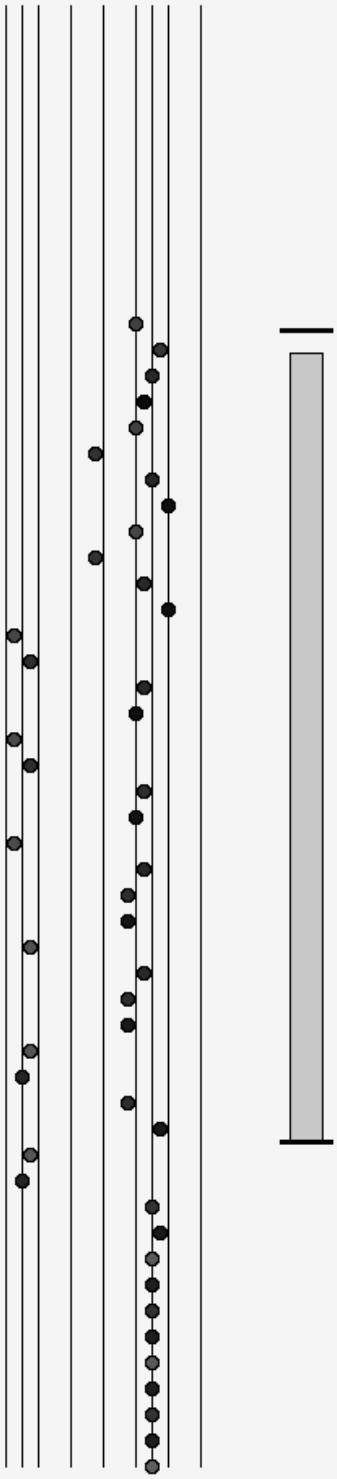


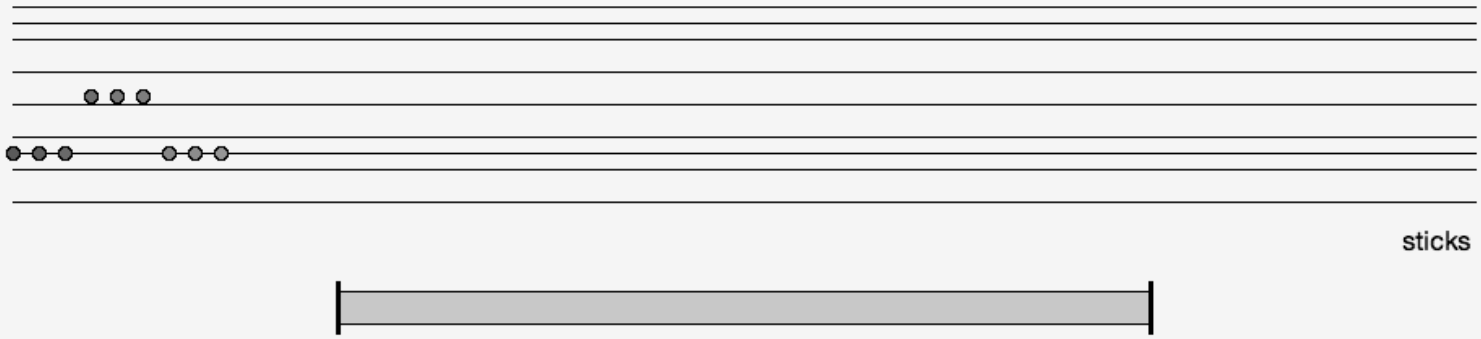


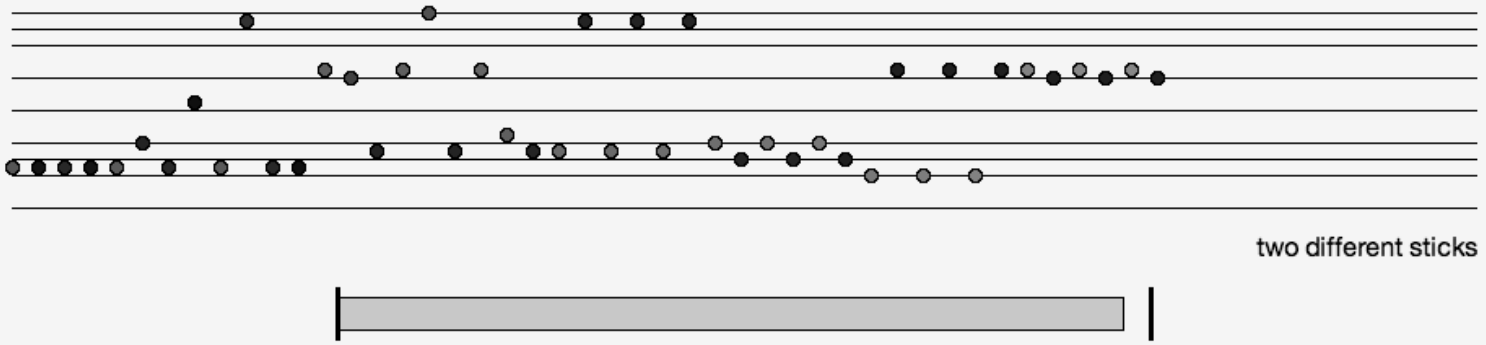


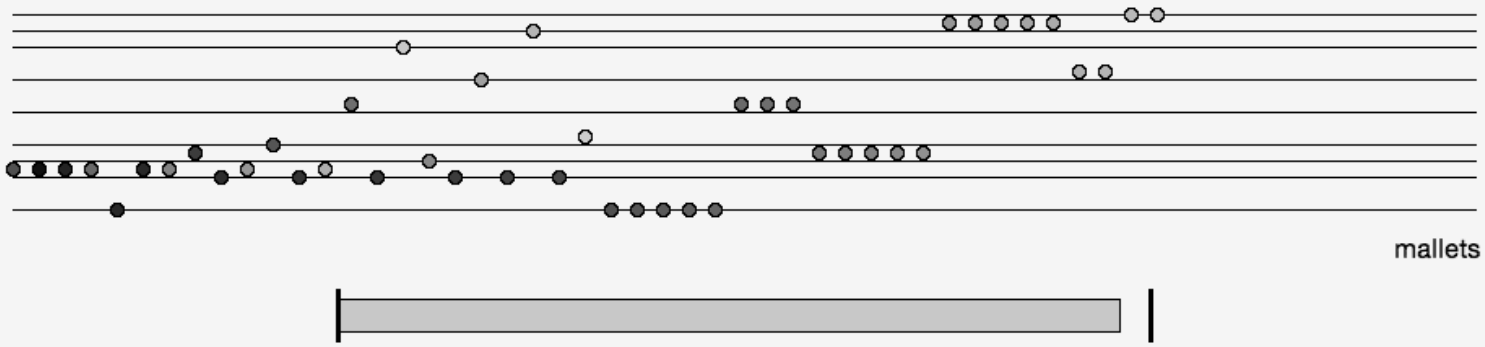

two different sticks

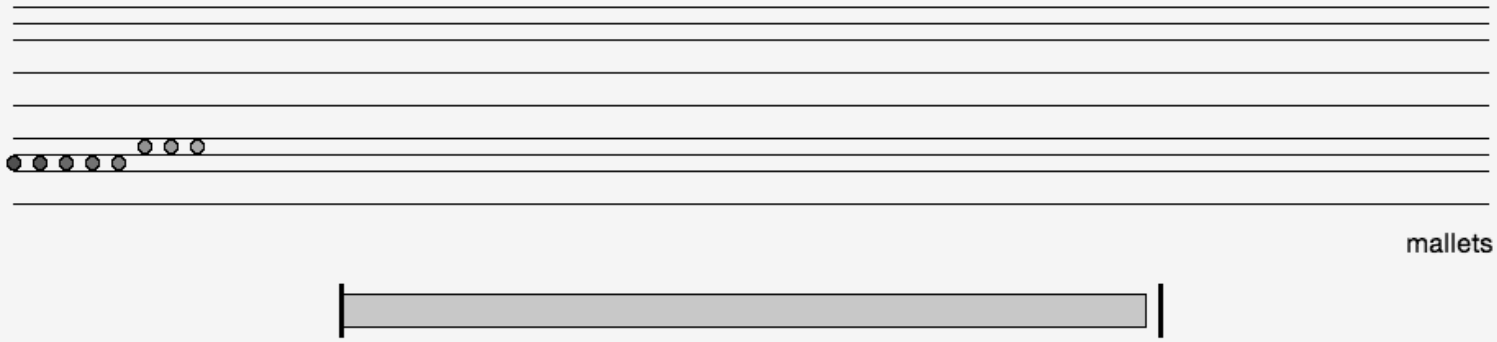





sticks


two different sticks


mallets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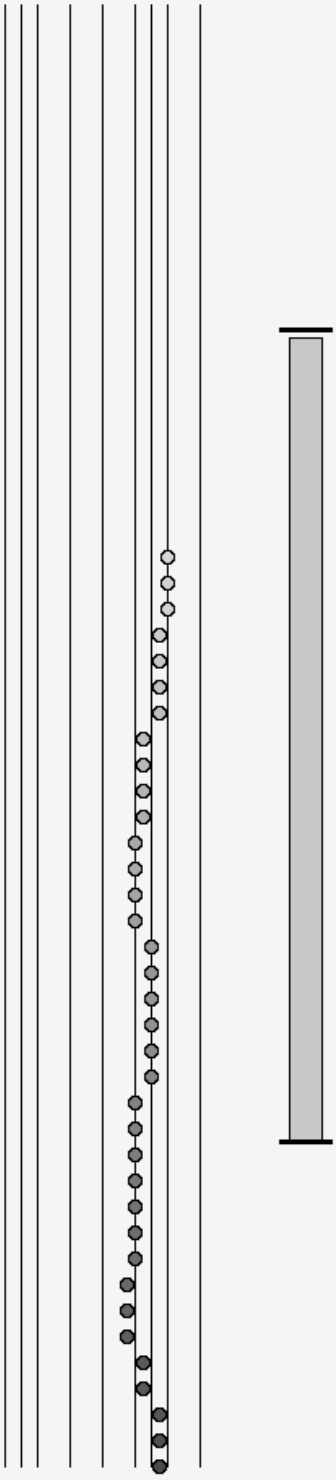


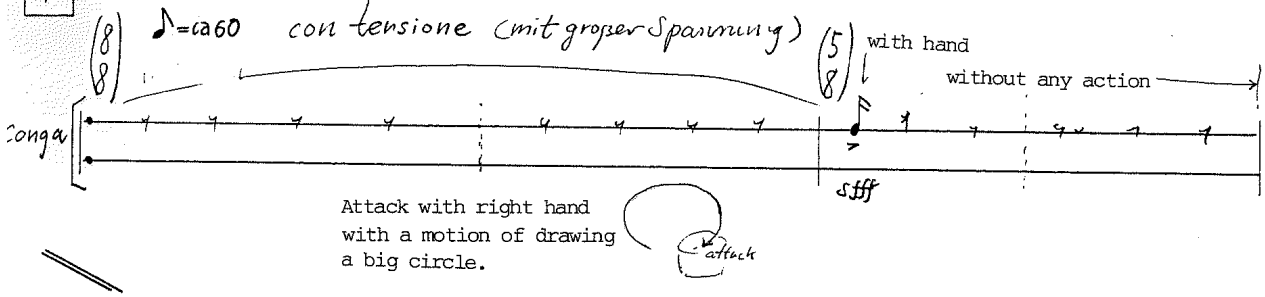
SEN VI - for multipercussion

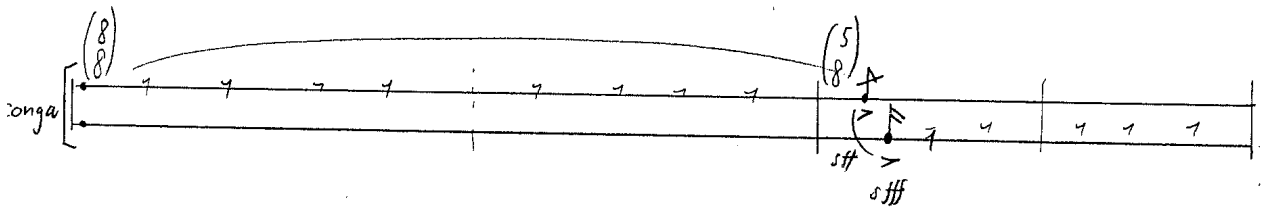
By Toshio Hosokawa

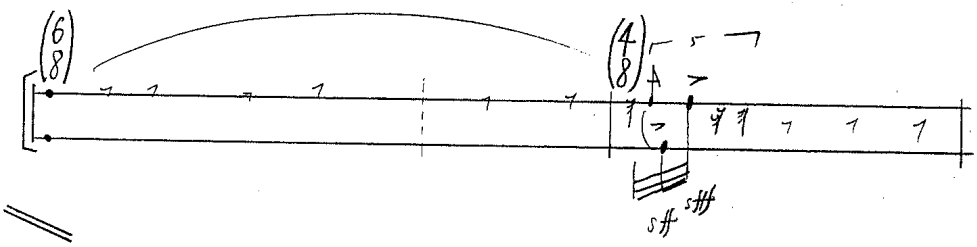
for Isao Nakamura

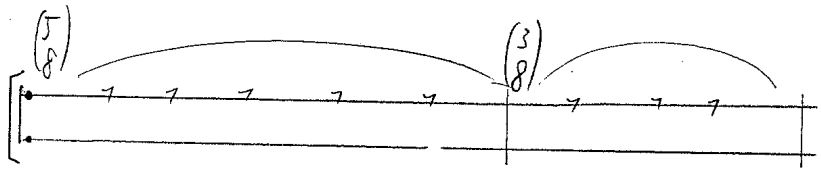
„SEN VI" for percussion solo (1993)

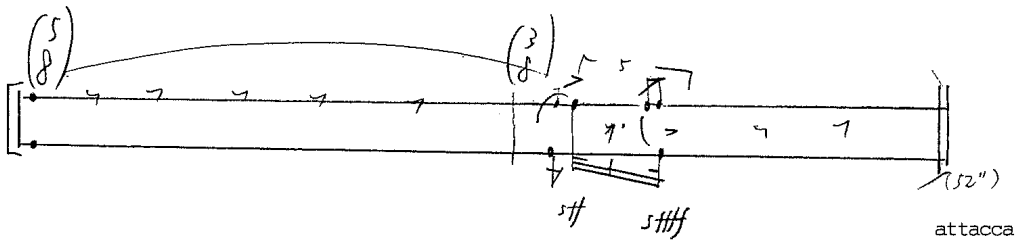
1



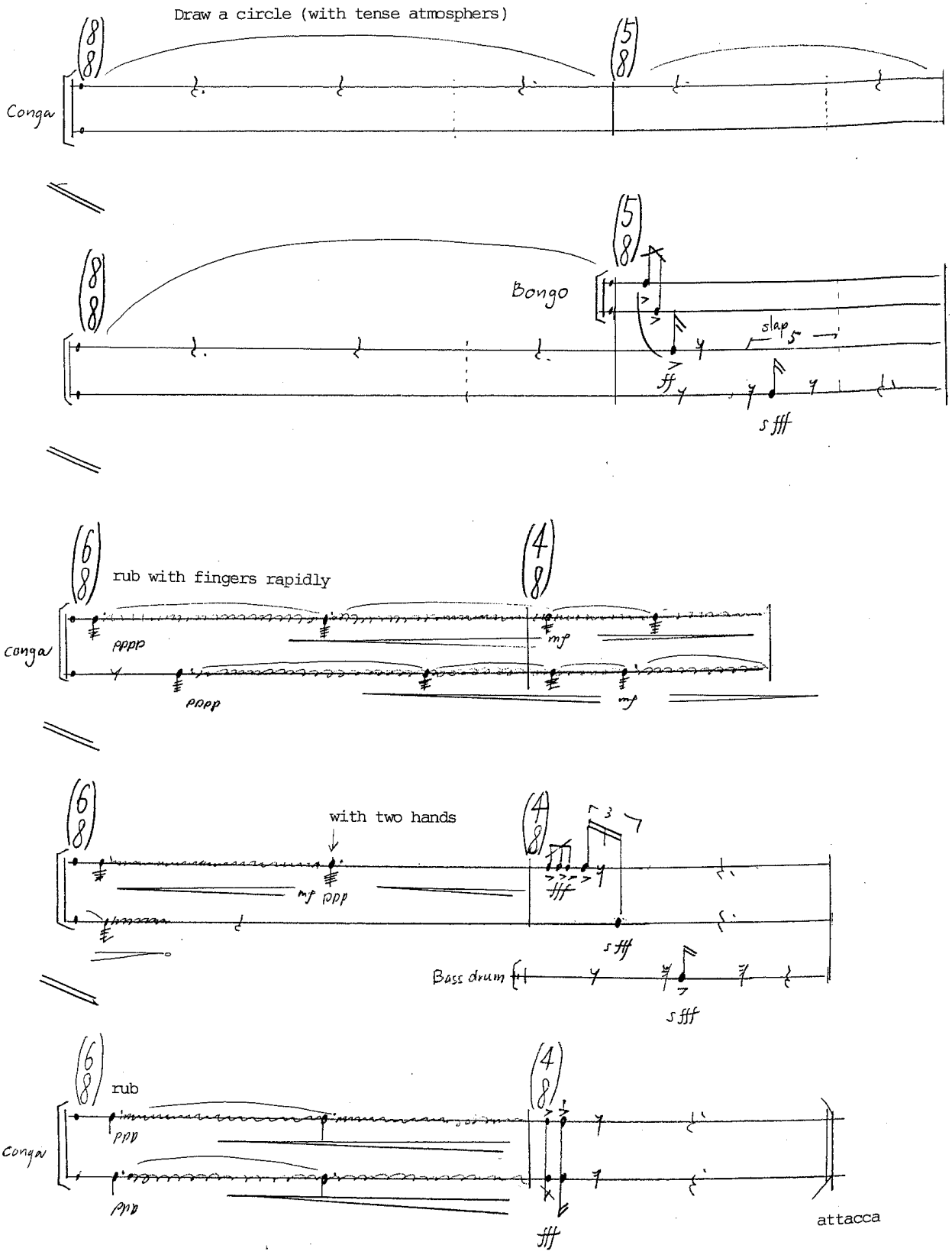


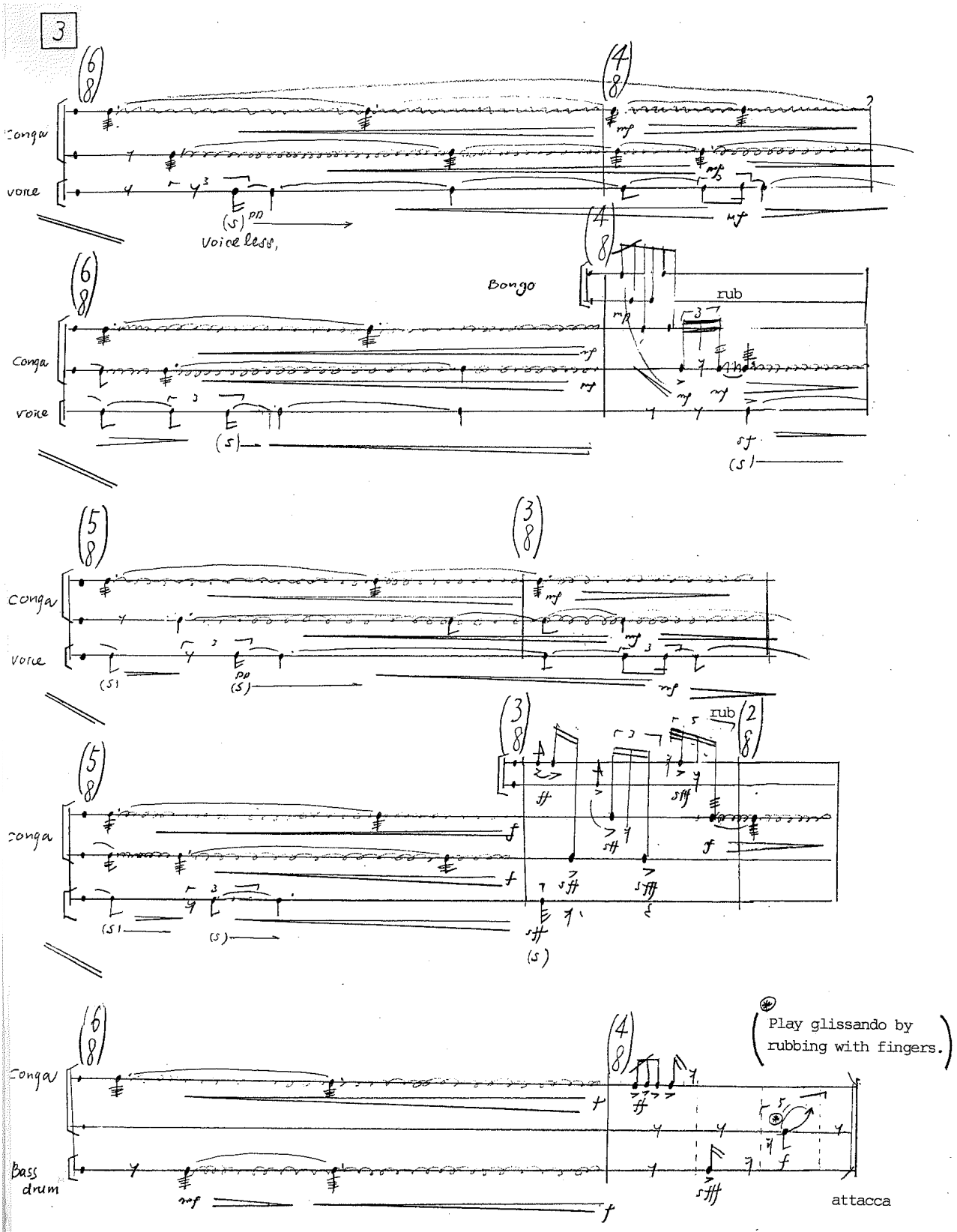




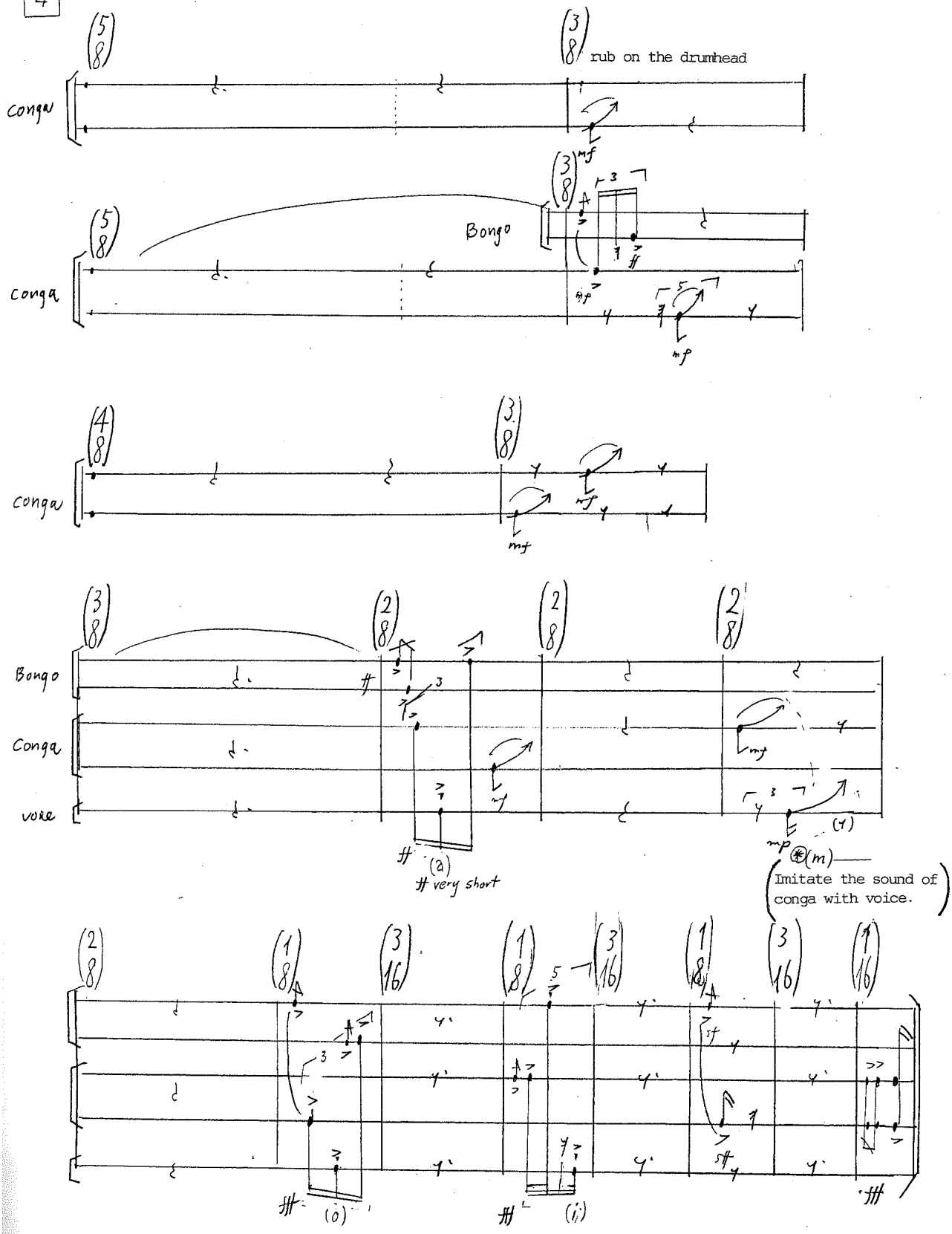


2

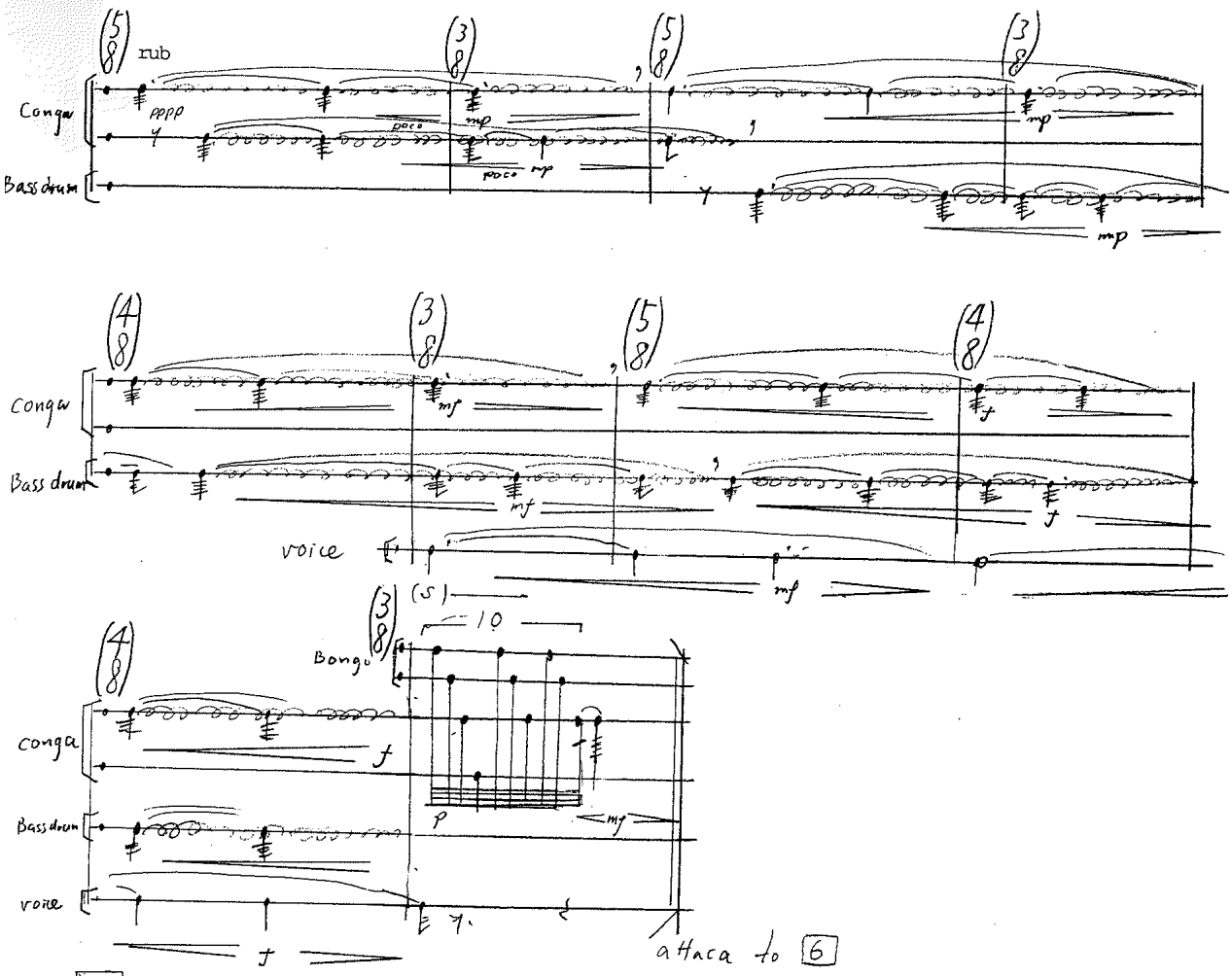

Draw a circle (with tense atmosphers)
Conga
Bongo
slap
rub with fingers rapidly
pppp
mp
with two hands
mf
ppp
sfff
Bass drum
rub
ppp
attacca


3
Conga
voice
Voice less,
Bongo
rub
Conga
voice
Conga
voice
rub
Conga
Bass drum
Play glissando by rubbing with fingers.
attacca

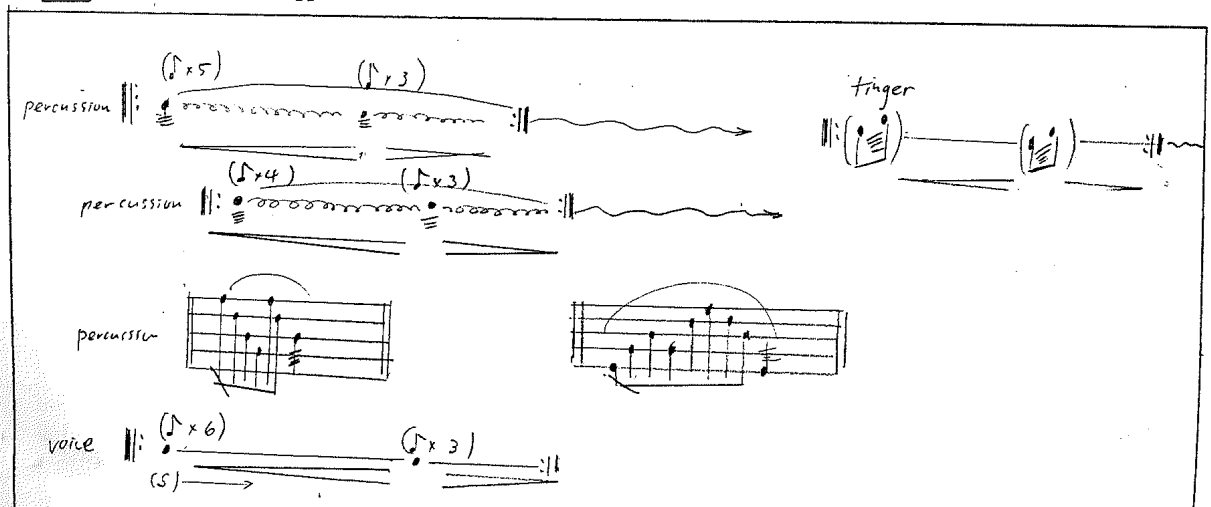
4


rub on the drumhead
Conga
Bongo
Conga
Conga
Bongo
Conga
voice
(a)
very short
(m)
Imitate the sound of conga with voice.
(o)
(i)

5 like waves



6 Improvisation: Approx. 2 minutes



Improvise using the elements as above. Try to get multiplied sound waves as much as possible. Play ppp - mp for the first one minute. Then gradually raise volume of sound.

attacca

7 Improvisation: Approx. 2 minutes

with stick. Q

Improvise with complete freedom using a soft stick.

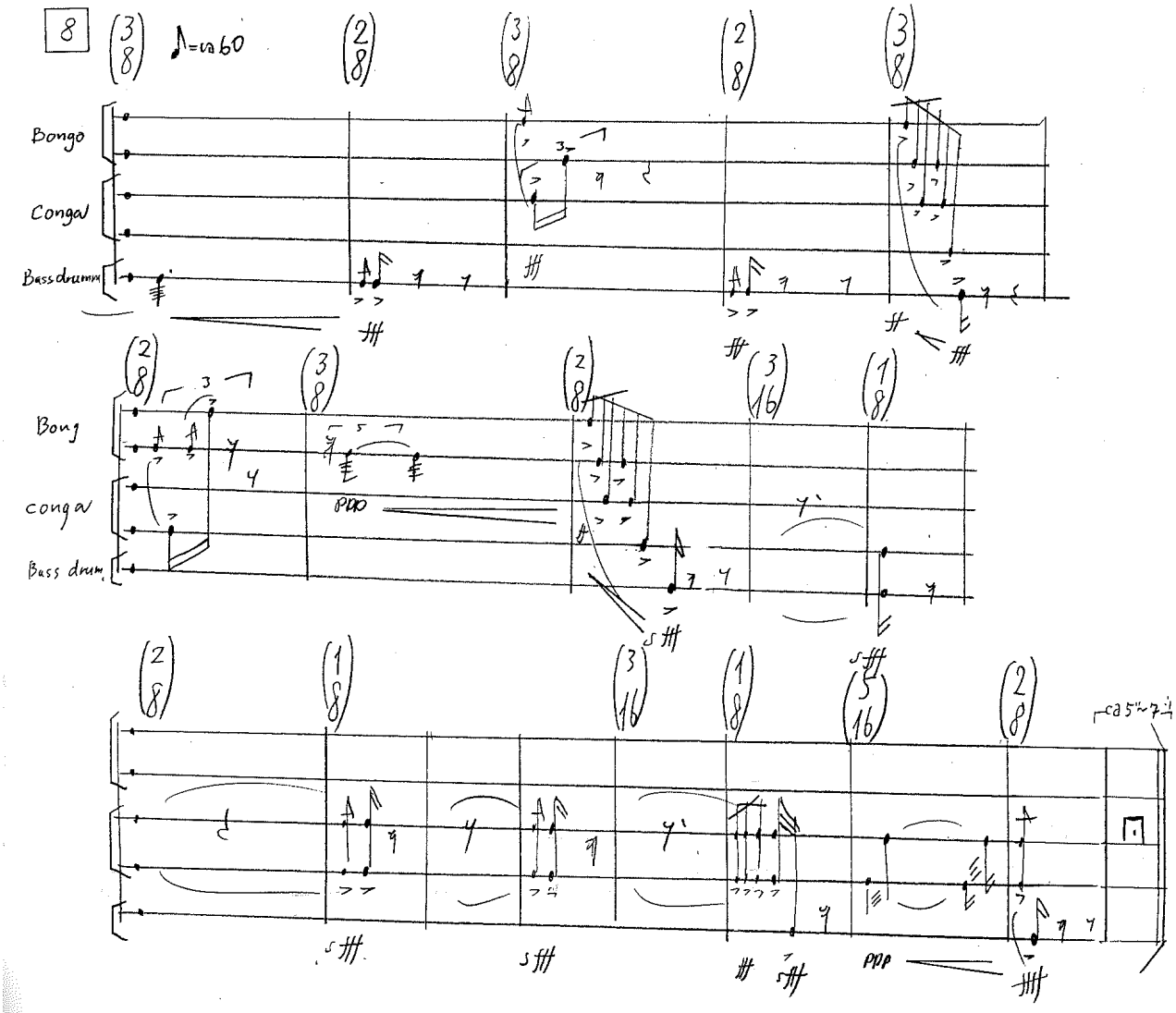
Keep ppp at first to express very soft feeling.

Last half should have the dynamics of ppp < f >.

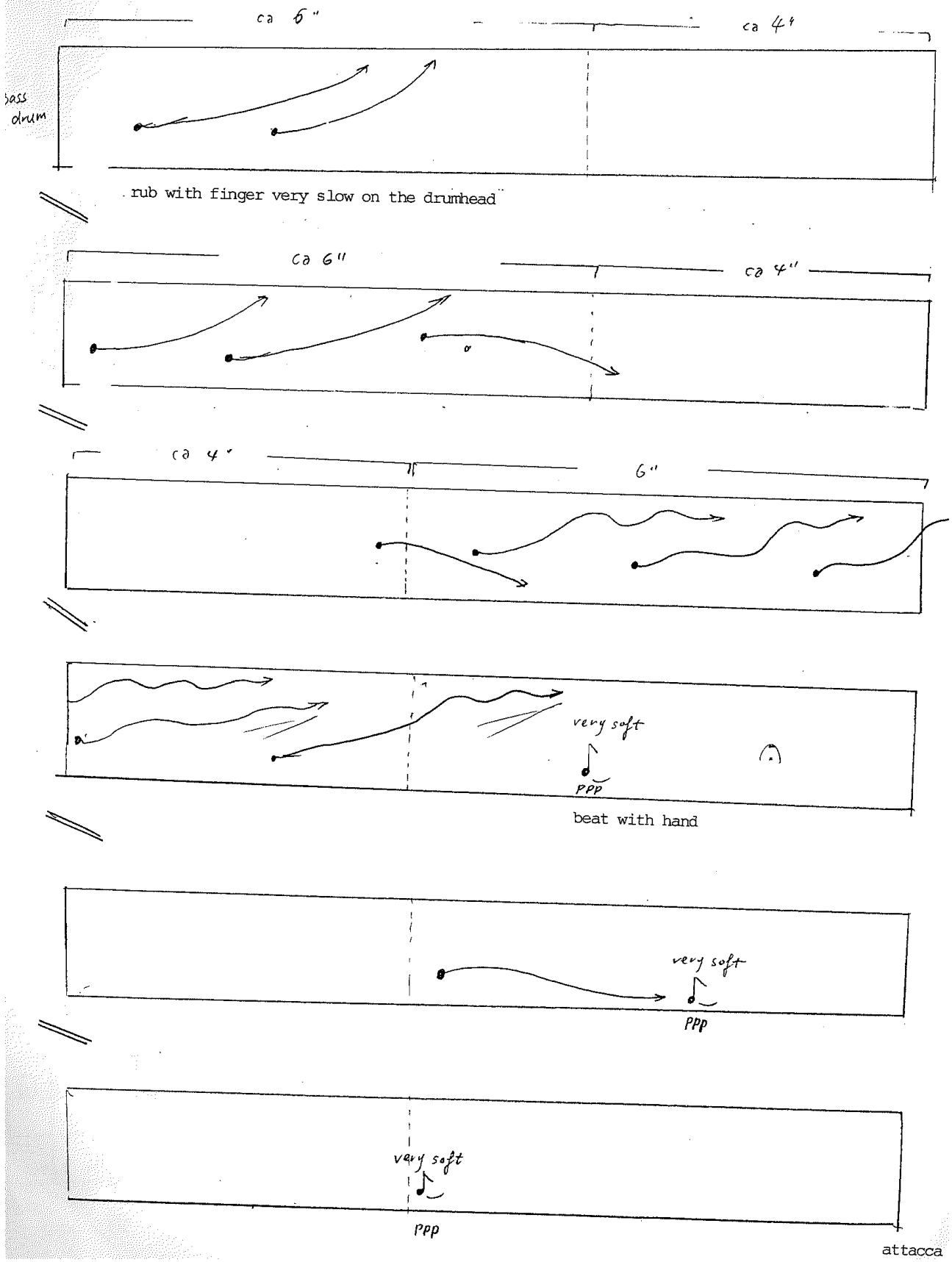
In the last part, use mp < fff repeatedly to get crescendo.

attaca

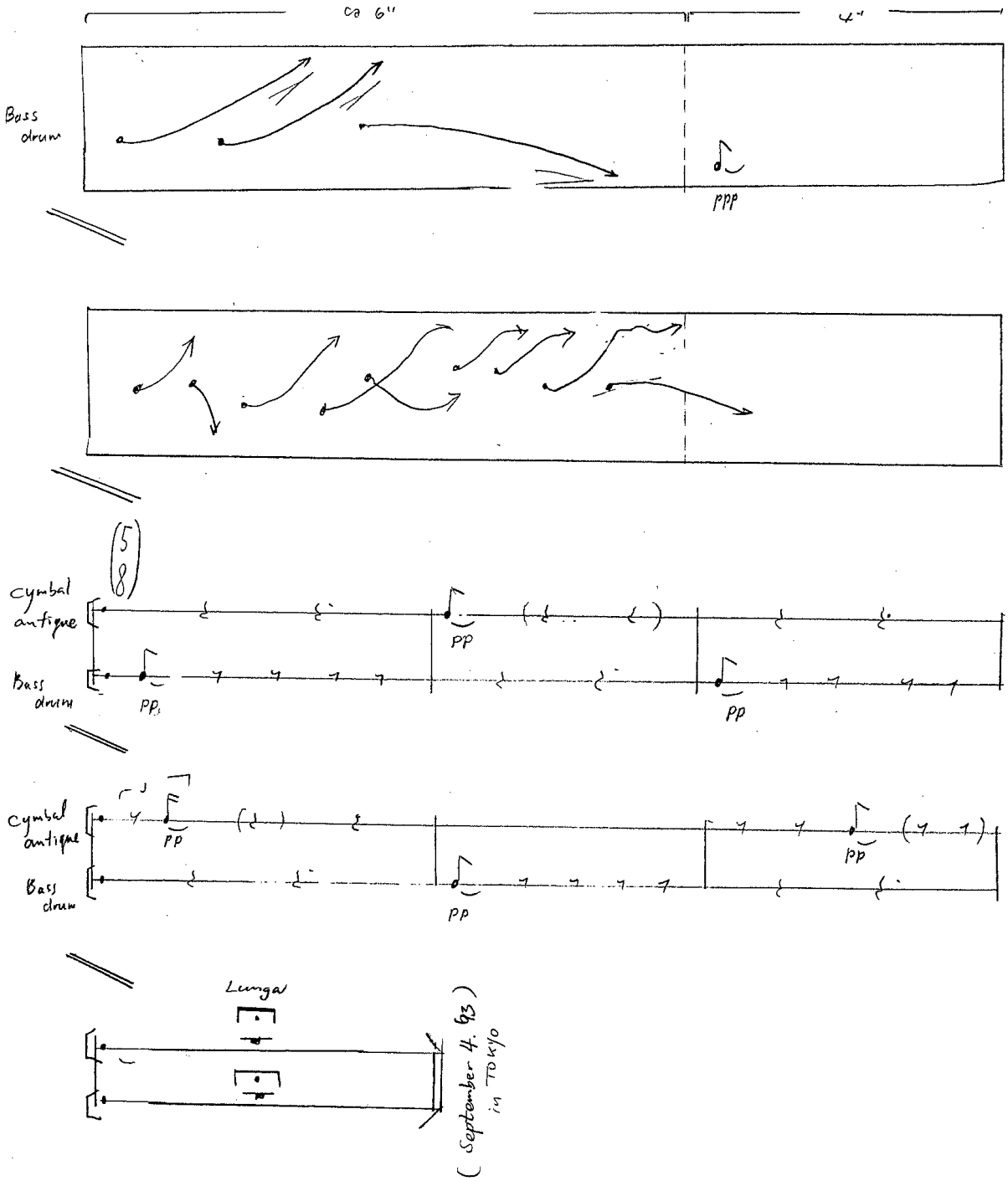
8



9


ca 6"
ca 4'
bass drum
rub with finger very slow on the drumhead
ca 6"
ca 4"
ca 4"
6"
very soft
PPP
beat with hand
very soft
PPP
very soft
PPP
attacca

10


ca 6"
4"
Bass drum
ppp
(5/8)
cymbal antique
Bass drum
pp
pp
pp
cymbal antique
Bass drum
pp
pp
pp
Lunga
(September 4. 93)
in TOKYO

st242.15.1

sumtone

:

luís antunes pena

três quadros sobre pedra

for percussion and electronics

Three Pictures on Stone was created during an artistic residency at the ZKM | Karlsruhe (Center for Art and Media Karlsruhe) in Germany with the percussionist Nuno Aroso.

The starting idea was to work with instruments that are not part of the common percussion family such as stones of different kinds, sizes and textures. Having defined the setup, we started to search for sounds, rhythms and musical structures associated to this specific instruments.

Three Pictures on Stone is dedicated to Nuno Aroso.

Três Quadros sobre Pedra para percussão e sons pré-gravados foi realizada em Março de 2008 durante uma estadia artística no Centro de Arte e Média de Karlsruhe ZKM | Karlsruhe.

A peça foi sendo construída a partir de uma ideia de trabalhar com instrumentos e sons que não fazem parte do instrumentário comum da percussão, nomeadamente, pedras de diversos tamanhos, formas e constituições. Tendo o instrumentário, foi feita uma pesquisa de sonoridades, ritmos e possíveis estructuras musicais associadas particularmente às pedras. Foi então, a partir dessa procura, ora sistemática, ora improvisatória, que surgiram os primeiros sons e ideias que levaram à realização da peça.

Três Quadros sobre Pedra é dedicada a Nuno Aroso.

Luís Antunes Pena, September 2010

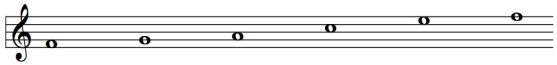
Instrumentation:

6 granite stones
6 ceramic bars
1 wood block
1 guiro/shaker
1 tom-tom (small)
1 cowbell
1 thai gong (dampened)
1 chinese opera gong (dampened)
1 cow bell (dampened)
1 cymbal 18' (suspended)

Setup of the concert at Villa Concordia Bamberg, Germany | July 2010 |
Nuno Aroso, Percussion | Luís Antunes Pena, Electronics

about the granite bars: (please note that these are approximate pitches and are not necessarily tuned)

about the ceramic bars: (please note that these are approximate pitches and are not necessarily tuned)



about the notation of the first and the third movement – **Quadro I / III**

the notation of the first and third pictures use a space notation. These are an approximate indication for performance.

in the first picture take special attention to the timbre that should always be very rich varying the position of the granite bar, in the middle, at the edge, with full surface or just using a corner.

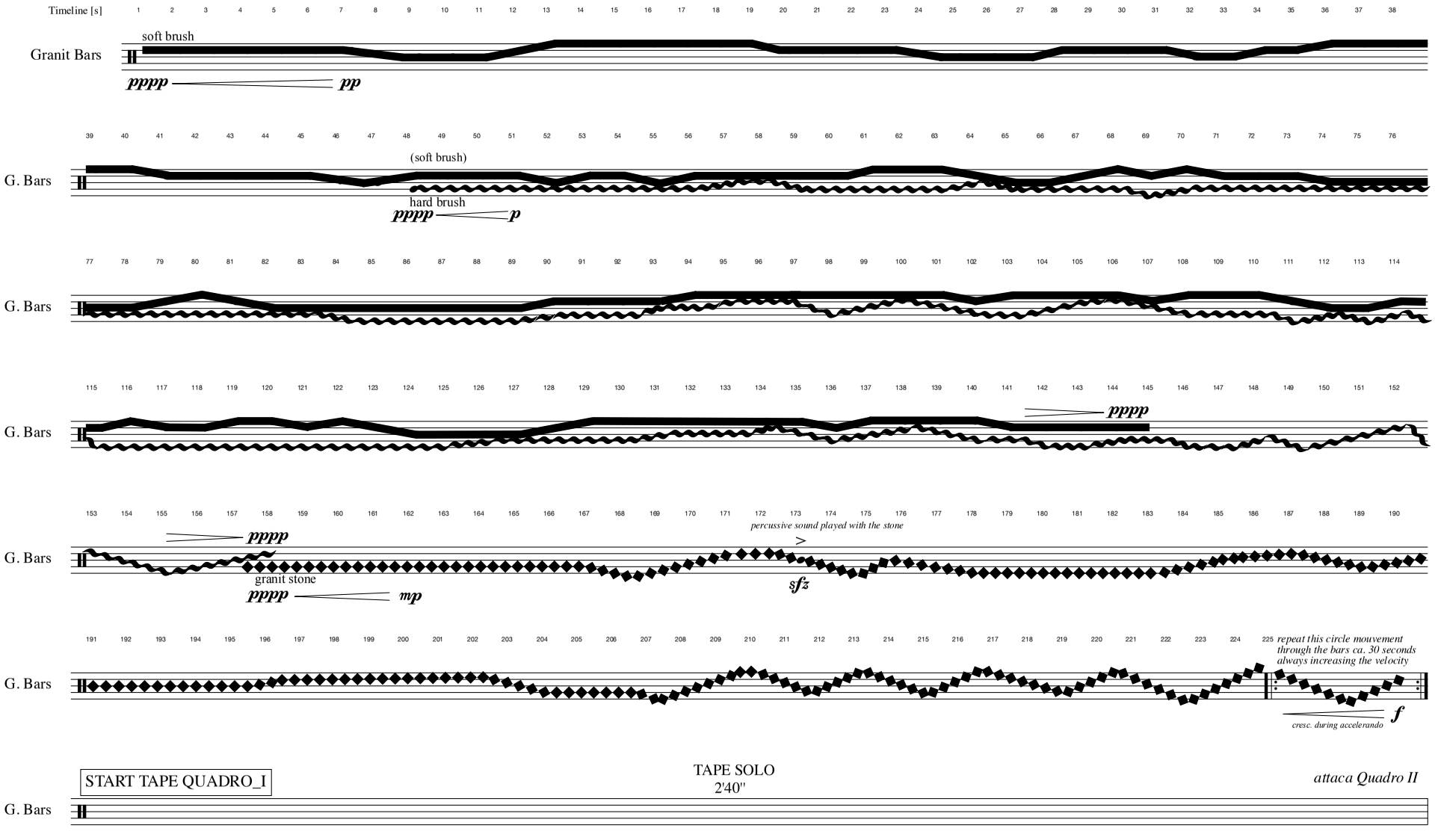
Quadro II is to be played precisely as notated in the score.

Quadro I

move the brush using the whole surface
and also the edge to achieve a constant timbre variation

keep constant contact with the suprface.
no pauses between the changing of stones,
always legato.

Luís Antunes Pena



Quadro II

START TAPE QUADRO II

Tape starts synchronously with percussion. Make a long fade in hearing at the beginning only percussion solo.
During Quadro II play the electronics in low dynamics. Tape should never be louder than percussion.

Granit Bars

1

♪= 96

with stone beaters or with simply with river stones

pp sempre

13

26

38

51

f ***pp***

63

pp ♪= 96 ritenuto --->

76

♪= 96 (without changes)

pp *repeat ad libitum until you achieve the tempo and dynamics*

♪= 96

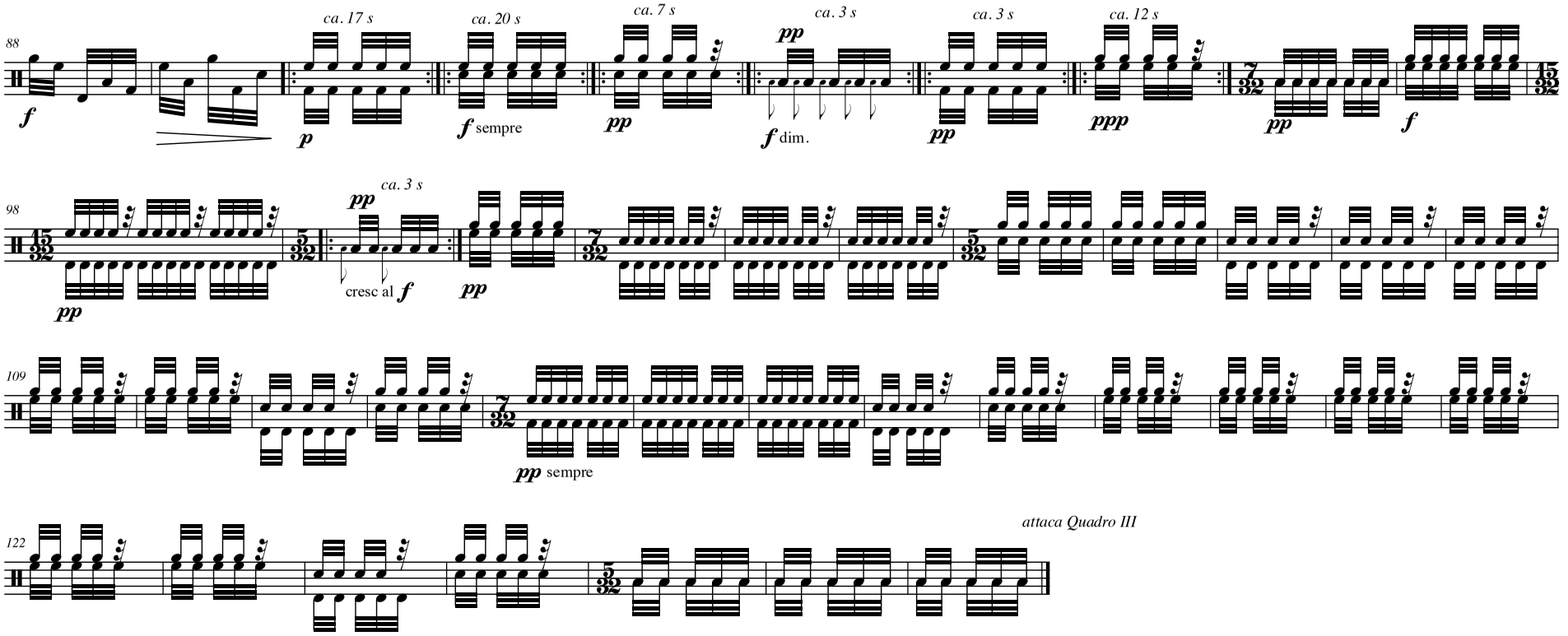
ritenuto ---> ♪= 48

cresc al ***ff*** ***f***

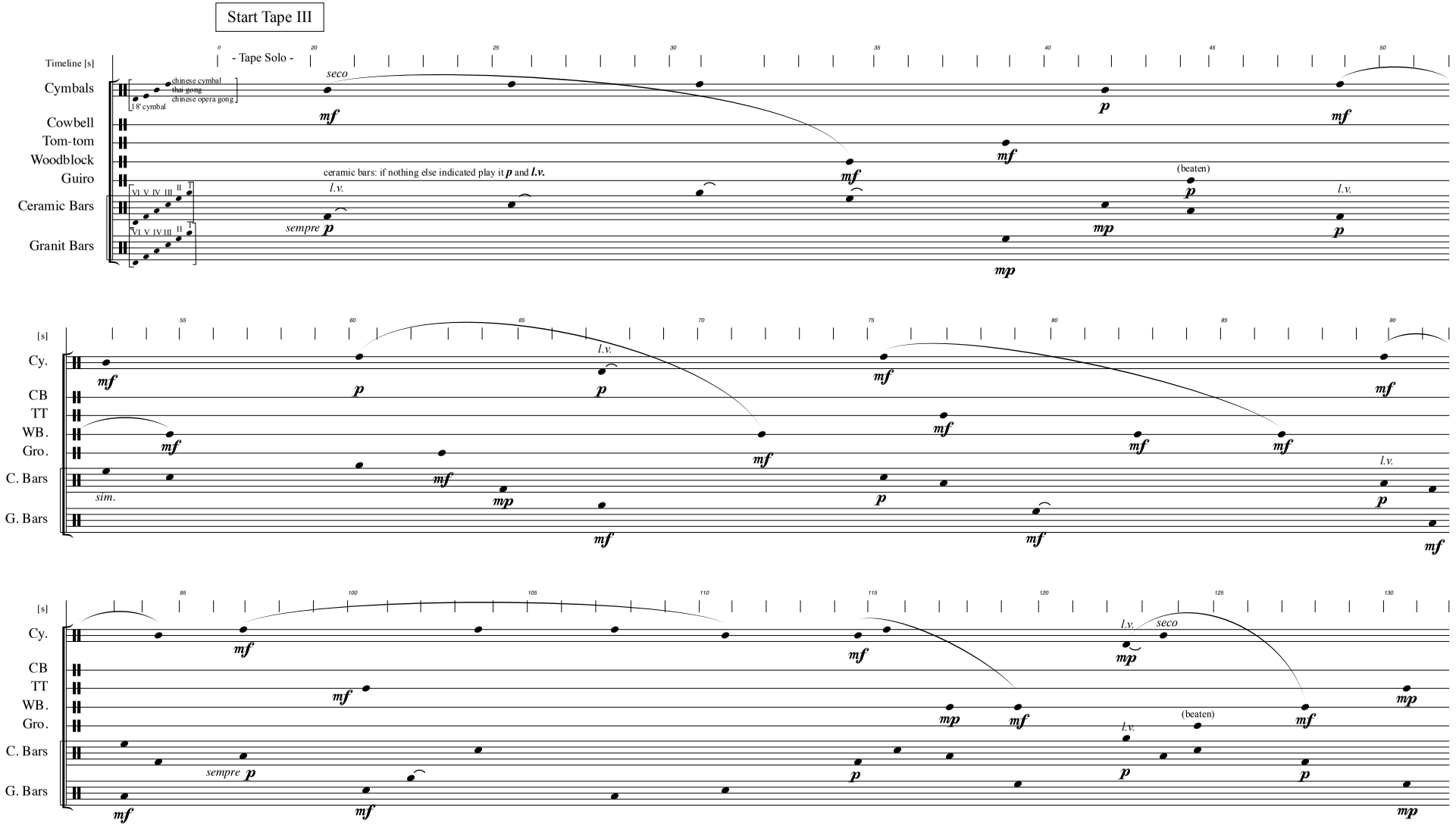
ca. 12 s *ca. 9 s* *ca. 7 s* *ca. 9 s* *ca. 3 s*

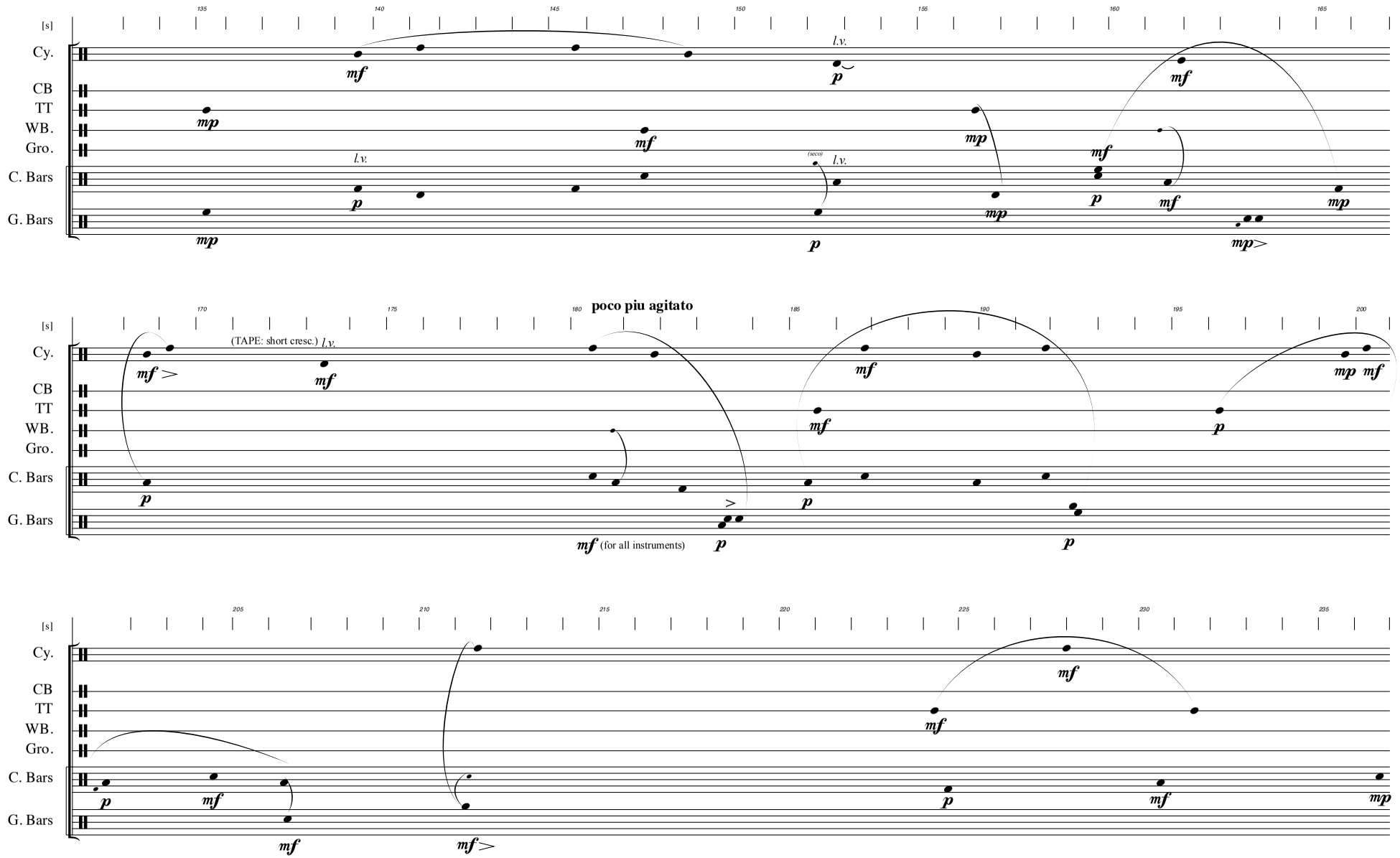
ppp ***pp***

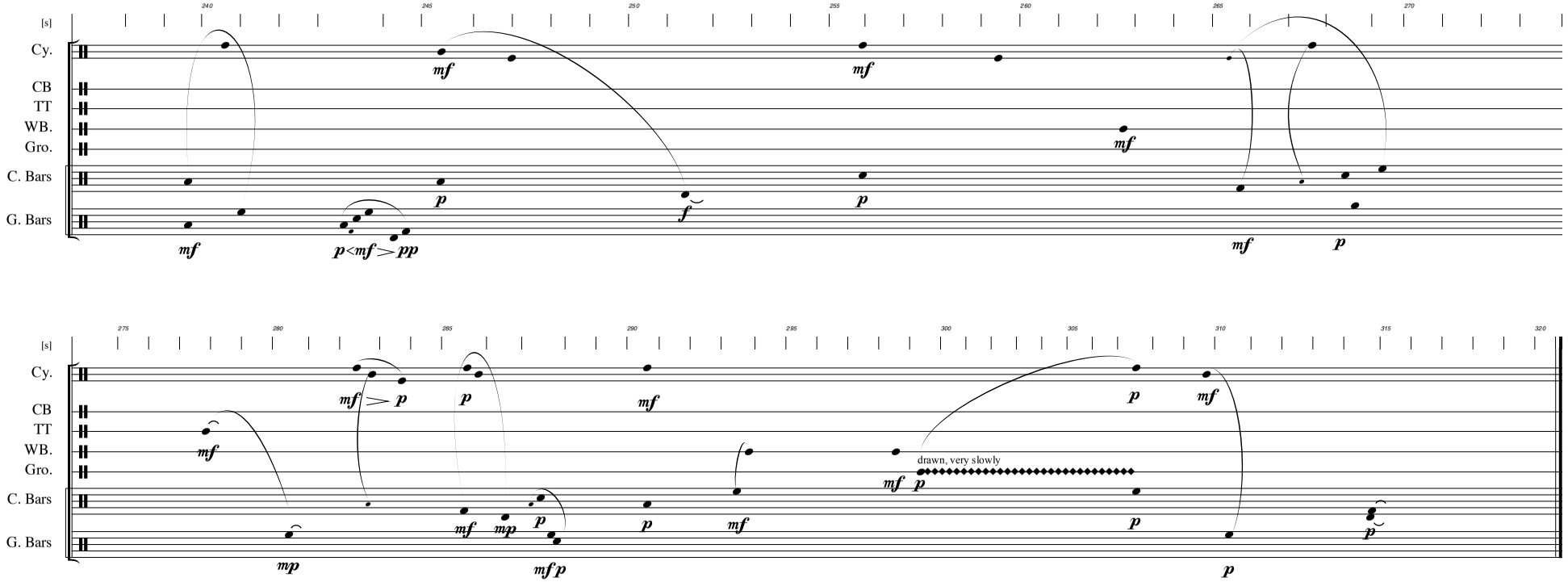
cresc al ***f***


88
ca. 17 s
ca. 20 s
ca. 7 s
ca. 3 s
ca. 3 s
ca. 12 s
f
p
f sempre
pp
pp
f dim.
pp
ppp
pp
f
98
pp
ca. 3 s
pp
cresc al f
pp
109
pp sempre
122
attaca Quadro III

Quadro III


Start Tape III
Timeline [s]
- Tape Solo -
Cymbals
Cowbell
Tom-tom
Woodblock
Guiro
Ceramic Bars
Granit Bars
chinese cymbal
thai gong
chinese opera gong
18' cymbal
seco
ceramic bars: if nothing else indicated play it p and l.v.
l.v.
sempre p
(beaten)
[s]
Cy.
CB
TT
WB.
Gro.
C. Bars
G. Bars
sim.
sempre p
(beaten)


[s]
Cy.
CB
TT
WB.
Gro.
C. Bars
G. Bars
135
140
145
150
155
160
165
l.v.
(secco)
170
175
180
185
190
195
200
poco piu agitato
(TAPE: short cresc.)
(for all instruments)
205
210
215
220
225
230
235


[s]
Cy.
CB
TT
WB.
Gro.
C. Bars
G. Bars
240
245
250
255
260
265
270
mf
mf
mf
p
f
p
mf
p
p<mf>pp
mf
p
275
280
285
290
295
300
305
310
315
320
mf
p
p
mf
p
mf
drawn, very slowly
mf
p
p
p
mf
mp
mf
mp
p
p
mf
mf p
p

Appendix C

Audio Cd with the works performed during the experiments at the present research

Track 1 - *Vox Sum Vitae* - João Pedro Oliveira

Track 2 - *'Xcuse me while I kiss the Sky* - Pedro Junqueira Maia

Track 3 - *Spatial Network* - Beau Sievers

Track 4 - *Sen VI* - Toshio Hosokawa

Track 5 - *Três Quadros Sobre Pedra* - Luís Antunes Pena

(All the works played by the thesis author)