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Instrumental Fado:

A Generative Interactive System

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Doctoral Thesis

Instrumental Fado - A Generative Interactive System

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"O fado?
É uma maneira de lançar a voz"

António Victorino d'Almeida

UT-AUSTIN PORTUGAL PROGRAM

Abstract

Faculdade de Ciências Sociais e Humanas
Universidade Nova de Lisboa

Doctor of Philosophy

Instrumental Fado - A Generative Interactive System

by Tiago Videira

Fado was listed as UNESCO Intangible Cultural Heritage in 2011. This dissertation describes a theoretical model, as well as an automatic system, able to generate instrumental music based on the musics and vocal sounds typically associated with fado's practice. A description of the phenomenon of fado, its musics and vocal sounds, based on ethnographic, historical sources and empirical data is presented. The data includes the creation of a digital corpus, of musical transcriptions, identified as fado, and statistical analysis via music information retrieval techniques. The second part consists in the formulation of a theory and the coding of a symbolic model, as a proof of concept, for the automatic generation of instrumental music based on the one in the corpus.

KEYWORDS: fado, ethnomusicology, music information retrieval, style imitation, algorithmic composition, generative music

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Resumo

Faculdade de Ciências Sociais e Humanas
Universidade Nova de Lisboa

Doctor of Philosophy

Instrumental Fado - A Generative Interactive System

by Tiago VIDEIRA

O Fado é considerado, pela UNESCO, património imaterial da Humanidade desde 2011. Esta tese descreve um modelo teórico, assim como um programa informático, capaz de gerar música instrumental baseada nas músicas e sons vocais tipicamente associados à prática de fado. Apresenta-se uma descrição do fenómeno do fado, das suas músicas e sons vocais, baseada em fontes etnográficas e historiográficas e em dados empíricos recolhidos. Nestes dados inclui-se a criação de uma base digital contendo transcrições musicais identificadas como fado, bem como a sua análise estatística utilizando técnicas de musicologia computacional. De seguida procede-se à formulação de uma teoria e programação de um modelo simbólico como prova de conceito de um sistema automático de geração de música instrumental baseada na música constante na base de dados prévia.

PALAVRAS-CHAVE: fado, etnomusicologia, musicologia computacional, composição algorítmica, música generativa

Acknowledgements

I still remember the day I was welcomed into this project. Professor António Câmara enthusiastically reminded us of how a PhD was a journey and it was all about enjoying the ride and not so much about the results. Because he believed that if we committed ourselves to this path with our heart and soul and gave the very best of us, in the end we would become leading experts in our areas. After all we would spend five years of our lives researching, reading dozens of books and articles, networking and meeting new people, and hopefully having international experience by traveling abroad, attending conferences and developing new skills.

I have to say that at this point this is exactly how I feel. First, I do not feel this is the end. I believe my work is a permanent work in progress, and that I will have many more intriguing tasks to perform and a myriad of new journeys to make. But I also believe I am a new person. I have grown in ways I would never have imagined, and I have developed a critical sense of the world I did not know it was possible. By the simple fact of embarking in this journey and having spent two years, mostly on my own, living in Austin, I have developed a whole set of new skills and I have learned countless ways of solving the plethora of challenges I had to face.

I have also met new people who taught me invaluable things, shared cultural and creative experiences and put me to the test in many ways. I was under incredible pressure in countless occasions and saw myself on the verge of the unknown many times. Often, I had to figure out on my own how to come out of hard situations, other times I was able to count with the aid of many wonderful people who helped me along the way.

This dissertation is just the reflection of those five years. It is a vast text I have written to present many of my findings: to share the survey of many books and articles, to present many calculations, assertions, but also limitations and doubts. Many times I thought I was going in the wrong direction and I had to improvise. Other times I have felt I did not know enough about the subject I was reading about and had to learn, to take a crash course online or to go and find and talk with people who knew better. No one is alone, and although most of this dissertation is based on a very lonely journey, the truth is that most of it is built over the shoulders of many others who have worked before me. Therefore there

are numerous quotations and credits throughout the dissertation – everything that was already done I felt I could and should use. I was advised to do so, as it would make no sense to double the work or to reinvent the wheel. I admire those persons and give full credit to them for all their findings. At times I felt I was just solving a puzzle, because all those credited authors had done a terrific work unveiling data but had done so in different times and places. My task was simply to reorganize it, patch it up together, and make sense of it all in a new and refreshing way.

Sometimes I have also felt very insecure, because there were so many possible approaches to the same problem. And history could not help me – I was dealing with a new area, but with several methodologies deriving from different schools of thought. I have met remarkable scholars who gave me valuable insight and were leading experts in their areas. However, they did not understand much of other subjects that I also needed to cross. Therefore, many times I have felt I was overlapping several different worlds and wondered if my peers would ever be able to understand or make sense of this interdisciplinary approach.

At one point I also felt I would not make it. There was simply too much work to do, too many new things to learn, to dissect, to present, to experiment with. At one point, I realized I was so overwhelmed that I was using my dissertation as a metaphor to understand human behavior as a whole. At that point I simply had to back off and see the big picture – and understand how this was just a journey, and that I had no individual responsibility to fully model and understand the world or even human kind as a whole. So I had to refocus on my tiny problem. So, my individual limited perception is that I am just presenting my original work at this point in time not because it is completed or it is perfect, but because it has been five years and my financial aid has long ended. I believe at this point my work already demonstrates how I have learned to do research, to critically think and, mainly, to solve very different problems applying high-level reasoning and scientific methodologies. If my hard work is recognized by my peers, then I intend to proceed my endless journey searching for the ultimate truth, if there is one, and start a new chapter of my life.

At this point, then, I wish to acknowledge and thank with all my heart to all of those who made this journey with me and, somehow, helped to make it possible.

First, and most important I thank my family. My mother, father, grandmother, and my recently late great-aunt, who were the true pillars always there for me with unconditional love. Secondly, my cousins, my godmothers and godfathers who were always there when I needed to talk.

Also, I thank my friends. They know who they are, because I talk to them regularly. The ones who were always ready to hear my calls when I was afar, or to listen to my rants via Internet, or in person when possible; to give me emotional aid and comfort, to go on walks with me, or simply to share incredible cultural experiences, both in Portugal and in the USA.

I also thank my professors – a group of remarkable scholars who aided me in several ways. Some of them, like professor Tomás Henriques, Filomena Molder, Carlos Guedes and Alberto Pimenta were inspirational in the sense that they molded my character in the previous years and were pillars and references in my thought. Others, like António Tilly, João Soeiro de Carvalho, Salwa Castelo-Branco, Maria de São José Côrte-Real, Nuno Correia, Robert Hatten and Russell Pinkston were present in several occasions during my present work, sometimes even being unaware of it, giving direct insight. It is not always about quantity but quality. There were occasions when a simple ten minute conversation had the power to open a Pandora's box, unleashing many thoughts or references that were the start for a whole new chapter or path of learning.

I have to thank my peers – too many to mention, some with minor interventions, others with full-credited quotations in my text. Some of them close friends, but these ones, having direct influence on my text, gave me valuable information and suggestions: Elad Liebman, Peter Stone, Carlos Teixeira and Manuel Dias, scholars from the scientific world. Fábio Serranito, philosopher and competent philologist, with his infinite patience, is my regular proof-reader and arbiter elegantiae, correcting many of the grammatical flaws my text sometimes presents.

And finally, with most direct influence, I thank my Supervisor – Jorge Martins Rosa and my tutor who received me in Austin, Bruce Pennycook who were there, many times at a distance of a simple email, with a wise advice and a critical look on how to proceed and what to do. Again, sometimes is not about quantity but about the quality, timing and pertinence of the advice.

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Part I

On the musics and sounds of fado

Chapter 1

Introduction

One utopia, and a strong force driving this project, is the understanding of the creative process human beings go through when making songs. How and why does it happen? Is it a craft? Is it something reproducible? Is it something that can be learned and taught? It is something similar to a cook inventing a new dish and then writing down a recipe? Would it be possible to systematize the process of making a song in such a way? To reduce it to an algorithmic task, possible to be coded to be performed by a computer?

These questions come a long way, since graduation, when studying musicology and analyzing music in symbolic terms. They continued during Masters when the work of other scientists, concerned with the same problems, and using computers to emulate musical styles were being studied. And naturally they still remain a vastly complex, open problem that is being addressed, one step at a time.

There are many folk, sung story-telling traditions like ballads, romances, blues, *mornas*, country or even *rap*, all of them, that could make excellent case studies, as a starting point for our bigger task. While they share many common traces among themselves and with other past and present traditions, there is one in particular which is a very peculiar and unique way to tell a story with very distinctive features: Portuguese fado.

Fado is considered Intangible Cultural Heritage by UNESCO, since 2011, so we have had a strong motivation to pursue this research within our interests (song making) and at the same time providing a helpful contribution to the preservation and memory of this performance practice.

In the first part of this dissertation, we are going to show how the concept of fado historically emerged, what it represents, and how it has changed. Moreover, we will offer a detailed, holistic and systematic characterization of the musics and sounds associated with it (both instrumental and vocal), providing a series of factual and empirical descriptors. We will discuss some values associated with fado through a systematic analysis of the performance practice itself, as portrayed by its performers, audiences and scholars, along the course of history, and offer a detailed characterization of its traits. A combined interdisciplinary methodology following the lines of ethnomusicology (ethnographic and historiographic methods) and psychology of music has been used.

We have complemented the analysis with the use of computational musicology on empirical data. We have conceived a musical corpus with 100 transcriptions, identified as fado, found in the written sources. These transcriptions are piano reductions, adapted for the domestic market, of both the instrumental accompaniment and vocal line sung, the vocal line being reduced to an instrumental version. This corpus was edited and made available as a digital database[1]. This database consists of the musical scores, MIDI files, analytical, formal and philological commentaries, as well as slots for relevant information (sources, designations, date(s), authorship(s)) for each fado. The creation of this new digital object is relevant for archival and patrimonial purposes. We have applied music information retrieval techniques, followed by statistical procedures, on the corpus, in order to identify some patterns and rules shaping its characteristics. Our results and conclusions allow a better understanding of what fado is and open doors regarding the construction of a theory, parametrization and modeling of the music and vocal sounds associated with it, for pedagogical, patrimonial and composition purposes, namely automatic generation of similar music.

The second part of this dissertation deals mainly with musical informatics. After providing a state of the art, we conceive and describe a model based on the previous section: a digital system, capable of generating new instrumental music (based both on the instrumental and vocal line usually present in fado practice, the vocal line being reduced to an instrumental version), following the processes and rules previously found. We also discuss and present ideas for automatic evaluation of the system and future work to be done.

[1] `http://fado.fcsh.unl.pt`

This project possesses not only ethnographic, but also pedagogical relevance: it contributes to a better understanding of what fado is, or can be according to certain contexts, and the knowledge about how to compose and perform music typically associated with it. Furthermore, it led to the creation of code and a proof of concept program that may result in an application capable of generating and playing royalty-free music, which can be used in relevant contexts. It could be commercialized and mass distributed in the entertainment industry, as a learning tool in an academic environment, or even be used in social and institutional contexts that usually lack the conventional appropriate settings to aesthetic fruition – namely as background music.

Chapter 2

Objectives

In this part we will show how fado is a multidimensional concept, representing many different stances according to time, space and context and its constant mutation and evolution through time. Moreover, we will offer a detailed, holistic and systematic characterization of the musics and sounds associated with it (both instrumental and vocal), using a series of factual and empirical descriptors that will aid in reaching a definition, which will be the base for subsequent modeling.

There are some very good historiographic and sociologic descriptions, and even several sources with musical transcriptions and phonograms. Those sources have been surveyed and further interpreted and integrated in a new presentation, using new angles and perspectives. We are reinforcing their analytical depth, and complementing them with some empirical data. The musical dimension of fado will be further explored and characterized.

Several sources on fado discuss and approach the concept as an absolute, fixed category, containing in itself a series of performative or contextual phenomena. The legitimation of a category often occurs when it is claimed by primary or secondary sources or in the media. Sometimes it can be artificially created and incorporated in the daily lexicon of a community by institutional enforcement, but often the opposite occurs. The practice precedes the theory and the category is created when, in a given cultural or spatial context, a certain consensus already exists in the mind and memory of the people – either the practitioners, or the listeners. The process of creation of categories seems to be dynamic and incremental. It is known that nothing is born out of "cultural synthesis" or "spontaneous generation"; there always must be an individual authorship for any creation, that might be followed by a certain oral or social chain of transmission, tangible fixation, or a "butterfly effect" in order for that creation to have impact, and establish itself as canonical, or else it is simply forgotten. Often, certain phenomena have local impact and ephemeral duration and then eventually vanish, others remain alive in the memory of the people. Institutional legitimation is important, and sometimes a written description by a relevant person, or the propagation in the media is enough, especially after most part of the population having access to its content. Fado, as a performance practice, exists in the written sources since the eighteenth century; however, little or nothing can be assumed or claimed before that, and even during that period, so this is a wide and fertile terrain for speculation. It does not seem prudent to assume that simply because there is not a written source, therefore it does not exist. We find equally imprudent to assume that, since something is claimed, then it is extensible and generalizable to a whole context, culture, community or nation. As a rule of thumb, this chapter aims to describe fado as a holistic concept. We will not exclude the possibility of some aspects not being considered and one might speculate about their existence. It seems plausible that in each moment in a given space and time someone might have considered fado to be something very unique, and personal, given their own life experience. In a certain context, fado might have had a different meaning than the one more currently in use, even inside that same community, perhaps just locally, and episodically. Perhaps one day someone decided to call fado to a medieval monody. And someone else to a recitation accompanied by an accordion. Would these hypothetical occurrences be less fado than a maxixe sung with African percussion by Mariza[1]? Sometimes entire groups of people or even entire communities seem to recognize as fado certain practices that others would never do. Intergenerational disagreement is also common. Therefore it seems very difficult to establish boundaries regarding categories or limits regarding concepts. It also seems fairly arbitrary to try to explain a dynamic phenomenon that seems to not be self-contained and that continuously changes its own values. Still, following the idea of Jordania (Brown & Jordania, 2011), in order to understand any phenomenon and describe it, one can begin by general tendencies, archetypes and stereotypes. We will try to do it, as rigorously as possible.

[1]Famous fado diva, internationally recognized, and often categorized as a world-music singer.

Chapter 3

Methodologies

3.1 Ethnomusicology and Historiography

The field of Ethnomusicology seems to be one in a constant struggle for its own definition. While there seems to be a central and unified notion of “fieldwork” as the main methodology to aggregate most of its scholars and researchers, their own views and paradigms have been changing over time. There seems to be a vast trend that Ethnomusicology studies music in and as culture. At present, the core departs from a tripartite model proposed by Merriam (Merriam, 1964) around the ideas of “concept” (what music is, what music means in a given context/culture), “behavior” (how the people actually behave, based on the concept, their interactions), and “sound” (the sonic outcome resulting from their behavior). This model is not linear, it encompasses constant back and forth dynamics, so that sound might also shape behavior and behavior shape concept, overtime, based both on the reaction of audiences to performances and external influences. This model was discussed and improved by Rice on several occasions (Rice, 1987, 2003, 2013). Rice proposed a more complex model in an attempt to refine the processes through which the sound relates to human behavior. He kept the core of Merriam’s described as “analytic procedures” but put emphasis on what he called “formative processes”, the ways in which people historically construct, socially maintain, and individually create music. The ways in which these issues are approached varies. While many use a scientific worldview, a notion that data is collected “in the field” and then analyzed “in the lab”, and universal laws extracted from it, Geertz brought another paradigm into the discussion. He challenges the scientific, objective worldview. Furthermore, he claims that it is impossible to fully understand another person, that human behavior is far too complex to be reduced to universal principles. And he believes that science does not explain anything, only outlines (Geertz, 1973, pp. 5-26). Therefore, instead of trying to aim for prescriptive universal laws, one should look instead for the understanding of meaning, for observing what is happening in reality.

> "The capacity, variable among peoples as it is among individuals, to perceive meaning in pictures (or poems, melodies, buildings, pots, dramas, statues) is, like all other fully human capacities, a product of collective experience which far transcends it, as it the far rarer capacity to put it there in the first place. It is out of participation in the general system of symbolic forms we call culture that participation in the particular we call art, which is in fact but a sector of it, is possible. A theory of art is thus at the same time a theory of culture, not an autonomous enterprise. And if it is a semiotic theory of art it must trace the life of signs in society, not in an invented world of dualities, transformations, parallels and equivalences." (Geertz, 1983, p. 109)

Many ethnomusicologists adopted this hermeneutic: thus, an experiential and subjective point of view. Therefore, one is trying to understand the values that shape the musical practices.

Bruno Nettl defines ethnomusicology both as the "the study of music in culture" and "the study of the world's musics from a comparative and a relativistic perspective". He stresses how ethnomusicologists try to understand how a society musically defines itself, its musical taxonomies, tonal systems and theories; the social and aesthetics functions of music in that culture: what it does and how it should be; how a society changes its music and how it deals with external influences: the processes that encompass change and its relationships with the others. The way in which such research should be conducted is mainly by carrying out fieldwork. This implies being in intensive contact with a small, but relevant, group of informants and performers, by opposition to large surveys or systematic analysis of big data (Nettl, 2005, pp. 12-13). John Blacking was one of the strongest advocates of this kind of method and spend several years in Africa conducting studies on the music and culture of the Venda people. His book "How musical is man?" (Blacking, 1973) is still a seminal text in the area, and it was of great influence to our own ideas.

At present, this method is widely recognized in academia, and it is fundamental to understand some idiosyncrasies of particular individuals, their beliefs and the way they perform their musical practices. However, it does not provide enough insight into the general trend of an entire culture, neither does it grasp the big picture if one aims at a global comparison with other cultures. It is impossible to fully understand the dynamics of thousands or even millions of people by questioning just a few dozens.

The task of studying the world's musics by themselves can even be more daunting if one thinks that there is not even a unified concept of what *music* is. The concept of music is seen as broader than the mere "sound" or "notation" so typical of the Western art music traditions. The attitudes of people towards the music are seen as part of the concept as well: both of what they think music is, what power and function it has, as well as their behavior and every action that is needed to be performed in order for the sound to get produced and communicated (Merriam, 1964, pp. 32-33)(Nettl, 2005, p. 24). Bruno Nettl argues how the ethnomusicologists usually try to observe all phenomena that somewhat relate to that concept: one studies what the members of a given culture claim it is music, even if it only vaguely resembles that concept to us, as also one studies what one thinks music is according to our own assumptions. After all, "it's almost impossible to get away from ethnocentrism, that it's in the nature of culture to be ethnocentric" (Nettl, 2005).

According to Nettl, music scholars believe that

> "when music is produced (in any sense of the word), something new is being created" and ethnomusicologists have to deal with this "new in a sense generally understood by them and new also within the specific cognitive framework and understanding of its culture." (Nettl, 2005, p. 28)

In any given culture it is virtually impossible to understand exactly how new music comes to live in the mind of a musician, however it usually arises as "the result of the manipulation and rearrangement of the units of a given vocabulary, of hard work and concentration" (Nettl, 2005, p. 29). In the tradition of Western art songs, this manipulation usually occurs in a symbolic level, with the use of musical notation and this process is seen as the composition, which is separated from the translation of material in sound. In this case the musical units are generally small and may even be "atomic" units such as a note or a grain. On the other hand, typically in folk and traditional music, these units might be samples of canonic corpora of a musical tradition like the Persian *radif*, or the jazz *standards*. In many cultures people simply learn the repertoire from their parents, friends or even teachers and masters, and introduce minor variations when executing it. Over time, the variants may become more and more inventive, but usually they are recognizable as forms of the original. "New songs might be composed, but they were cast in the rhythmic, melodic, and formal mold of songs already known" (Nettl, 2005, p. 32). This practice inevitably leads to an increasing corpus of songs that are relatively alike, all derived and similar to one another. This is extremely common in several musical traditions, namely the European-folk traditions and fado is no exception, because the same creative model applies. The distinction between composition and improvisation is clearly blurred in these cases and Nettl prefers to consider these axes as continua. In each musical tradition the ones that are most innovative, prolific or inspired and are able to excel in creating new songs and positively contributing to the creation or expansion of a given repertoire are usually seen as "geniuses" and highly regarded (Nettl, 2005, pp. 38-41).

On a related discussion, Negus presents the idea that

> "there is no simple correspondence between an ethnic group and mode of cultural expression. Musicians and their songs cannot simply express, reflect or represent a particular group of people. (...) the cultural correspondences are established through particular social practices and political activities. (...) There is a *process* throughout particular musical codes, signs and symbols become used and claimed as expressions of particular social and cultural identities. It consists on the social interactions, relations and mediations (many time political) that occur around and across the music as it is created." (Negus, 1997, p. 122)

Furthermore,

> "There is no straightforward or intrinsic link between the lives of fans, the meaning of musical texts and the identity of a particular

> artist. Songs and musical styles do not simply 'reflect', 'speak to' or 'express' the lives of audience's members or musicians. A sense of identity is created out of and across the processes whereby people are connected together through and with music." (Negus, 1997, p. 133)

Negus also explains how music gains new fans and new identity meanings:

> "Once in circulation, music and other cultural forms cannot remain bounded 'in' any one group and interpreted simply as an expression that speaks to or reflects the lives of that exclusive group of people. In addition, the idea that music can in some way express the unity of a particular group of people must continually confront the apparent disunities and differences that can be found in the world." (Negus, 1997, p. 121)

The traditional fieldwork method generally used, by itself, we believe, is unable to explain the way the values are themselves shaped and how some other higher-level constraints directly shape the musical practices regardless of values (meaning they are cross-cultural traits). What we are proposing is a reflection on how an interdisciplinary approach making use of knowledges of other areas (namely psychology of music and systematic musicology) can complement the model and improve our understanding of both the shaping of musical practices and human behavior in general. While we perfectly understand and agree, to some extent, with many of Geertz definitions and challenges, we assume that science has made a great deal of progress since the seventies, and the scientific and positivist methods have indeed contributed to build a corpus of knowledge around the ideas of some universal or quasi universal laws around human behavior. At present we do believe that, contrary to what Geertz claims, science is able to explain some things, or at least offer some very probable causal relations for many phenomena shaping musical practices.

The recent studies in Embodied Cognition (Leman, 2008, 2012) depart from the idea that all human beings have something in common: a body. Therefore, there are inter-specific and universalistic traits deriving directly from that fact. Namely, the presence of a heartbeat, at around 60 beats per minute, and therefore, how the concept of musical tempo is shaped. This is a clear example of how the perception of a musical parameter is directly shaped by a body characteristic not dependent on cultural traits. The study of universals in seen by Nettl as a set of concentric circles, the definition of music itself being the larger one containing the essential characteristics of the musical utterance. Then, the traces of total musical cultures or musics are contained within the second and finally statistically relevant traces of those musics are contained within the third. Music is claimed to be not a universal language, but the musics of the world are not as different from each other as the languages of the world are (Nettl, 2005, pp. 48-49). Since the experience of learning music, performing music and communicating music is an embodied experience, there are many more commonalities than one might think. Derived from our body, many gestural and motor actions are also universal and their understanding is also cross-cultural (Brown & Jordania, 2011). Therefore the study of those common traces and their prevalence is something worth pursuing – even if one finds that there are many, many exceptions and several ramifications, the mere existence (or absence) of statistically relevant traces in a reasonable number of musics or even within some subgroups of musics might reveals us something about the nature of what it means being a human in a certain context.

On the level below the body, we propose what we call "the language" layer. At present, and based on recent neuroscientific and psychological studies, it is almost consensual that language shapes the way human beings create and articulate symbols and concepts, and therefore, it is in the base of how one thinks. Culture, as defined by Geertz (Geertz, 1973), is the set of knowledges and interactions shared by a certain community. The values are therefore shaped by language. There are no values if one does not have a language to express and think about them, neither there can be values if there is no communication between the members of any given culture.

Furthermore, language also shapes directly the musical practices in cross-cultural ways. The members of a given linguistic community will share common traits, even when they belong to different cultures. As Patel demonstrated, when infants grow their brains create discrete "boxes" out of the realm of the continuum (Patel, 2008, 2014). The natural rhythms and prosody of a native tongue will directly influence the musical rhythms human beings use to create their vocal melodies. In the same manner, as already noticed by Leonard Bernstein (Bernstein, 1976) and Pat Pattison[1] (Pattison, 2010), there are harmonic functions in speech, and therefore,

[1] `http://songwork.com/video-lectures/harmonic-functions-speech`, accessed June, 6, 2015

language also shapes the intervals used in the vocal melodies. These constraints, we believe, will then directly shape choices governing melodic creation, overtime, even in the absence of lyrics. Only below the level of language we envision the values. The level of conventions, shared grammars, imagined communities. It is widely known how this level indeed shapes musical practices and this has been studied for decades now (Blacking, 1973, Nettl, 2005). What we propose then, is to complement this level with the addition of two layers of information, that are also shaping the musical practices, in ways that cannot be efficiently studied by merely fieldwork. The ways the body directly shapes the musical practices is something that has been explored by neuroscience and the psychology of music, mostly through the use of empirical research (Deutsch, 2012, Zagorski-Thomas, 2005, 2012). The ways language directly shapes the musical practices has been almost neglected, but only empirical study can do the task as well, and neuroscience has been pursuing that road. The way the body shapes language, and the ways language shapes values we would say is out of the scope of musicology, and its study should be of concern to understand human behavior and human agency in general.

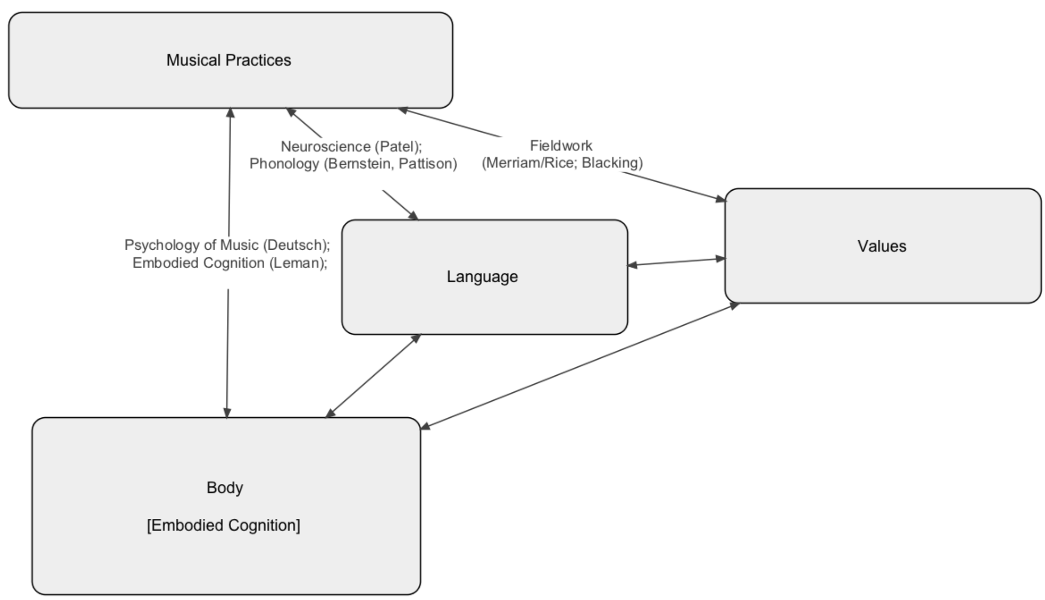

Figure 3.1: Complementing Fieldwork.

Of course, there are also body actions mediated by culture, namely gestural tropes, as studied by Hatten (Hatten, 2004, 2006, Robinson & Hatten, 2012), and there are, of course, language traits also mediated by culture, namely the thematic content of lyrics and programatic associations (for instance, *Pastoral Symphony* or *The Firebird*). But these are already included in the actual framework of study of ethnomusicology.

What we are aiming at are the specific cross-cultural traits that shape the musical practices that fall out of this realm. Due to its cross-cultural nature and their existence in large scale in human populations, and taking into account the advent of globalization and internet, we believe they can only be studied through the use of systematic methodologies and the analysis of big data. Namely resorting to statistical methods (descriptive, comparative and inferential) with the aid of computers, and visualization of information techniques aiming to spot recurrent patterns.

The proposed framework also assumes bi-linearity, that is, overtime, musical practices also shape the body and the values, and in the same way, values also shape language and the body, and language also shapes the body. It is a constant feedback loop, back and forth, in a complex network of interactions. Our proposal, however, is to focus mainly in the interactions directly related with the musical practices, as we believe, they truly represent the concern of ethnomusicology and of musicologists in general.

An introductory analogy by Seeger uses the variety of ways in which a banana can be sliced to illustrate how several perspectives are required to understand a concept, and even so some aspects of it will not be attained (Seeger, 2002). In a certain way, when talking about music one is metaphorically talking about human nature, about ourselves (Videira, 2011). One cannot be fully objective due to the cognitive constraints of being human-in-the-world, the limitations of language and the physical constraints of being trapped inside our human bodies in a given space and time. Therefore, one is doomed to be limited, reductionist and imperfect. Assuming the limitations and flaws of every research we believe that, within the constraints of time and resources we have, the best approach to the problem is to accept certain assumptions and build on top of them – namely the concept of fado. While many could argue that we should go into "the field", mix with the communities and study the musical practices and therefore infer what fado is, we argue that that kind of work has already been done by other scholars and that is not our main goal. If one is to use the same metaphorical language of Seeger, what we are trying to do is to pick up several banana slices cut by other scholars, use other kinds of knives to make some slices ourselves, perform chemical and analytical tests on the peel and speculate about its aroma and processes of reproduction, hoping that in the end we finally get an idea of what a banana is in order to replicate one. We cannot truly assert that the combination of several different sources and methodologies will result better than using an established method from beginning to end, but at this point we believe the more information and angles one has, the better equipped one is to solve any problem regarding that same issue.

3.1.1 An operative model to study the musics and sounds

The interdisciplinary framework envisioned aims at a scientific framework, encompassing several disciplines, to study the musics and sounds associated with the musical practices. The way to do this, using the tools most hard-sciences use, is the gathering, preparation, analysis and manipulation of data.

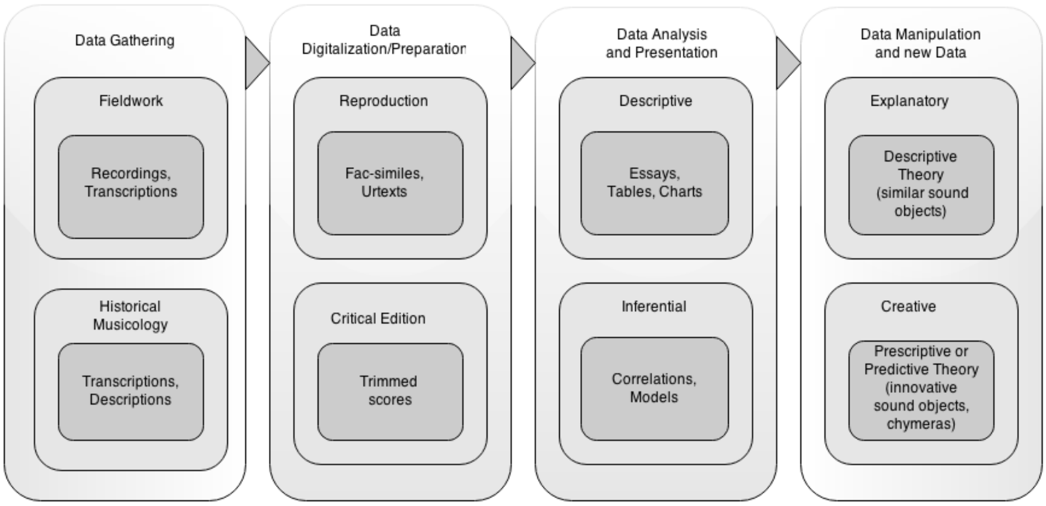

Figure 3.2: Operative Model.

Data about the musical practices should be gathered either in the field or through historical research or both. When using fieldwork methods typically the data assumes the form of video footage, sound recordings or transcriptions. In the case of practices from the past, historical research in archives or personal collections might also unveil transcriptions of music in notated forms, iconography or textual descriptions. Either way, the first step is to obtain this data, as well as relevant information about its context.

The second step is the digitalization and preparation of the data. With digitalization one typically aims at obtaining *fac-similes*, in the case of transcriptions, or digital audio and video files in the case of recordings. The main goal is to preserve and have redundant copies representatives of something as closest as possible of the original source. The task following this, is the conversion of the digital raw data to symbolic formats, suitable to be edited, parsed and analyzed. In the case of the transcriptions, a *fac-simile* is really a photograph, an image format. The main goal is to convert it into symbolic format. This is done by transcribing it into notation software to create an *urtext*. This *urtext* can then be exported into many different formats for subsequent use. A good practice should be to keep redundant copies in several formats, preferring open ones, since proprietary formats might expire[2]. After data has been saved and archived one can proceed to prepare it. This process, in the case of transcriptions, typically involve critical editing methods, imported from philology. In the case of recordings the situation might be more complicated but often it involves the restoration, editing and trimming of the audio in order to isolate the relevant sections or parameters one desires to study. Often, in some musicological projects, the goal is achieved at this stage, since the preservation and publication to the community is the only objective.

The third step envisioned is the analysis of the data. This involves two stages. The first one is descriptive and aims to make sense of the data and convey it in terms of numerical or categorial data. Therefore one can use analogical methods like musical analysis involving segmentation, harmonic analysis, textual descriptions, tagging. More recently, when the data evolves big corpora, music information retrieval techniques are used and the digital files are parsed automatically generating huge files. This new data can then be analyzed through descriptive statistics, using statistical packages, and tables and charts produced for better visualization and comparison. The second stage involves interpretation: making inferences and establishing correlations in order to generate models for the data. In the case of a set of musical transcriptions, the analysis of the data typically involves the formal and harmonic analysis of the corpus, a systematic analysis via music retrieval techniques and the generation of tables with several different features. These features can reflect many of the parameters by which one characterizes music, like pitch or rhythmic statistics, melodic contour, note density,

[2]At present, exporting the *urtexts* as XML, MIDI and PDF seem good options and most notation programs are able to do this. Video and audio formats should be also saved as lossless formats like WAV, AIFF, or lossless compressed ones as FLAC or M4A.

range, etc... Comparative statistics can be made with other corpora, or simply inferential statistics by trying to correlate some features with other ones and creating models. Many musicological projects conclude at this stage when they aim at the characterization of a certain genre or practice, or simply comparing a certain corpus of songs with another, or even, to simply ascertain the internal coherence of the initial corpus.

The fourth stage can also involve two steps or two different approaches according to the desired intention. The first one aims at explaining the musical practices analyzed, described, and eventually modeled, in the previous step. In that case, one tries to produce a descriptive theory. A theory that will explain the practices as they occurred and were observed up to that point. Using the theory one should also be able to recreate or create new musical works that would be similar to the ones observed. The second one is a more creative approach and aims to produce a prescriptive or predictive theory. Speculative by its nature, in this case, following it one should aim at create new musical works that will, hopefully, innovate the musical practices studied, trying to anticipate the changes they will suffer. In a global world and knowing that musical practices are dynamic and ever feeding themselves, in a feedback loop, we would say that such approach, more than anticipate might indeed suggest or force the change, in that given practice, once the original practitioners acknowledge it.

According to this holistic vision the ethnomusicological work is only complete when one indeed has an explanatory theory for the musical practices studied, as well as a suggestions on how and why might they change and in which direction, as well as the ability to reproduce, recreate or innovate them. Therefore, the ethnomusicologist is envisioned as a humanist, a social scientist, an empirical one (conciliating the views of Rice and Blacking), and, furthermore also an active participant (conciliating the view of Mantle Hood).

3.1.2 Consilience

Having a unified, holistic methodology might seem impossible, especially in the short run. However, good practices might be established in order for results to be easily reproducible, and furthermore, to be comparable between them all. Also, the modular approach proposed in the operative model also allows that a researcher can work in a team, leading only the research up to a point, and then, the problem to be continued by another researcher or another team, in another time and part of the planet. The main goal is to allow for the maximization of resources in the long term and an approach to maximum consilience between the several areas of knowledge.

In order to achieve that, and as each ethnomusicological project, involves the interaction and study of human beings in their context, what often lacks is data about those contexts. Therefore what is also proposed is that in every research, either fieldwork, with single informants or small groups, either laboratory experiments, using empirical methods, standardized metadata retrieval should be conducted.

Metadata, here, refers to a set of informations related to contextual parameters that will allow researchers to compare, integrate and replicate studies that are apart in time and place. Since fieldwork is usually a time consuming, lonely task to be conducted on a small group of people, it is impossible to retrieve statistically significant data out of those samples and generalize it for a given population or linguistic community. Therefore, some of the most important parameters to be retrieved could be native language of the persons involved, cultural community, degree of education, social status, age and musical values. By having more complete sets of data it would be possible to make them comparable to a certain extent and retrieve big data from the smaller sets. This would allow scientists to make comparative and inferential statistics out of several fieldwork studies, and could lead to what happens in the hard sciences: bigger, more complex projects, involving teams from several research centers, spread throughout the world, studying several musical practices, involving several human beings, and comparing the results cross-culturally, using methods from several scientific areas.

3.2 Ethnographic and Historiographic Sources

Many written testimonies of fado have been produced throughout recent history. We have novels, memories, personal letters and periodicals referencing fado and sometimes describing contexts, performances or situations. We also have several kinds of essays, papers, dissertation and books. We have engaged in a critical reading of these sources to understand the difference between subjective, personal observations and speculation, on the one hand, and, on the other, the ones that are academic or use some kind of scientific method (the later ones are rather scarce). Also, we were aware of the several different approaches and methodologies used: informal descriptions and opinions; sociological, philosophical and theoretical description of contexts; historical and political readings of the reality; theoretical and analytical assumptions regarding some aspects of the phenomenon; surveys on past sources or ethnography and field work, etc...

There is also a huge amount of musical transcriptions and scores. It was imperative to understand their context, who wrote and collect them and with what objective. We have also applied analytical and philological treatment in order to depurate and obtain the most faithful material.

There are also the living and dynamic sources: informants, who are themselves performers, and living testimonies of the phenomenon nowadays. Also, we have had access to digital sources and recordings, although not in a systematic way, but as a consequence of living in the era of Internet: videos, TV shows, CDs, interviews, websites, and a whole lot of disperse information that we stumble upon every day and which is very useful to access and document whenever relevant or needed.

The interpretation and validation of all these sources is of extreme importance since there are huge differences between them and not all of them have the same reliability. These sources were used not only to understand what fado is, but also to outline a coherent, complete and up-to-date definition of the phenomenon in all its layers and facets.

3.2.1 Critical Sources

Most nineteenth-century references to fado appear mostly in novels, travel diaries, pamphlets, newspapers and informal essays. Although some of these sources were consulted, namely (Almeida, 1893, Balbi, 1822, Freycinet *et al.*, 1826, Ortigão, 1898, Peixoto, 1896), we have had access to their content mainly through quotations in more recent surveys and historiographies. Most of these sources are not scientific, nor have in mind fado as a direct object of observation. The first academic reference relevant to our study is an entry on the musical dictionary of Ernesto Vieira (Vieira, 1890), which provides us with a descriptive model that will be analyzed further down the thesis.

The beginning of the twentieth century brought two new books that provide an extensive account of the phenomenon: *História do Fado* [The History of Fado] written by Pinto de Carvalho (Carvalho, 1903) and *A Triste Canção do Sul* [The sad song from the south] by Alberto Pimentel (Pimentel, 1904). We consider these books as foundational sources for the study of fado, and, according to the standards of the time, we would consider them as academic studies that try to present the history of fado, its myths and origins, as well as descriptions of the practice, main lyrical themes, and relevant figures.

Two more books from the first half of the twentieth century are of great importance to fado history and testimony: *Fado, Canção de Vencidos* [Fado, the losers' song], a series of eight lectures broadcast in the national radio presenting fado in a negative light (Moita, 1936), actually acquired extreme relevance, because it was so detailed in scrutinizing the traits and characteristics of fado, as well as its history, that the result is a relevant description of the values associated with it, as well as the surrounding society. As a reply to the former, another book, defending fado, *Os ídolos do Fado* [Fado's Idols] (Machado, 1937) acknowledges its virtues in a very biased and passionate way, by quoting a series of epoch personalities, and by conducting a biographical survey of most of the relevant performers at the time. These two works account for a rich testimony of the period and are valuable sources to understand how fado was seen and described at the time. After this period we have almost a fifty years gap with few relevant publications in the area. Some new works arise, namely (Barreto, 1959, Branco & Barreto, 1960, Osório, 1974), but they should not be taken as relevant sources since they do not add specific value, compared to more recent ones who quote, interpret and contextualize them.

The last two decades have seen an unprecedented rise in the number of scholars and social scientists interested in the areas of popular music, musical industry and ethnomusicology in general, and fado in particular. This has led to the flourishing of a considerable amount of academic studies regarding the phenomenon in several of its facets, and to a vast number of publications of relevant interest to the area, namely peer reviewed articles and academic dissertations. Some of these works are grounded on historiographical resources from the past, already highlighted, and most of them also collect dispersed information from the other sources (namely literary works and newspapers) and try to contextualize and interpret them, and are thus more useful for the contemporary researcher.

In Brazil, José Ramos Tinhorão found what he thinks is a missing link, and published a detailed theory explaining how, in the end of the eighteenth century, there was a performance practice called fado, which included dance as a strong component (Tinhorão, 1994). He strongly believes that Lisbon's fado is derived and intrinsically connected to this older Brazilian dance. His thesis is widely accepted by academics and has been incorporated and legitimized from then on in most subsequent studies, having found resistance only among non-scholars.

When Lisbon was the European Capital of Culture, in 1994, a large exhibition showcasing fado was displayed in the Ethnology Museum. This event led to the publication of a catalog, *Fado: Vozes e Sombras* [Fado, Shadows and Voices], trying to show what had been done up to that date, containing many relevant texts describing the performative practice (Brito, 1994). In that same year Ruben de Carvalho (Carvalho, 1994) published a book on the same theme, as well as Barreto (Barreto, 1994). Later on, Salwa El-Shawan Castelo-Branco published a whole book regarding Portuguese music with a chapter entirely dedicated to fado, which is a very detailed and systematic description of the performance practice, similar to the one already written in the catalog (Castelo-Branco, 1998). An entire hardcover deluxe collection, commemorating one century of fado, in seven volumes containing photos, transcriptions and essays was also published (Guinot *et al.*, 1999).

Both the Master's thesis and the Ph.D. dissertation of São José Côrte-Real, and the respective papers resulting from them, (Côrte-Real, 2000, 2002, 2010, 1991), are very important and detailed systematic studies on fado, as they contain both ethnographic interviews with migrant communities and performers (including Amália Rodrigues), as well as relevant documentation concerning the cultural policies of State during the Portuguese dictatorship period (1926-1974).

Rui Vieira Nery, son of the prominent fado guitarist Raúl Nery, is a key present day fado scholar. Not only is he a prolific scholar, but he has also collaborated in many initiatives regarding the divulgation of fado, namely the approved candidacy for UNESCO Intangible Cultural Heritage. His publications are detailed historiographical surveys and hermeneutics on the past sources. His books *Para uma História do Fado* [A History of Portuguese Fado] (Nery, 2004), *Pensar Amália* [To Think (about) Amália] (Nery, 2010c), the entry on the Portuguese Encyclopedia of twentieth century Music (Nery, 2010a), the collection of essays portraying fado, mainly through its lyrical content, in the earlier years of the Portuguese Republic and during the First World War (Nery & Mateus, 2012), are very relevant sources since they portray, probably, the best overall view regarding the many facets of the phenomenon of fado up to date.

Daniel Gouveia is not a scholar, but a fado musician and composer, and someone who has lived all of his life among *fadistas*. He provides us with a very personal testimony on the practice, some passionate considerations, and a useful inventory of poems and repertoire (Gouveia, 2010). Alberto Sardinha, also not a scholar, but a passionate fan, unsystematically recorded live testimonies from local people from rural areas. He compiled his set of highly speculative theories and observations regarding the origin of fado (Sardinha, 2010a). Both non-academic works were reviewed by Rui Vieira Nery in passionate discussions on the press, praising the work of Gouveia and highly criticizing Sardinha's (Nery, 2010b, Sardinha, 2010b). Regarding the issue of the historical origins and myths about fado, an earlier essay was also published by Maria Luísa Guerra (Guerra, 2003).

A state-of-the-art generation of researchers, many of them with connections to INET-MD, the Institute of Ethnomusicology of the New University of Lisbon, has been publishing relevant information concerning fado in papers, studies, essays, catalogs and dissertations. Among them we highlight Pedro Félix (Félix, 2013), who writes on fado in the musical theater, Pedro Russo Moreira and João Leitão da Silva, who wrote very relevant chapters concerning issues related with fado, musical industry and cultural policies in their Ph.D. dissertations (Leitão da Silva, 2011, Moreira, 2012). We can also include in this set of works the dissertations of Ricardo Fonseca (Fonseca, 2011) and Liliana Rodrigues da Costa (Rodrigues da Costa, 2012) who approach fado from a socio-economical point of view, but also provide interesting data that can be further analyzed from other perspectives. Also relevant is the work of Sara Pereira focusing on the iconology of fado (Pereira, 2015) and Pedro Pavão dos Santos on the issue of identity (Santos, 2015).

We also have the work of scholars who approached fado from the perspectives of space and identity. Michael Colvin studied the neighborhood of Mouraria (Colvin, 2008), while Richard Elliot dissects how "fado acts as a cultural product reaffirming local identity via recourse to social memory and an imagined community, while also providing a distinctive cultural export for the dissemination of a remembered Portugal on the global stage" (Elliott, 2010). Kimberly Holton, a Portuguese American, provides us with a historiographical survey (Holton, 2006).

An original empirical study regarding the acoustic and phonatory characterization of fado voice was also recently published (Mendes *et al.*, 2013).

3.2.2 Fieldwork

Systematic fieldwork using mainly an emic approach was conducted in Lisbon, since 2009, taking notes from informants, attending performances and reading and paying attention to the media. Especially relevant was the contribution of a group of fado performers in the context of *tertúlia* [informal gathering], typical restaurants, and touristic venues[3].

A pioneering anthropological-sociological fieldwork on fado was conducted in the late seventies in the neighborhood of Alfama. Although it was not intentionally designed this way, in the end it led to a most interesting anthropologic-sociological study with many consequences for the understanding of the musical phenomenon (Costa & Guerreiro, 1984). We would also like to highlight recent academic dissertations, mainly conducted in Lisbon, representing serious and rigorous fieldwork. They constitute a body of knowledge that is not only relevant because of the dissertations in themselves, but also mainly because they contain data, descriptions, and ethnographic interviews available to be read, compared, studied and submitted to new and further interpretations. Among them we have the studies by Oriana Alves and Liliana Sebastião (Alves, 2003, Sebastião, 2009), from the New University of Lisbon. Also Lilly Ellen Gray, which offers us a valuable testimony and ethnographic view on fado, containing much valuable information about its music and vocal sounds to be considered (Gray, 2013). Lilly Ellen Gray also published other valuable papers regarding the same theme (Gray, 2007, 2011).

Soraia Simões, researcher and author, has also been conducting a series of ethnographic interviews with musicians, composers, instrument builders and performers with the aim of having a relevant contemporary sound archive. Part of this archive, called *Mural Sonoro*, is available online[4]. She also recurrently moderates lectures, debates and informal gatherings around relevant musical themes, namely around fado. Several of these reunions were attended. The available material is a valuable primary source for the study of emic perspectives on fado during our age.

[3] The youtube channel "Tertúlia" contains recordings of some live performances of the group: `https://www.youtube.com/channel/UCJlUZ6RIRgbL7iHfbNdfJhA`, accessed June, 6, 2015

[4] `http://www.muralsonoro.com`, accessed June, 6, 2015

3.2.3 Recordings and Media

A systematic study of the early phonographic recordings is yet to be completed. Portugal does not have a National Sound Archive and the materials are not easily accessible, that being a work in progress. It is expected that in the near future the situation will be solved, since members of INET-MD like António Tilly and Pedro Félix are currently working on the issue. One of our main goals was to work on the symbolic written sources, therefore we have only used as references the old recordings presented in the CDs that come along with books like the ones from Paul Vernon (Vernon, 1998), Daniel Gouveia (Gouveia, 2010), Alberto Sardinha (Sardinha, 2010a), and Leonor Losa (Losa, 2013) along with random old digitized recordings that could sometimes be found on the Internet. These early recordings were extremely important as comparative references not only for one to be able to imagine the actual sound of nineteenth century scores, but also to perceive change during the twentieth century.

Two important series were broadcast by RTP (Portuguese national television) recently: *Trovas Antigas, Saudade Louca*, a history of fado, (Ávila, 2010) and *Estranha Forma de Vida*, a history of Portuguese Popular Music from the twentieth century, both with archive footage, interviews and relevant information. We also had access to several similar references and testimonies in an informal way, being constantly and randomly exposed to TV shows and often old archive images and recordings with relevant information broadcasted. Some of them are available online and can be consulted.

3.3 Systematic Musicology and Symbolic sources

In order to fully characterize the musics and sounds of fado we consider the study of past musical examples to be a fundamental source. Since fado performance pre-dates the era of sound recordings the study of symbolic notation is required to access the music of those periods. There are several transcriptions of fado on musical notation, the most recent being the 180 fados transcribed by António Parreira, on the so-called "traditional" canonical repertoire fixed in the beginning of the twentieth century (Parreira, 2014). However, we have decided to go to older sources. We have compiled a representative corpus of one hundred samples to perform our initial research. The *Cancioneiro de Músicas Populares*, compiled by César das Neves and Gualdim Pais (Neves, 1893), contains several traditional and popular songs transcribed during the second half of the nineteenth century, 48 of which categorized as fados, by the collectors, either in the title or in the footnotes. This set was complemented with a transcription of *Fado do Marinheiro*, provided and claimed by Pimentel to be the oldest fado available (Pimentel, 1904, p. 35). We have also had access to the digital version of the collection of musical scores from the Theatre Museum in Lisbon, comprising more than one thousand individual popular works that were previously scanned by researchers from INET-MD. The first 51 categorized as fados were selected in order to complete the corpus. Therefore, we have obtained 100 transcriptions representing works composed roughly between 1840 and 1970.

All this data is not only relevant for the understanding of the rules and patterns that generate the typical music associated with fado practice, but also as cultural heritage archive and source material for future projects. Having this in mind, and thinking how a new digital object could arise from this data, a collaborative team was created in Lisbon, in articulation with Professor Vítor Badalinho and some of his master students of New Media and Web Practices: Cândida Gouveia, Ricardo Correia and Rita Pereira. The team has developed a website hosted in the New University of Lisbon server[5], allowing the database soon to be available to the general public, as well as allowing sorting and searching relevant content using several criteria. The database content is provided in the appendixes of this dissertation as well.

We estimate that there are at least 200 more works categorized as fados to be found in the collection. Future work will be transcribing and editing the remaining scores categorized as fados and enlarge the database. We have chosen these particular sources because they were readily available and still not yet analysed or digitalized. Many more could follow.

These transcriptions were meant to be played by upper class girls in their homes and salons. The distinctive accepted social model at the time was the one imported from Paris and thus it was of the utmost importance for them to learn French and to play piano at a basic level (Nery, 2010c). According to Leitão da Silva, the notion that the musical scores were meant for the domestic entertainment market led the collectors to present them according to the conventions of commercial sheet

[5] `http://fado.fcsh.unl.pt`

music editions at the time, namely by adapting their harmonies and instrumentation to those conventions, softening their lyrics, and dedicating each piece to an aristocratic lady. Furthermore, the choice of repertoire to be transcribed also privileged the texture of solo voice, despite many traditional Portuguese songs (from Alentejo and Minho, for instance) using polyphonic ones (Leitão da Silva, 2011, pp. 257-258). In a certain way, and following a phenomenon common to other folk genres across Europe, social class shaped a canon (Negus, 1997, pp. 73-74), and the mere study of the music of rural populations through the means of notions of scientific objectivity reflected the idiosyncrasies and values of the collectors and transcribers more than those of the popular repertoire itself.

3.3.1 How social class shapes a canon

Negus reviews an interesting theory developed by Dave Harker, following the tradition of Marxist analysis, on how social class seems to be shaping a canon. Harker sees mediation as a phenomenon by which

> "particular people passed on songs they had taken from other sources, in the form of manuscript or print, but that in the very process of so doing their own assumptions, attitudes, likes and dislikes may well have significantly determined what they looked for, accepted and rejected. Not only that, but these people's access to sources of songs, the fact that they had the time, opportunity, motive and facilities for collecting, and a whole range of other material factors will have come into play (...) while we cannot 'read off' what a person did with songs from, say, their class position, it is still the case that their social origins, education, occupation (or lack of it) and so on were obviously connected with how they felt, thought and acted in relation to songs" (Negus, 1997, p. 69).

It follows the concern on how the mediators

> "bourgeois song collectors systematically neglected the music of working-class people and constructed and then managed to institutionalize a gentle, pastoral, ideologically biased 'tradition' of what he calls 'fakesongs"' (Negus, 1997, p. 69).

If we extrapolate this to the Portuguese case and collectors like César das Neves, then we have an interesting issue to take into account: how representative is this collection? How "ideologically polluted" might it be? How can one guarantee that it is not the case that an entire canon was shaped by their hands? It is exactly because of these issues that one has to deal with written sources (musical scores) with a great deal of care. Some of these issues are also discussed in a recent study about the folklorist Armando Leça and his work in the Portugal of the first half of the century (Pestana, 2012).

According to Leitão da Silva,

> "The heterogeneous techniques used in musical transcription point to the ambiguous space that traditional music occupied. On the one hand, the study of the music of rural populations relied on notions of scientific objectivity in which the collector's agency is effaced. Conversely, the larger segment of musical transcriptions of these repertoires shared the conventions of sheet music editions (in their harmonization and instrumentation), a fact that points to its integration as part of the market for domestic entertainment" (Leitão da Silva, 2011, p. 257).

Following his reasoning, Leitão da Silva, states that

> "According to Pestana, the collection and publication of the repertoire contained in the *Cancioneiro* that was drawn from rural contexts was underpinned by a nationalist ideology and supplied a version of these songs that was accommodated to urban audiences. Consequently, it is possible to discuss the *Cancioneiro* as a symptom of a process in which the vernacular was aestheticized in order to integrate the conventions of the entertainment market. In this process, one of the criteria in selecting repertoires collected in rural areas was the musical texture. Despite including songs from many Portuguese regions the *Cancioneiro* consisted exclusively of songs for solo voice, glossing over the vocal polyphonic practices of several of the country's provinces (such as Alentejo or Minho), and emulating the conventions associated with the commercial edition of sheet music. Moreover, each song was dedicated to an aristocratic or bourgeois woman/girl, which indicates the publication's intended audience as well as reinforcing the parallel

> between singing and playing the piano with the feminine segments of several strata of Portuguese society" (Leitão da Silva, 2011, p. 258).

According to Negus' review on the history of ballads in Western Europe,

> "the oral tradition had not been quite as anonymous, collective and immediate as has often been portrayed. There was often a distinct division of labour between song composers and performers. During the Middle Ages, professional singers had frequently sold their services particularly to the nobility and clergy. Hence, the oral tradition had not simply entailed a fusing of creation and reception in a pastoral communitarian world. Instead, there were many notable individual performers, whether the aristocratic and trained bards or the jongleurs and traveling minstrels. The broadside ballad, facilitated by the printing press but drawing on oral traditions of performance and music circulation, was distributed by sellers who drew crowds of people onto streets corners and into town squares and performed their songs. These ballads covered a rich variety of subjects. There were songs about war news, labor songs, love songs and joke songs about human relationships. There were songs about death and murders, gallows songs and tales of criminals and royalty. There were songs about sport and prominent figures and campaigning songs that addressed political or social issues. Combining together what would now probably be identified as news, commentary and entertainment, these ballads often achieved higher sales than the newspapers of the time. This has prompted some writers to suggest that the ballads were a precursor to what become the 'tabloid' newspaper: in these times the populace 'sang their journalism'.
>
> Gradually over time the relationship between the producers and consumers of these ballads became more organized and singers and shouters were replaced by more specialized reciters. Towards the end of the eighteenth century the broadsides were increasingly adopted by professional performers and began to be produced with a more theatrical quality as the street performances interacted with and became part of the music-hall tradition of entertainment. These changes were accompanied by municipal attempts to regulate public behavior in the

> streets of the cities. Laws were enacted that restricted public shouting and singing and which led to a sharp decline in the trade of the street performers. Eventually the street ballads were superseded by the formal production, distribution and plugging methods that were adopted to distribute songs by the sheet music industry. Yet, the practices of the song peddlers and ballad hawkers were retained in many of the practices of the boomers and pluggers who utilized public singing when promoting songs in music halls and vaudeville theaters. The popularity of sheet music peaked at the end of the nineteenth century, but the song sheet and many of the techniques of ballad production (such as producing songs quickly in response to topical events) were adapted to the Tin Pan Alley tradition of 'song factory' production" (Negus, 1997, pp. 73-74)

3.3.2 The Database and the *urtext* Corpus

According to Bardin, a strong reference in content analysis methodology, the analysis organization occurs in three chronological poles: the pre-analysis, the exploration of the material and the consequent analysis of the results, inference and interpretation. The pre-analysis is an organizational stage corresponding to a period of intuitions, the goal of which is to systematize initial ideas and make them operational leading to a scheme or a plan. Usually at this stage three objectives are to be accomplished: the choice of the material to be analyzed, hypothesis and goals formulation, and the elaboration of cues that will sustain the final interpretation (Bardin, 2009, pp. 95-96).

"There are two main ways in which people approached pieces of music. One was their overall form and the other was their melodic, harmonic or rhythmic content. (...) Analyzing the form of a new piece basically consisted of assimilating it into one existing formal prototype or another" (Cook, 1994, p. 9). Since the content of the database refers to the musical scores from the late nineteenth and early twentieth century we are using as a model the first fado definition by Ernesto Vieira, as shown in his musical dictionary:

> "a section of eight bars in binary tempo, divided into two equal and symmetric parts, with two melodic contours each; preferably in

> the minor mode, although many times it modulates into the major, carrying the same melody or another; harmony built on an *arpeggio* in sixteenth-notes using only alternating tonic and dominant chords, each lasting two bars"(Vieira, 1890, pp. 238-239).

This definition is our hypothesis and we have evaluated it using both philological and comparative methods referenced in empirical musicology publications inspired on the methods and techniques of formal content analysis and philology (Grier, 1996). We believe that our universe conforms with the general rules of exhaustivity, representativity, homogeneity and pertinence (Bardin, 2009, pp. 97-98), hence configuring a coherent corpus.

The technique applied consists in giving a unique identifier number to each fado occurrence found in the sources mentioned (001, 002, 003, etc.) and then to re-transcribe each one into a Music Notation program. In this case we have used *Finale*®(MakeMusic Software). We have chosen this program because not only it is a flexible and professional engraving software, but also because it allows to export the files into several formats, namely XML (open binary file format that can be read in any other music notation software, proprietary or not). Also, this software allows us to edit the scores and export them as PDF (printable image format), so they can be seen and analyzed in any machine, and also to export them as MIDI files, so they can be listened to, or further computed as data. Furthermore, the software possesses a humanizer that can be set to several preset styles so that the rendition sounds as if it was played by humans, adding some subtle stylistic and gestural conventions, and not be strictly mechanical.

The Database consists of several metadata fields that can be updated, transformed and changed easily. Beyond the identifier number we have assigned slots to insert common names and designations for each fado, sources where they were found, author(s), composer(s), date(s), philological and personal commentaries, analytical notes and formal schemes, as well as the XML, the PDF and the MIDI files themselves, so anyone can have an instant "global view" of the fado when navigating through the database. This database comprises what we call a corpus of *urtexts*, since all fados were transcribed as close as possible to the original *facsimiles* sources. No humanizer preset was used in this corpus to preserve the data as raw as possible.

3.3.3 Uniformity Operations and the Edition Corpus

After the initial database was concluded, we began the next step of our method: the preparation and exploration of the material. This preparation consisted in standardization processes that allowed us to classify the materials as equivalents. Usually, if the pre-analysis operations is successfully concluded, the analytical stage is nothing more than a systematic and fastidious process using previously defined procedures (Bardin, 2009, pp. 99-100).

The first method applied, in this case, was a philological method, borrowing from textual criticism techniques for clearing up the document from textual errors and incongruences. There were several ways to do that, but the best one was perhaps an adaptation of *eclecticism* (Hartin & Petzer, 1991, pp. 47-53) and *internal evidence* strategy: we have looked for evidences coming from the text itself independently of other similar documents or from the physical characteristics of the document. As a matter of example, we can say that recurrence within the document was a very good clue: if there are two or more similar or mirrored melodic themes, we expected them to behave in the same way; but if in one or two occurrences of the same theme we found certain notes, and on the other we found a different note, and especially if this note was outside the scale, we have assumed that this note was out of context and it was a textual error. We have also applied *external evidence* regarding not exactly identical documents, but documents that were expected to be in the same cultural tradition and respect the same tonal conventions. In our specific case, one can assume that the fados from this period all behave tonally and with very simple harmonic functions, so when in a given document a note or a chord is found that does not conform to this tradition, and if this note and chord is not recurrent within the document, there is no reason to believe that this was an avant-garde fado, but instead that it is a textual error. We have applied the same principles regarding rhythms and even structural forms: we expected phrases of four or eight measures, for instance, so when we saw a phrase with nine measures in between others of eight, we assumed that it was a textual error.

Several fados were notated in quaternary meter or in binary meter but with durations doubled, originating sections of sixteen bars long, therefore we have standardized all transcriptions into the same time signature and beat unit as Ernesto Vieira's model. In this case, binary tempo with a quarter note as a unit.

At this stage we have defined our *context* and our *recording* units (Bardin, 2009, pp. 104-108). Since we were not sure of the ontological dimension of a fado, our context units were not the fado itself, but each one of the occurrences in the literature *per se*, even if there were two or more with the same designation or with very similar content. Those were the best references available and, at the same time, the most reliable units that contained a micro-universe that could be studied and analyzed. The recording units, on the other hand, varied accordingly to our hypothesis.

The first one we tested, Ernesto Vieira's definition, called for the comparison of phrasal units (melodic contours) that became symmetrical and comparable within the universe of each occurrence, so the best method was to consider each one of these "melodic contours" or musical phrases, that usually were correlated directly with lyrical content[6], our recording units.

We have then analyzed each occurrence in the database and performed formal processes conducting to the stylization of each one, turning them into a *structural matrix*. Much of this process can be described formally using specific techniques coming from musical analysis, namely

> "*Semiotic analysis*: analyzing a piece of music semiotically means, first, chopping it up into units possessing some degree of significance within the piece; and, second, analyzing the way in which these are distributed throughout the piece, with a view to discovering the principles that govern this distribution" (Cook, 1994, p. 151).
>
> "Semiotic analysis proceeds through a number of stages and (...) the initial stage is segmentation. (...) Really it is patterns of recurrence that determine where one motivic unit ends and the next begins; recurrence is in other words the principal criterion on which the process of segmentation is based" (Cook, 1994, p. 152).

[6]When we are dealing with a musical score, which has its basis on a narrative (we must take into account that the music is the background of a story, a tale, a fate, a *fado*), the lyrical content is a crucial element to define the musical structure, at least of the vocal part. It seems clear by now that each musical phrase, or melodic contour is based on a lyrical line following prosodic rules. So, the recording units are, in fact, connected to the poetic structure of the fado, but as we are discarding this information when we are dealing with raw musical scores, sometimes that connection seems invisible. It must be said, however, that in case of any doubt regarding when or why a musical phrase should be segmented we have always looked up for the original lyric associated with the source and have made our best decision taking that lyrical content into consideration: in the fado, the melody serves the word (if yet we need to recall an old dispute between Monteverdi and Artusi).

And so, we have applied this methodology to the database identifying where the recurrences occurred (the recording units) and we were able to segment the material identifying the formal sections of each instance. We have added double bars in each transition point so they are visually identifiable for any reader. We have called the corpus at this stage the [critical] “Edition corpus”, since it was critically edited and it is the most complete and standardized possible corpus still retaining all the original information from the sources. Since many original sources lack articulatory or dynamic instructions they seem somewhat distant from the actual practice and their sonic output is rather mechanical and dull. Therefore, in this case, after some trial and error testing, the fados were rendered using the humanizer preset “marching band”, in the expectation that these MIDI files in containing subtle articulatory and gestural variation better reflected a human performance. We have also used this version of the corpus in many of the calculations and as a source for values and comparative analysis.

3.3.4 The Melodies-only Corpus

While the Edition Corpus is perfectly adequate for comparing form, texture, harmonic material, range, and a series of relevant parameters, it is not a good corpus to actually compare the melodic material of each fado, because of disparate criteria in formal units, recurrences, size, keys, metrics, etc. As such, we have “cleared” the extra-material that did not conform to the basic structure – what one could call the idiosyncrasies of each fado – namely, introductions, stylish *intermezzos*, *codas* and finales, and even ornaments that were caught and written down by the transcriber at the time. We have also eliminated all the accompaniments (*ostinati* and harmonic material, eventual bass lines). Finally, we have transposed all fados into the same key – either C Major in the case of major fados, or A minor in the case of minor fados. When we did this we were, no doubt, cutting parts of the fados that are essential to each one. However, we do believe that we were not cutting what it was the most essential (for comparative purposes) and what gives a fado its identity as a group, and plus, what should be common and comparable between all of them. The statistical comparison between the melodic elements of the corpus would not have been feasible without taking this crucial step. However, we ought to pay attention to the fact that

> "the most inductive way of beginning an analysis is to look for patterns of recurrence. If you are going to be genuinely inductive, then you need to begin with a relatively full version of the music (...) since any more drastic initial reduction of the music will necessarily incorporate a priori judgements as to what in the music is essential and what is not." (Cook, 1994, p. 208)

So, it is vital to be able to assume why and how the divisions and cuts were made in order to preserve the integrity of the corpus and the reliability of the investigation.

> "This first stage of a semiotic analysis is known as a paradigmatic analysis because it consists of extrapolating the units of significant structure in music. (...) The second stage of the analysis is known as *syntagmatic analysis* and here attention returns to the temporal aspect of the music" (Cook, 1994, p. 165).

All these procedures were, of course, manual since no computer program up-to-the-date was able to tell, within a MIDI file, when exactly a musical phrase begins or ends and why a certain measure is to be seen as a textual error, for instance. There are algorithms and programs of segmentation being done and in development, namely see (Melucci & Orio, 2002, Paulus & Klapuri, 2006, Stammen & Pennycook, 1993, 1994, Wiering *et al.*, 2009), but not with the required precision and reliability necessary to work in an effective and timely manner for our purposes. However this is no problem to the trained human ear and eye, which can easily correlate the lyrical content to the melody and also the different melodic contours between themselves and assume and justify why the segmentations occur in those exact spots. At this stage we had a third corpus that was called "Melodies-only".

3.4 Music Information Retrieval

Having "normalized" and "typified" the fados (occurrences), and flattened them into their matricial structures, we started looking for melodic or harmonic patterns to see if there were relevant hypothesis to be tested. We then built a spreadsheet using the relevant data from our hypothesis, using the MIDI parameters. Thus we entered a new stage of our method: the treatment of the material already prepared in the previous stage.

The first step of the treatment was the *codification*. It corresponded to a transformation – made according to specific rules – from the raw data, which allowed the material to be represented in units that would describe precisely the characteristics lying in the material (Bardin, 2009, pp. 103-104). In our specific case, the codification was made using MIDI language. The international MIDI code converts all the parameters that lie in the fado transcriptions, in the literature, into numbers. With those numbers it was possible to perform all the statistical operations needed to infer patterns, rules or laws that govern the style with which they were created. We have no illusions that the MIDI code obtained omits vital parameters that usually appear in a human performance and that were surely present in the fado performances of the nineteenth century (namely the *gestures*). "Any transcription, especially a transcription as drastically simplified as conventional notation, constitutes an interpretation of what is heard" (Cook, 1994, p. 225). So, we were working with a defective and subjective source of the performance being studied, however, MIDI codification strictly respects all the parameters that were in the literature occurrences. And since we barely had anything more than that, we were not losing any more information by introducing the codification at this stage. We were then apt to use a comparative method (Cook, 2004). In the comparative method

> "the analysis was based on the relative frequency with which different intervals occur in a single musical line. (...) The other important thing to consider in making an analysis of this sort is the selection of the basic data. (...) the sample must be reasonably large" (Cook, 1994, p. 189).

We have already mentioned the importance of the corpus and the preservation of some analytical principles when of its constitution (exhaustivity, representativity, homogeneity and pertinence), but one cannot stress enough that if the corpus was not well formed or if it lacks sufficient data, the validity of the results would be at risk. So it was absolutely crucial to know when and why to stop the building of the corpus (since the job must not be endless also) in order to achieve optimum results of the statistical operations performed.

This method has a past history. For instance, John Blacking applied it to the Venda Songs, a tribe in Africa (Blacking, 1973).

> "He compares the various songs of this repertoire with each other in the hope of discovering both what it is that they all have in common, and the rules of transformation in accordance with which the same underlying structure can result in a large number of apparently quite different songs" (Cook, 1994, p. 204).

We also have to take into account, for instance, the studies of Kolinski regarding melodic contour and its models to statistically characterize popular musical genres (Kolinski, 1965, 1973, 1982).

> "It discovers an underlying structure in relation to which the musical surface can be viewed as a kind of elaboration. What is more, it is objective in a way (...) that there are clear and explicit rules for doing the analysis so that any two people should come up with the same result" (Cook, 1994, p. 208).

Also, regarding melodic contour we should take Adams (Adams, 1976), Morris (Morris, 1993) as references besides, of course, the extensive tonal theory of perception developed by Lerdahl and Jackendoff (Lerdahl *et al.*, 1996) whose theories led to in-progress software development of applications capable to make an analytical approach with MIDI files and real sound samples by the Kinetic Controller Driven Adaptive and Dynamic Music Composition Systems project (Guedes *et al.*, 2009). All these approaches of the methodology seem valid with their merits and disadvantages, and we were influenced by several combinations of them while testing and experimenting various parameters within the fado occurrences. We have also read and been influenced by the methods and specific techniques of statistics applicable to music described by Beran (Beran, 2004), a general reference, as well as the *Empirical Musicology* compilation (Clarke & Cook, 2004) and several articles from the *Journal of New Music Research*.

As soon as the database was concluded, there was a long period of experimentations and tests implementing several of these analytical techniques and statistical operations in order to make enough inferences to provide us with a relevant set of rules that govern fado. The simplest and most immediate choice was to use a spreadsheet and manually retrieve information that we believed could not be easily retrieved automatically – namely the formal and harmonic analysis and the segmentation process much prone to contextual issues leading to ambiguity and errors. Therefore, these two sets of operations were done manually using all our previous skills in music theory and analysis.

Following a suggestion of Elad Liebman, we then explored the several Automatic Music Information Retrieval tools available in order to find other suitable alternatives for other kinds of parameters. These were the *MIDI Toolbox* (Eerola & Toiviainen, 2004), available to install in *Mathematica*, or the *Music21*[7], a toolkit for computer aided musicology assembled by MIT, that is fairly accessible to use and program in Python. We started programing with *Music21*. However, after an initial period of experimentation, we were not satisfied with the steepness of the learning curve versus the efficiency of the results, and instead discovered the set of tools developed by Cory McKay, the *Bodhidharma* and the *JMIR* (McKay, 2004, 2010). The *Bodhidharma* was of particular interest and ended up being our choice based on usability, ease of the learning curve, flexibility and customization of the tests and corpus and ability to import data and export results – not only the program has a very intuitive and nice graphic user interface, but it is also able to import and perform calculations natively in MIDI files without further conversions. Furthermore, it allows us to decide precisely which series of tests and parameters we can calculate, and export them instantly into our spreadsheets. It can also be trained to perform automatic music classification based on personalized corpus using specific characteristics that we can determine, which is a very useful feature both to verify the consistency of the initial corpus and to perform some evaluation tasks. Having all this in mind, we decided to invest our time in this particular program and most of the tests and features we have calculated were retrieved using this software. The precise algorithms are described on McKay thesis, his text being our source for the definition of each parameter (McKay, 2004).

Already in the final stages of our work, we have had access to a new software, *MeloSpyGui*[8], which is a library, implemented on top of *music21*, with a friendly graphic-user interface. This library currently being developed in the core of Jazzomat Research Project, directed by Dr Martin Pfleiderer, at the Hochschule für Musik Franz Liszt Weimar (The Liszt University of Music Weimar), is able to

[7] `http://web.mit.edu/music21/`, accessed June, 6, 2015
[8] `http://jazzomat.hfm-weimar.de/`, accessed June, 6, 2015

retrieve several musical features from monophonic melodies in both EsAC and MIDI formats. We have successfully tested and used it with the "Melodies-only" corpus (since it is unable to handle polyphony) mainly to complement our work with additional features regarding melodic contour.

3.4.1 Testing the internal consistency of a corpus

In order to evaluate the consistency of the repertoire contained in the corpus we have inspired ourselves both on a study conducted on Cretan Songs, using music information retrieval systems (Conklin & Anagnostopoulou, 2011), and on very recent attempts at automatic music classification of fado based on sound recordings (Antunes *et al.*, 2014). We have devised an objective and reproducible test to perform evaluation tasks using the same software we have used to retrieve information: *Bodhidharma*.

Cory McKay's software *Bodhidharma* is able to extract up to 111 different features from MIDI files. These features are divided into seven different categories: instrumentation, musical texture, rhythm, dynamics, pitch statistics, melody and chords. Instrumentation retrieves information relative to the possible 128 pitch-instrument patches plus the 47 percussion instruments in the percussion key map, available in any general MIDI type 1 file. With this class of features it is possible, for instance, to know the prevalence of certain timbres over others. Musical texture features complements this set. One is able to retrieve data on channels and tracks, and thus infer statistics on voices and how they behave between each other. Rhythm features represent a set of operations along the time dimension. The software is able to calculate statistics on pulse, note durations and densities. Dynamics refer to features that rely on the parameters associated with note velocities and volume channel messages. Pitch statistics are a set of features based on the possible 127 pitches each note-on can have. All notes derived from channel 10 (usually associated with percussion) are ignored. With this information one can extract information usually related with tonalities and scales. While these statistics infer information on pitches as a whole, the category of melodic features, on the other hand, provides us with information on the horizontal dimension – the relation between those pitches, namely intervals, type and direction of motion, and melodic arcs. This later set is complemented by another dealing with information on the vertical dimension of pitches, namely the type of chords used. Not all features have been implemented and some of them are multidimensional which causes difficulties in running tests with them. For that reason we have opted to choose only the one dimensional features that have been implemented, in a total of 71. We refer back to chapter 5 of Cory McKay's dissertation for a complete list and discussion of all these features (McKay, 2004, pp. 55-68).

Cory McKay's software was tested using two different classification taxonomies. First, a reduced one for faster evaluation purposes and for comparative purposes, with other similar studies that were also based on rather small classification taxonomies. Afterward, an extended one, more suitable for real-life purposes. The reduced taxonomy comprised originally three root categories: jazz, popular and western classical. Each of this subdivided into three leaf categories. In total the reduced database consisted of 9 taxonomies with 25 recordings each, for a total of 225 MIDI files. For our purposes we added the fado category (and respective MIDI files) where we thought it would make sense, inside the popular category, next to country and rap, resulting in a total of 10 taxonomies for classification.

TABLE 3.1: Classification with 10 taxonomies

Jazz	Popular	Western Classical
Bebop	Rap	Baroque
Jazz Soul	Punk	Modern Classical
Swing	Country	Romantic
	Fado	

The extended classification taxonomy comprises a total of nine root categories and several sub-categories to a total of 38 taxonomies, to which we have added the fado one. This database has the same 25 recordings for each taxonomy leading to a total of 950 MIDI files, plus the fado MIDI files we have added.

According to Cory McKay:

> "the expanded taxonomy developed here (...) made use of an amalgamation of information found in scholarly writings on popular music, popular music magazines, music critic reviews, taxonomies used by music vendors, schedules of radio and video specialty shows, fan web sites and the personal knowledge of the author. Particular use was made of the *All Music Guide*, an excellent on-line resource, and of the *Amazon.com* on-line store. These sites are widely used by people

TABLE 3.2: Classification with 39 taxonomies

Rock	Jazz	Rhythm and Blues
Classic Rock	*Bop*	*Blues*
Blues Rock	Bebop	Chicago Blues
Hard Rock	Cool	Blues Rock
Psychedelic	*Fusion*	Soul Blues
Modern Rock	Bossa Nova	Country Blues
Alternative Rock	Jazz Soul	Funk
Hard Rock	Smooth Jazz	Jazz Soul
Punk	Ragtime	Rock and Roll
Metal	Swing	Soul
Western Folk	**Modern Pop**	**World Beat**
Bluegrass	Adult Contemporary	*Latin*
Celtic	*Dance*	Tango
Country Blues	Dance Pop	Salsa
Flamenco	Pop Rap	Bossa Nova
Fado	Techno	Reggae
	Smooth Jazz	
Western Classical	**Country**	**Rap**
Baroque	Bluegrass	Hardcore Rap
Classical	Contemporary	Pop Rap
Early Music	Traditional Country	
Renaissance		
Medieval		
Modern Classical		
Romantic		

with many different musical backgrounds, so their systems are perhaps the best representations available of the types of genres that people actually use. These two sites are also complimentary, in a sense. The *All Music Guide* is quite informative and well researched, but does not establish clear relationships between genres. *Amazon.com*, in contrast, has clearly structured genre categories, but no informative explanations of what they mean." (McKay, 2004, pp. 81-82)

The discussion of musical categories vastly transcends the scope of this work, so we are using these taxonomies as they have been presented, and using them as a starting point to demonstrate the potentials of our methodology. For a more in-depth discussion of musical categories we refer to the work of Fabian Holt (Holt, 2007).

3.4.2 Test Implementation

Intuitively the corpus seems rather dispersed since 48 fados provide from the same homogeneous source (César das Neves' *Cancioneiro* (Neves, 1893)) and all others are individual folios transcribed by several different people, spanning a rather large period. So in order to obtain a consistent training set from these two different universes our training sample consists of the first quartile of the corpus (roughly half of the fados from the *Cancioneiro*) and the third quartile from the same corpus (half of the fados from the individual folios). By having this criteria, we consider to have obtained a coherent sample representing the entire corpus.

In the first trial we have trained 50 MIDI files from the Edition Corpus using the implemented, one dimensional, 71 features. The trial was executed using ten taxonomies (the original nine taxonomies from the database of 225 MIDI files assembled by Cory McKay plus the new fado taxonomy, with 50 recordings, created under the sub-category folk in pair with country and traditional). The resulting classification of the remaining fados was a success of 100%. All fados from the second and fourth quartile of the database were successfully classified as fados achieving very high scores (min 53,8%, max 98,4%, avg 83,4%). These outstanding results led us to think that they were actually too good to be true and we suspect that some bias coming from encoding might have led to this outcome: namely all trained fados in the Edition Corpus were encoded using *Finale*®"marching band" humanizer style, most of them using the same 2/4 time signature, a base tempo of 64 beats per minute with little fluctuation, and very few dynamics when compared to a probably much wider range of options coming from the rest of the MIDI files of the database. If we interpret critically the results of the previous study on automatic classification of fados performed on sound files (Antunes *et al.*, 2014), we have a precedent of fado being easily recognizable by a very distinctive set of specific features, namely instrumentation and range. While these characteristics might seem to help the task to be easily performed, in fact, in the end they do not help that much because we do not extract valuable information regarding the possibility of fado having unique melodic, rhythmic or harmonic traces beyond those features.

In order to overcome this problem, our solution then was to try to eliminate the strong bias those specific features bring. So, we decided to use the *urtext* corpus instead with all the small errors, incongruences, and different time signatures it contains. We also encoded it without any humanizer preset. And finally we decided to train the database using only 49 features: the one dimensional ones directly linked to rhythm, melody and harmony deliberately discarding all features related to timbre, instrumentation, pulse, dynamics and even time signature. Our main concern was to indeed try to understand if the main parameters involved in the original transcriptions, by themselves, could represent a corpus of a coherent genre and if fado could be, in the extreme, recognized and classified only based on rhythm, melodic and harmonic features.

For the second trial we repeated the process of using 10 taxonomies and the same 225 auxiliary samples used in the first trial, but this time with 50 recordings from the *urtext* corpus and the lesser amount of features. The result was still surprising: 48 fados were successfully classified as fados, which indeed indicates the strong coherence of the genre despite our intuition of a very fragmented corpus, with still very high scores (Min 54,2%, Max 97,0%, Avg 80,7%). The two exemplars not classified as fados were clearly outliers for very good reasons. Number 076 is one of the fados originally in 3/4 and, as it resembles a light waltz configuration, was classified as baroque with a score of 31% or romantic with 23,3%. These low values, none of them achieving even near the threshold of 50% just show how the system was confused by this particular piece, mixing traces from several genres. When one looks at this particular score, in its *urtext* version, one can easily understand why the system was lead into classifying it under the umbrella of the classical genre. The second outlier was work number 091, which was classified as bebop with 42%. The low score indicates also a great uncertainty about this particular work. When one looks at the score, one easily understands the ambiguity: it is a fado with very peculiar and complex contrasting rhythm figurations, chromatic passages, ornamental figurations, and it uses at least four different voices. The sophistication of this particular arrangement (which is also one of the most recent ones) when compared to the rest of the corpus clearly singles it out. Still, we have to add that both these works must have something of fado about them, since they were not clearly classified as any other genre, remaining in a kind of sweet ambiguity.

In our third trial we opted for refining the process and used the same *urtext* corpus with the same 49 features based only on rhythmic, melodic and harmonic traces. However, we used 39 taxonomies and the total database of 950 MIDI files plus 50 fados as a training set. We wanted to know if increasing the complexity and array of possibilities the system would get confused by them and the peculiarities of the database would start to be singled out more often. The results show that 45 fados were still successfully classified as fados with very relevant scores (Min 46,3%, Max 96,8%, Avg 75,7%). Although a success rate lower than in the previous tests (as expected), this seems to show how consistent the corpus is after all, contradicting our initial intuitions. Two of the fados, works 044 and 050, were wrongly classified as renaissance with high scores (65% and 75%). Our best guess for this fact is probably the relevant percentage of ornamental figurations and embellishments appearing in these scores. Works number 091 and 097 were classified as unknown. This means that no taxonomy was able to gather any relevant score and just shows how incredibly ambiguous these works are – number 091 being recurrent in the previous test too. Number 088 seems also with a very strange and ambiguous classification – the software chooses to classify it as ragtime with a score of 51% but also as fado with 86,3%. This apparent contradiction comes from the fact that fado is a sub-category from the larger category folk, while ragtime is a sub-category of jazz. When the system assumes a first classification under the umbrella of jazz, then is has difficulties in finding a suitable sub-category. On the other hand, if the system as a second choice opts to classify it as folk, then it clearly nests it on fado. The same ambiguities seem to arise with 079, since the systems classifies it as fado with 87% but points out how ragtime has a strong score of 63,3%. A closer look at the scores of these works reveal how, in fact, many idiosyncrasies typical from ragtime are present, hence the ambiguity. We also have to point out how work number 041 also created doubts: although it was classified successfully as fado it only achieved a score of 51%, displaying a second choice of country blues at 37,7%.

In all of these trials one can notice how the fado corpus is actually larger than the other taxonomies. Since the original database was provided with 25 samples for each taxonomy we also wondered what would happen if we trained the fado taxonomy with 25 samples as well in order to not create a bias in this respect. Therefore in our fourth trial we kept the same conditions of the third trial. However, we trained the classifier with 25 random fados from the set and then asked the software to classify the remaining 75 ones. We were expecting that this could add some confusion since now there was much less initial information available to create a fado profile. If indeed the corpus was not that much consistent, among itself, the results could be more varied. However, we felt that this step had to be taken in order to eliminate any bias created by over-representation of fado in the training stage. The results of this trial almost confirmed our expectations: the system was indeed much more confused and was much less effective in recognizing as fado the 75 remaining samples. Nevertheless, the classifications did not spread randomly among other taxonomies; instead, they were highly concentrated around very precise taxonomies. The system successfully classified as fado 37 samples without any doubts (49,3% of the total), and additionally was very divided on 14 ones classifying them either as fado or as country blues (18,7%).

This double classification happened because none of the taxonomies got a score above 50%, with two or more of them being very similar. Sample 022, for instance got a score of 43,9% as country blues and 44,9% as fado, while sample 033 got scores of 41,3% and 41,2% in those same taxonomies. If we add up the 14 samples that were classified as possible fados to the 37 ones, we get a total of 51 samples successfully classified (68% of the total). Then we have 20 other samples classified as country blues representing 26,7% of the total. If we add up the 14 cases where the system could not decide between fado and country blues, we get a total of 45,3% of the samples being possible country blues songs. If we consider both clusters, we realize that both categories encompass 57 possible cases (76% of the total), which indeed shows that there is some consistency among the corpus, even if it is not the ideal one. In 11 samples the system returned unknown (14,7%), meaning that no taxonomy could create a relevant score. This shows that although these samples might not have been recognized as fados, they were not recognized as any of the other possible taxonomies. This either leads us to believe that some unique traces were not grasped by the training set and that they are only available in these particular samples, or perhaps that they are indeed peculiarities of fado and some of these samples were needed as trainers. As we have seen in the previous trials with more samples this was not a relevant problem. Five samples were classified as ragtime (6,7%) which is also a trait present in previous classifications and not a surprise. Finally, sample 088 was classified as romantic (at 40,3% score) and sample 054 as either bluegrass (32,8%) or country blues (32,8%). We might add that this last trial represents what our intuition expected from this corpus – most of the works being slight ambiguous and presenting many traces from several different styles, and thus confusing the software. However, what the tests have shown is that our intuitions were indeed exceptional and that the rule was the software having no doubt whatsoever about the true classification of the works present in the corpus, even when using a non-formatted and non-homogeneous version and only relying on harmonic, melodic and rhythmic features. We consider the deviations on the last trial were rather homogenous instead of dispersed, and the confusion between fado and country blues is rather expected given that we are only analyzing rhythmic, melodic and harmonic features. These two musical practices share common traits since they pertain to the umbrella of folksongs, what we would call a "daily life singing stories" tradition. We speculate that if we had taxonomies for ballads, romances, *modinhas* or *mornas* the confusion might add up. Also the confusion between ragtime might be expected since all the fado samples are written as piano solo folios following much of the same conventions of the ragtime piano solo folios of the time.

In conclusion, we believe the method proposed, although experimental, has shown to be useful as a way to know more about the internal consistency of any given corpus and also its "families" and look-alike taxonomies. Moreover, it reinforces our idea that it is also useful as an evaluation tool: it may allow us to know if any sample modeled out of a given corpus will be very different from the samples of that same corpus. If the database is large enough and has a relevant number of taxonomies, and if any given sample is very different from the taxonomies trained, then it will either be classified in the wrong taxonomy or be classified as unknown. What we would propose as future work, then, is a reinforcement of the database. In an ideal scenario, many more samples and taxonomies would be present in order to have a more adequate representation of the world's musics.

3.4.3 A method for comparative data visualization

By themselves, the statistics retrieved on the fado corpus are useful to understand the constraints regarding genre and are a resourceful material that provides concrete values for the generative model. However, they lack contextual information in relative terms. It is not easy to make interpretations or draw meaningful conclusions until we have comparative references to guide us. Therefore we took advantage of the database provided by Cory McKay and decided to use it as an experimental sample to represent the world's musics. We are aware of the limitations and the narrow scope of a sample comprised by 39 taxonomies and 1050 samples, but on the other hand, given our limited time and resources, it seemed to be a good compromise for a starting point.

While we already had some preconceived ideas about fado and its place within the context of the several world's musics, we completely lacked empirical data to support our thoughts. Our idea was to design a methodology based on what naturalists were doing when collecting different animal species and observing them and comparing each other. These ideas of using recordings of music and comparing them has a long tradition in Ethnomusicology, but the problem is that most of it was done manually, without the resource of computers. The emergence of computers and the possibility of having large databases of music in digital format allowed the resurgence of systematic ways of analyzing music.

With this experience, very much based on what is done in the exact sciences, we hope we have achieved a systematic, reproducible way to show the relevance of the data gathered, and also empirically demonstrate what the place of fado is in relative terms.

The first step was to use the software *Bodhidharma* to retrieve the feature data from all the MIDI files. All the MIDI files were already tagged and organized according to their name and taxonomies. In order to better detect and visualize the possible bias created, we decided to include the raw data categorized as "fado" and then include the edited data (the homogenized corpus following Ernesto Vieira's model) as well, categorized as "Fado Edition". This way we could also see, in relative terms, to what extent the encoding and normalization process would change the perception of the corpus. Once the data was retrieved, it was copied into a spreadsheet where it was further trimmed – namely all the multidimensional features (for complexity and visual reasons) were ignored. Now the main question was what could be done with such a large amount of data? A spreadsheet containing thousands and thousands of numbers is nearly useless if one is unable to make sense of the data, therefore we had to devise a plan to be able to visualize the data in an almost immediate and meaningful way.

The clean and organized data was then prepared to be imported into R®, a statistical open source programming language. The intention was to find a nifty way in which to display the data that would be visually informative in comparative terms: we were going along the same way naturalists look into a board with the pinned butterflies and can immediately see their differences and similarities. We wanted to look at a graphical display and immediately grasp what would be the relative place of fado among all other taxonomies, but at the same time understand how the other taxonomies relate among themselves. We also wanted to have all relevant information present in order to understand each unique taxonomy in case it was needed. Therefore, side-by-side box-plots of all the taxonomies was the ideal solution. We decided to sort the box-plots by the median value in order to convey the relative place of each taxonomy visually in an immediate way. The decision between the median and the mean was not an easy task, because sometimes one does not know for sure what the most meaningful value is. While in most exact sciences the arithmetic mean is actually the norm, among human artifacts outliers are frequent and can greatly distort some parameters. Hence, we have decided to sort the taxonomies based on the median but we have included the mean value as well. By having both values included in the graphic, and paying attention to its differences, one is also able to deduce information about possible outliers. In order to better understand the significance of the position of fado regarding the remaining recordings we have also decided to provide lines representing global median and mean values. Notice that since fado is over-represented in this sample, not only because it has four times more recordings, but it is also doubled because it has two corpus, we have excluded the values of fado for the calculation of the global median and mean in all cases.

Since all fado samples in this corpus are encoded as solo piano pieces the statistical comparison of features relative to instrumentation and musical texture made no sense in this context, since they do not represent the usual and most common practice. Therefore, they were ignored in this particular descriptive experience. Following this method we were able to generate a series of figures, representing the empirical data, that will be extensively used along the dissertation to illustrate, reinforce or disapprove the characterization of the musics and sounds of fado.

Chapter 4

On the concept of fado

Fado is a complex "total-art form". One cannot just have the lyrics, or just the music, or just the performer. One needs to have the whole set of elements for fado to happen. Both lyrics and music are regarded as a base for the *fadista* to create on top of them. Manuela de Freitas points out that the ancient Greeks provide the foundation for this distinction in the concepts of Tragedy and Music, fado resembling Tragedy, since it is something more than music (Freitas, 2013). Fado can be understood only in the context of an empathic performance, of a narrative that has to be embodied, suffered and then conveyed to an audience through the use of several resources that we will try to analyze further down the text, involving the styling of a melody, several body gestures and postures and a fluent interchange with the musicians. The audience is then expected to empathize and experience the emotions, affects and moods being communicated to them. It is because of this whole set of characteristics that need to be present that it is argued that recordings are not the same as live fado, because recordings cannot capture the image and all the language conveyed by the body. Through the recordings we lose valuable information.

Seeing fado as a "tragedy" or a theatrical display of the narrative, the *uniqueness* of each performance, extensive to the *exclusivity of the repertoire*, is another value largely pointed out, especially among older *fadistas*. "*Fadistas* talk about singing their lives and their stories as individuals, in their own style, with singularly marked voices" (Gray, 2013, p. 28). They claim, with some nostalgia, that in the old days each *fadista* was unique, had his or her own identity and nowadays all are copy cats. Currently, it is fairly common for several *fadistas* to sing the same fados, using the same lyrics, and many times imitating the gestures and styling of other famous *fadistas*. This is a typical convention among popular music in general, with the practice of covers, and imitation, of popular artists and their repertoire. This consequence seems to emerge from a shift in technology and the massification of popular songs through the means of digital reproduction (Tschmuck, 2010). Although this has not happened just to fado, fado as a practice, however, has been extremely affected by it. While until the beginning of the twentieth century fado was orally transmitted, and there was a convention and an ethical code that *fadistas* sang their own narratives, after the advent of sound recording things began to change. Many new fans and practitioners started learning the repertoire directly from the recordings and used them as a fixed reference, as an *urtext*, the "correct version". And while in the "old days" it was an important value to be unique and original, nowadays some *fadistas* and fans already protest when they actually hear deviations from the recorded versions, which seems to be a paradox. The situation today is that we can imagine a continuum of possible performances, having the maximum number of fixed elements in one side and a maximum improvisation in the other (using a concept developed by Salwa Castelo-Branco (Castelo-Branco, 1994, p. 133)), and while nineteenth-century values seemed to privilege maximum improvisation, nowadays there are clearly some fans, especially among the younger generations that seem to lean to the other side. The evolution of the repertoire by itself, with the experimentation with new structures, and new kinds of pre-composed music, since the fado-songs presented in the theaters, were already contributing to this shift. It was a slow and dynamic evolution, in a continuum where all possible combinations still exist. Just the distribution and how they are perceived, and valued, is changing.

4.1 *Modinhas*

According to Rui Vieira Nery, in the transition of the eighteenth to the nineteenth century, the dominant genre cultivated in Portugal, using Portuguese lyrics, was a generic type of sentimental song called "*modinha*". The term *modinha* referred to a series of diverse practices performed in distinct social contexts – it was applied both to some erudite written songs, with complex melodies and harpsichord accompaniment, or to the peasant songs from the Lisbon outskirts, or even to the popular ballads carried by the blind itinerant beggars. In these latter cases, the songs were usually described as being very simple melodically and harmonically, as having a very melancholic character, and as being performed with a large degree of improvisation, usually accompanied by a viola [the emic term for the acoustic guitar]. There was no clear boundary between all these performance practices, since they coexisted in the same time and space, and they were constantly inspiring each other (Nery, 2004, p. 31).

When Nery analyses some examples of *modinha*s published in that period he recognizes the typical alternation between tonic and dominant, which already occurred in the *lundum*, and a sad, fatalist and melancholic themed lyricism. The most curious fact, however, is that in two different printed versions of the same *modinha* "Cruel Saudade" authored by Manuel José Vidigal, what varies is the ornamentation of the vocal line, which shows how it was clearly not fixed and, in some way, demonstrates how the improvisatory character was already present (Nery, 2004, p. 33). We have very few documentation regarding transcriptions of these practices, since they were mainly transmitted orally. However, we have literary testimonials and descriptions. Nery quotes William Beckford, who in 1787, describes the *modinha* as being "an original sort of music different from any I ever heard, the most seducing, the most voluptuous imaginable, the best calculated to throw saints off their guard and to inspire profane deliriums" (Beckford & Alexander, 2005, p. 54). Nery also points out how many *modinha*s being sung in the streets of Lisbon were coming from Brazil, due to the intense commerce and social relationships between Portugal and the colony. Sometimes the music was very simple, other times poets like Tomás António Gonzaga or Caldas de Barbosa would lend their texts to erudite local composers, like Marcos Portugal, who, would then try to compose more complex songs, nevertheless, searching inspiration in the popular melodies. These refurbished and re-elaborated versions would then reach the salons and higher classes, since they suited the new audience and were an acceptable repertoire for the young ladies to play and sing them at the piano.

This curious mix between the popular and the erudite draws the attention of the foreigners who wrote about it: Nery quotes William Kinsey stating that the Portuguese should not try to imitate the Italian style arias because the *modinha*s and their own popular songs were good enough to elicit tears and strong emotions among the audience. Nery also draws our attention to the fact that already in these descriptions one could see a certain concern for the national themes and the importance of a "national identity" portrayed by the *Volksgeist* – what emerges from the people (Nery, 2004, pp. 32-35). These facts just show us that, although the word "fado", according to our known sources, was not being used at the time to describe these phenomena, everything else was already in existence. This just reinforces the idea of how the category was not simply shaped out of thin air, but that it was dynamically attributed to a series of contexts that were already taking place. We have very little doubts that some of these *modinhas*, especially the popular ones, improvised with a *guitarra*, and sung over a melancholic text, had plenty characteristics of the early fados, even if they lacked the name.

4.2 The influence of the Dictatorship

The dictatorship that governed Portugal between 1926 and 1974 was responsible for huge transformations in fado. Fado was shaped and typified as a social ritual representing not only proper entertainment, dignified for touristic purposes, but also a form of nationalistic propaganda. The regime clearly understood how

> "music is a form of 'affective communication' and "is able to convey meaning and values (...) which can shape patterns of behavior imperceptibly over time until they become the visible background of real political activity. (...) music works as a public form of knowledge and mode of understanding which is shared by vast numbers of people across the world, those of us who know that, while music is not a 'universal language', the meanings of musical sound are not that 'indecipherable' " (Negus, 1997, p. 221).

During the 1930s the cultural policy was to try to sanitize and minimize the importance of fado in society. Luiz Moita prepared a series of eight talks, broadcasted in the *Emissora Nacional*, and later published in a book entitled *Fado: Canção de Vencidos* (Côrte-Real, 2000, p. 100). However, by

> "Revising and interpreting exhaustively the literature on Fado, Luiz Moita helped not only to concentrate on the one hand and to broadcast the information about it on the other hand, but also and more important yet, to establish a number of 'truths' mainly related to the

> history of Fado, that ultimately served – against his will – to enhance its significance as an emblem of national identity" (Côrte-Real, 2000, p. 158).

Following the lines of other nationalist policies in Europe, António Ferro, the culture and propaganda minister, endeavored to manipulate the several musical expressions, from art music to popular music. "In all three areas the policy was to revive the past, obeying the dictator's orders for national reconstruction based on 'the glorious past of the nation"' (Côrte-Real, 2000, p. 84). One of the main initiatives was the national contest *A Aldeia Mais Portuguesa* de Portugal (The Most Portuguese Village of Portugal), involving villages from all over the country. The main idea was to create a model for an idyllic rural past through which all Portuguese citizens could identify themselves and bond as a unified group. The various criteria to observe dealt with

> "natural landscape and topographic physiognomy, furniture and domestic implements, clothing, popular arts and industries, trading forms, means of conveyance, poetry, tales, superstitions, games, songs, music, dance, theater, festivities and other usages. (...) This event represented the engagement of the regime in the creation of a living model of preservation of the past in which people were treated as museum objects, (...) as actors of characteristic or 'typical' plays, or even as toys or 'puppets', easy to manipulate" (Côrte-Real, 2000, p. 88).

At around the same time, a vast ethnographic project, headed by Armando Leça, was being supported with the goal of collecting the music from the rural areas, the *true Portuguese music*, headed by Armando Leça. While Armando Leça completed the project and collected around 500 songs (sound recordings and transcriptions), the project was not concluded nor edited, probably because the regime could not find a convincing way to make the results stand out as a popular product, pleasant for the urban masses, according to their own intents of manipulation (Pestana, 2012). On the other hand, the regime was successful in dignifying fado by applying censorship to the lyrics and requiring the professionalization of the practitioners and the legalization of the *casas de fado* [fado houses]. Gradually, the practice became more and more standardized according to certain conventions, and even the repertoire began to stabilize. Most of the fados we can find in the transcriptions from the nineteenth century disappeared and a new derivative corpus of fados emerged. Nery describes all this process and claims that this formalization took place around 1926-1945 (Nery, 2004, pp. 188-220). The systematic transcription of this repertoire was made recently by António Parreira (Parreira, 2014). Although the regime during this period never expressed any positive discrimination or even a clear, deliberate intention of promoting fado as the National song, the truth is that with its laws, rules and interventions, in fact contributed to its emergence.

After the Second World War, fado became gradually more and more important due to broadcasting. The *Emissora National* at that period had several orchestras, two of them dedicated to popular and folk music and a school of singers. Côrte-Real explains with great detail how the radio "inundated the audience with Fado transmissions" (Côrte-Real, 2000, p. 159). It was a fertile period for the *spirit policy*[1] instituted by António Ferro, in an indirect way, when both the radio and television were not only broadcasters but also content producers since they could manipulate and control exactly what kind of content the population would have access to. On the other hand, in the streets, since many *casas de fado* were being controlled and the repertoire had stabilized in a sanitized version, and the performers were professional, the practice became accessible to virtually everyone, from the lowest classes to the elites. Some remarkable performers could be seen and heard by millions with the aid of technology, and so they achieved the status of stars or divas, and, with the massification of recordings the new generations would learn the repertoire following their traits and gestures. Amália Rodrigues at this point became a name of surmounting importance.

Amália Rodrigues, the most famous Portuguese diva, saw herself as a music-hall singer; she sang basically everything and every musical genre without discrimination. Fados, however, she found to be pretty dull and repetitive at the time, and so she felt the need to reinvent the genre, to make changes into the repertoire and make it "nobler" and "more erudite". Therefore, she chose to sing literary poems instead of the typical strophic narratives and surrounded herself with schooled composers to make new music to sing those poems. Alain Oulman was one of her favorite composers, and one that composed new songs and melodies shaped to take the most advantage of her versatile voice. "Both metric and the harmonic

[1]The literal translation of the concept "Política do Espirito" as employed by Côrte-Real.

language used by Oulman are deeply innovative regarding the traditional conventions of the genre" (Nery, 2010c, p. 74). Thus, the new songs were not very well received among the musicians and traditional fado listeners at first. José Nunes, one of Amália's *guitarra* players, used to say mockingly before the rehearsals of the new repertoire "Well, let's hit the Operas then!" (Nery, 2010c, p. 75). However, Amália did not think the same way. She stated:

> "The *guitarra* players, in fact, had to learn all those new harmonies composed by Alain, which had nothing to do with fado, because fado is harmonically poor. And I sang them because for me they were fados. The nobility within them is what matters. Because fado is a condition of the soul, a song that means fate and carries that meaning inside. If Alain's music was deprived of fado I would not sing it" (Nery, 2010c, p. 75).

This seem to point out to a vision of fado being "something" that can be recognized in a music or a poem: another layer of information that Amália was empathetically recognizing as fado and then embodying it in her performance.

By the time of the Revolution what had not been initially planned as such, had happened – "Fado represents a paradigm of the use and manipulation of expressive behavior by a political regime" (Côrte-Real, 2000, p. 97).

4.3 Fado as Space and Identity

The transformations and evolution of fado during the twentieth century led to the concept becoming more abstract. Several sources identify, equate and associate fado with a series of philosophical problems, concepts and issues that vastly transcend music, dance or literature. Context seems to be everything – and also who, where, when and how. The fact that the nationalistic propaganda of the dictatorship worked is documented in several sources and it is still visible nowadays, a little bit everywhere. It is interesting how the image of Portugal and fado projected into foreign cultures is so embedded by these myths and conceptions invented and shaped by the *spirit policy* of the Estado Novo. One should not be surprised, then, when the first foreign academic papers and studies referencing fado reveal a concern about the city of Lisbon (space) and the character of the citizens and their inner feelings towards themselves in the world (identity). Fado is seen and perceived as a representation of the city of Lisbon[2], and of the Portuguese people themselves, the association with melancholy and longing, the reference to the *untranslatable* word "saudade" and to the daily life of the people in the typical neighborhoods of Lisbon. Some informants refer to it as "what happens" after a certain social context – people gather to eat and drink, lights dim, someone sings a melancholic song; fado "happened". In a certain way, the original meaning of fado, "*fatum*", was expanded and reinforced, gaining a weight and a preponderance in certain contexts that clearly transcends the performance practice. Fado is thus seen as an abstraction, a symbolic and philosophical concept.

> "Dantas' representation of Severa's death, in his novel and in his play, followed by the refrain from Sousa do Casacão's 'Fado da Severa' has made an impact on the fado novo of the 1930s to 1970s by presenting the *fadista*'s death as a national concern. Dantas identifies the *fadista* as a national figure, because of her associations with the national song, and thus he has made the Mouraria relevant to Portuguese outside of Lisbon. (...) Thus the Fado 'Maria Severa' perpetuates Dantas' association between Severa's death, the death of Mouraria, and the death of the Fado, to blame the regime for the loss of tradition, a consequence of the annihilating [of Mouraria neighborhood] progress" (Colvin, 2008, p. 67).

Colvin describes how Mouraria in the nineteenth century was already a web of social contrasts, and thus the municipality of Lisbon decided to demolish it, along with the historic riverside in an attempt to hygienize it. The idea was mainly to create a new image of Lisbon proper for tourism (Colvin, 2008, pp. 69-70).

> "The nostalgia of fados novos set in the pre-Republican Mouraria blurs epochs in the Fado's diachronic evolution. Anachronisms and ellipses confuse decades, as musicians of the early twentieth century become contemporaries of *fadistas* of the mid-nineteenth. A vague longing for a lost Mouraria dominates as literary and legendary allusions subordinate historical accuracy. (...) And the *fadista* resigns

[2] One could also claim the particular case of Coimbra and the progressive autonomization of a second genre there, however this was a much later phenomenon with particular idiosyncrasies beyond the scope of this thesis. Furthermore, it was observed nowadays Lisbon fadistas singing repertoire with Coimbra style interchangeably.

> him- or herself to visiting the ghosts of the alluded Mouraria by consciously reconstructing its nineteenth-century avatars in verse. (...) We toss about the generic expressions *severas*, *marialvas* and *vimiosos*, thus cementing the artificial folklorization of a *fadista* Mouraria derived from a literary referent grounded in historical/biographical testimony. *Novos fadistas* of the twentieth century appropriate the history of the Fado to serve their propagandistic interests; lyricists and *fadistas* reconstruct an idealized Mouraria characterized by cohabitation between aristocrats and prostitutes and, seldom, noblewomen and ruffians: a quarter in which the social hierarchy of a pre-Republican Lisbon does not exist" (Colvin, 2008, pp. 73-74).

Related to this aspect and to how Mouraria was revamped, Negus also notes how

> "Local city councils in various parts of Europe have also considered using or have used music making as part of a strategy for regenerating neglected urban areas and to try and bring people back to city centers, particularly during the night. (...) through the allocation of resources, local councils have been able to support a diversity of different interest groups which have in turn been able to create their own momentum and generate alternative types of cultural practice on a small scale. In contrast, national governments, faced with the pressures of the nation-state system, have often been far more exclusivist (nationalist) in orientation" (Negus, 1997, p. 216).

In the end, "songs and music accumulate and connect with new meanings and beliefs as they pass through time and travel to different places" (Negus, 1997, p. 195). And the same performance practice earns new symbolic meanings and functions depending on who is performing, who is listening and where and why and how.

Colvin thus explains how fado continuously references an idyllic past, a "communal longing", an expression of an eighteenth-century Lisbon (Colvin, 2008, p. 77). He also describes how the aristocracy, who hitherto had disdained the *fadista* class, out of curiosity and caprice invited them into their salons (Colvin, 2008, p. 78). The aristocratic appropriation of fado was another factor to help promote its reputation and consolidation as national song in the mid-twentieth century.

Nevertheless the consequence of its cross-class popularity was a modification of the practice, since the singers were no longer *fadistas*. Quoting Osório, the experience became more staged: "The fado is mutilated and ceases to express a human condition, a concrete way of life. Its setting becomes more and more artificial, because the human sub-class that once expressed it starts to disappear" (Osório, 1974, p. 119). In Osório's opinion, tourism deals the Fado its most wounding, but not fatal blow, and thus reduces the song to "a wailing, mawkish postcard (. . .) a whining chant" (Colvin, 2008, p. 84).

The fact that the practice of Fado seems so connected with the notion of a particular space and of a conveyed typical "Lisbon sound" or "Portuguese sound" raises important issues. Negus addresses and reviews several studies regarding the problem of geographies, namely the "Liverpool" and the "Miami" sound, and proposes three distinct features to approach the issues related to "place-specific music": first, how the material circumstances in particular places (such as the characteristics of the population, entrepreneurial activity and communication networks) provide possibilities for and hence contribute to the production of specific sounds. Second, some of the ways that particular music instruments, rhythms and voices (using a particular language, accent and words) can be employed to communicate a symbolic sense of the identity of a place. Third, how listening involves the recognition and interpretation of how a place is signified musically and how this is often related to the way that music can be used to construct a sense of "spatial rivalry" (Negus, 1997, p. 189). As Negus points out, based on the "Liverpool sound" study, several sounds around the world are connected to a certain geography through the building of certain narratives and social experiences. Often musicians build a sense of spatial rivalry through music by contrasting the characteristics of their own sounds with those from other places. They also experience the music as "their own" and impose a meaning on the music that is grounded more in inter-places rivalries than actual sounds. The sounds from a certain place are explained, by the musicians, through a series of vague and often mystical quotes and very romanticized and intuitive discourses (Negus, 1997, p. 185).

In Portugal, similar studies have been conducted by anthropologists, sociologists and ethnomusicologists providing relevant and insightful material. Costa and Guerreiro, conducted a vast study dedicated to the Alfama neighborhood, in Lisbon, and realized that one could say that fado, within its limited array of musical compositions, known by everyone, in those neighborhoods, functions as a support to the broadcasting of all kinds of messages: either the daily news or the apology of certain social positions, being them conservative or progressive. It is central to the understanding of fado to see it as a means of making possible the generalized expression of the lower classes and, on another level, as a means of ideological propaganda. In Alfama, the ideological expressions conveyed by fado can only be perceived by the mediation of a core of significations linked with the social life of the neighborhood and its intricate conflictual-symbiotic relationship between the rich and powerful, on one side, and the urban plebs (deeply associated to pre-capitalist activities), on the other. All of this is present in the contrast that structures the majority of the amateur fado heard in Alfama: the feelings of rebellion against the rich, but also the envy of a similar situation; the secret (but sometimes assumed) hope of individual social ascension to a privileged life situation. In the contrast lies a mourning over a life full of sadness, poverty, insecurity and dependency, but also the inability to conceive a global change in the social structure. One desires a better place in the social hierarchy, and this feeling is reflected in several distinct ways, either in real life or in the imaginary life expressed by fado. One of the current practices currently observed is to highlight values like dignity and courage as means of compensating for the lack of money or political power. All of this is associated with the fatalism of those unable to conceive an autonomous project of social change (Costa & Guerreiro, 1984, pp. 184-185).

Therefore, "the enduring appeal of songs through time should not be understood as 'constant and fixed, not open to an infinite range of interpretations, but as being founded upon acts of appreciation and judgement that occur within definite social relations' " (Negus, 1997, p. 194). In this context, "hegemony" may be defined as

> "how dominant groups not only seek to maintain power through coercion and persuasion, but also attempt to gain consent for their leadership by adopting a range of cultural symbols and then connecting these with their own political and ideological leadership. Hegemony is actively won and maintained by accommodating and incorporating a range of dissenting or potential oppositional beliefs and by redefining these in relation to a particular agenda" (Negus, 1997, p. 195).

And so we can talk of a myriad of hierarchies among fado, in both listeners and performers. There is the political regime expecting to bond and unify the masses to better control them. There is the level of the street *fadistas*, the casual dreamers that only want to express their own feelings and tell their own stories; but also the professionals that intend to earn money to live and do not even have to feel what they are singing, being, in a sense, actors. There are also the aristocrats desperately trying to escape the boredom of their lives, or simply wanting a pretext to mingle with other social classes, or even just having an attraction for the rustic and the exotic; but also the tourists coming from afar and expecting authenticity, an expression of the genuinely local.

James Félix advocates two central ideas regarding authenticity in fado: the first is that there is no absolute standard or measure of authenticity, but it is ascribed on a case by case basis and is a personal judgment which may differ from one individual to the next. A second idea is that, while authenticity is important, it does not mean that the inauthentic is of lesser value, but rather they serve two different functions, and as such cannot be judged in the same way. James Félix argues that the terms “amateur” and “professional” should not be taken as opposites, but actually they describe two different orders of things: amateur being more a state of mind and belief. Amateurs performs fado because they believe in what they are doing and every fado for them is a personal thing, whereas being a professional simply means they get paid for it, or they do it for money. In that sense, it is possible to be both professional and amateur at the same time: if paid artists really feel strong emotions during one public performance of a certain fado, then they would be both, however when they sing it the next night, if they do not feel it, but just sing it faking the emotions, then they are just being professional (Félix, forthcoming).

Chapter 5

Analysis

The characteristics of fado derive and are constrained by the abilities and limitations of the performers, the instruments and the contexts in which the practice occurs. If one takes into account that in nineteenth-century Portugal most of the population was illiterate, poor, and without access to music education, then fado is a reflection of these initial conditions. As soon as conditions change, namely performers belonging to higher social classes, being schooled, living in different spaces and using other musical instruments, the musical practices also change, mirroring this fact. We will describe how these initial conditions shaped the music and detail its traits, and then how change over time modified the characteristics of the repertoire.

A fado performance can be systematically analyzed by breaking it down into its core elements and observing the sequence of its events. Typically one has a core textual and lyrical element, a narrative, in the form of a poem, which is the fado itself. That fado is then presented to an audience by a performer, usually singers that identify themselves as being *fadistas*, as they embody fado. Those *fadistas* are usually supported by other elements, which will provide an instrumental support to their theatrical display. The observation and characterization of all these elements in the chain of events will highlight all the relevant codes, conventions and values associated with the practice. The analytical categories developed by Alan Lomax in the "*Cantometrics*" were used as inspiration (Lomax, 1978).

5.1 The Narrative

At present there is vast agreement among researchers that "fado was always poetically constrained. The text was often improvised either by one performer or by two challenging each other" (Nery, 2010c, p. 65). Alberto Sardinha and Gouveia (Gouveia, 2010, p. 75) argue that fado was a poetic genre "consisting in a pitiful narration about the life of a certain character" (Sardinha, 2010a, p. 59). Fado in Portuguese means literally "fate". A fado is a destiny, an outcome, and it could be defined as a story unfolding through several stanzas and, as such, it would have affinities with the traditional Portuguese ballads in their literary form. Sardinha states that "people from rural areas think that fado and traditional ballad are one and the same" (Sardinha, 2010a, p. 51). And that would be the reason for the name, for the origin of the designation "fado". Usually it would be a sensationalistic or fatalistic story, episodic, eventually historical, concerning a certain character. Based on both this assumption and the arguments of Carolina Michaelis de Vasconcelos, Sardinha argues that fado as a literary genre has its roots on the fifteenth or sixteenth century (Sardinha, 2010a, p. 187). Moreover, he claims that due to its nature (narrative and mainly oral), being created by and for the people, within the lower classes and with themes without erudite relevance, it would be a genre largely ignored by academia and the higher classes. Therefore, one would not find references to this phenomenon in the literary sources. of the period. Also pointed out by António Tilly[1], the designation "fado" could be a broad concept meaning "ballad", "song" or any narrative being performed, regardless of its musical structure. These traditional ballads, at first spread by jesters, would later be carried throughout the country by the blind and the mendicant wanderers, who would sing and narrate them, selling flyers with the tales and performing in hostels in exchange for food and sleep.

> "After listening, wondered or horrified, to the latest news on crimes, disgraces, or extraordinary successes and phenomena sung by the blind musicians; after buying from them the flyers with the narratives, the people, relying on their musical memory, would repeat these ballads in their daily life: during labor (...) and at the evening gatherings" (Sardinha, 2010a, p. 93).

[1]Private conversation, 10/04/2014

These events are also confirmed by other sources (Côrte-Real, 2000, p. 168), and they are congruent with the other European folk song traditions exposed by Negus, and already discussed in a previous section. Sardinha also analyzes a relevant statement from César das Neves in his *Cancioneiro*: "This fado, from the mid-nineteenth century, is the primordial type of the popular weeping fados, more to be listened to as a ballad than to be danced". According to Sardinha, this statement is relevant because it is the recognition by a nineteenth-century musicographer that there is a primordial kind of weeping fados, having a popular, "anonymous", musical origin based on oral transmission. Furthermore, it reinforces the idea of an association between this kind of weeping popular fados and the traditional ballads, and also the idea that there were fados to be danced and others to be listened to (Sardinha, 2010a, pp. 213-214). Although there seems to be no dispute regarding the existence of these practices, Sardinha seems to be the only one claiming the label "fado" to define them derives directly from the narratives. Following this assumption, fado would then primarily be a literary genre. The issue resides, then, in understanding the true importance of that poetic-literary dimension and up to which point it defines the concept. Tinhorão, however, argues that dance and musical accompaniment were primordial and that the lyrics come from the previous tradition of fandango improvised singing, where the performer creates a narrative on the spot. The most used formation would be stanzas with heptasyllabic lines, sung alone or in a kind of provocative contest between two performers (Tinhorão, 1994, pp. 69-72). Quoting Armando Leça, he finds a parallel between the development of the lyrics in fado and in traditional ballads since the sixteenth century, forcing the melody to be symmetrical and with a very slow and dragged pace allowing the performer time to invent a coherent rhyme (Tinhorão, 1994, p. 76). He also associates the themes sung with the evolution of the social profile of its practitioners: from very low class (prostitutes, slaves, etc.) to the labor classes, further stating that until the mid-nineteenth century the narratives were mostly positive, pragmatic and humoristic, while after the transition their character became much more realistic and fatalistic, mirroring a certain kind of self-consciousness of the people in relation to their own daily life. It was this thematic transition that led to the independence of a sung fado from its previously danced version (Tinhorão, 1994, p. 79). Rocha Peixoto describes how most themes used in the traditional ballads come from either the Romans and Celts or universal feelings, and thus, claims that fado is the only thing that genuinely represents Portugal and everything that is Portuguese. All those typical mournful themes (love, good, evil, death, passion, revenge, etc.), are sung under the same rhythm, using a poor music of slight variations[2] (Peixoto, 1896, pp. 10-11).

Among the players, fados are known by their melody names, regardless of the lyrics. The general audience and, sometimes, even the singers do not know the name of the melody that they are singing, instead identifying the fado by the name of the poem. Lyrics used to be exclusive to each *fadista*, sometimes original, other times created on the spot. Some were famous for being able to create coherent narratives, of several stanzas, covering whichever topic, lasting two or three times what is today considered the usual duration of a typical fado (Nery, 2010c, pp. 111-112).

Contemporary authors claim no new literature for fado is available nowadays, in the sense that the themes expressed (love, passion, betrayal, affects in general, politics and social situation of the country) are recurrent. This lack of thematic change can be confirmed comparing the themes and lyrics of nineteenth-century (Carvalho, 1903, Pimentel, 1904), early twentieth-century (Guimarães, 1938), and contemporary fados (Gouveia, 2010, Nery, 2004). And yet this is valued, since it fulfils the expectations of the audience, and it is the core of what allows each one of us to create empathy with the performance. However, even if the themes remain the same, the lexical field and erudition of the words has broaden and since the middle of the twentieth century it is possible to find erudite poems circulating side by side with the popular fados.

5.2 Prosody

One aspect that seems to gather enormous consensus among fado performers is the value attributed to the way one articulates the text. When we read many of the ethnographic resources, namely the personal interviews gathered through the

[2] "No nosso romanceiro nada ha cujo thema nao seja celtico, romano ou universal. (...) Portugal tem pois e apenas, de genuinamente seu, o fado; o fado para a folia, para o amor, para a amargura e até para a morte, em choradinho z'i á beira do sepulchro! N'um mesmo schema metrico, de norte a sul, d'antes, hoje e sempre, o povo enquadra todas as suas ideias e sentimentos, todos os factos, n'essa melopeia derrancada que só pode gestar-se n'um paiz que nunca foi mais que uma ruina, raro com lampejos de uma opulencia fruste. Ignez de Castro e a Severa, o bem e o mal, o rosto da lua e as vozes do echo, além-tumulo e a redemção, a paixão, a desdita, o ciume, a vingança, até o Pobre Portugal, tudo se canta n'um mesmo rythmo, uma musica de pequenas variantes, alcanceada, gemebunda, irreparavel. Os que nao cantam, sentem, ouvem com um prazer morbido, interpretam os sentimentos no quadro ineluctavel d'esta logica."

decades, and see the opinions among the *fadistas*, we cannot help noticing how the idea of a good, clear diction is praised: this gives an extreme emphasis to how important the story being told is, and how the music is just a mere vehicle for the word. Moreover, not only is the way one says the text important, but also how one divides the text. Alfredo Marceneiro is constantly praised and referred to as a master, not because of his timbre or vocal range, which was extremely limited, but because of his inventiveness and the way he divided and stressed the syllables. In other words, the value of prosody or, more specifically, the rhythm of the melodic line plays a crucial part in defining the genre among its own performers. If there is a doggerel line, with the wrong metric accent, it will ruin the cadence, the flow.

The *vocabulary*, the lexical field, does matter. According to Daniel Gouveia, fado needs to be popular. Not all poems are suitable to be fado lyrics. If the popular masses cannot understand it, then it is not fado. Fado can be high-art, there are some beautiful poems that can be sung as fado, but not all of them are suitable. Also, some words do not belong to the fado universe, some words just sound inadequate, as if out-of-context or anachronistic in a fado lyric, for instance, a word like "telephone" (Gouveia, 2010). Among the values stated by lyricists and composers, the *Lisbon accent* was regarded as an important one, as well as the *intonation* – the way in which one conveys the narrative, the *weight* the words carry and how one perceives meaning through them. If one perceives a rural or foreign accent in fado, it is not fado anymore, it loses something. Amélia Muge, for instance, stated that her song sung by Camané sounded like fado because he puts a weight in the words that she, herself, does not put. In her version it sounds "light, carefree", in his version it sounds "heavy, worn down by suffering[3].

5.2.1 Language

One interesting issue that arises with language can be exemplified with a case study: the project Fado Novato[4]. Fado Novato [Novice Fado] are a group of three American musicians who seek to learn and perform fado. They are documenting every step of their evolution along the way. There are two men, one playing *guitarra* and the other viola, and one woman singing the vocals. When we listen

[3]Debate fado(s): Escritas e Autorias, moderated by Soraia Simões, promoted by Mural Sonoro in 15/12/2013.

[4]`http://fadonovato.com/`, accessed June, 6, 2015

to this project, we see almost no problem with the musicality of the instrumental parts – they imitate at a very good level the instrumental arrangements from the recordings they are learning from and even the timbre of the instruments is quite accurate. In some recordings the *guitarra* is actually a Bouzouki and the instrument is close enough to provide an acceptable rendition of the mood it is supposed to convey. On the other hand when we listen to the vocals we find them hilarious, distractive, and they totally ruin the experience for us. We cannot say that we are listening to fado at all, because all the emotions, feelings and the context associated with the traditional experience we are used to know changed. And they changed because of the language. Even though the singer sings in Portuguese, the accent and prosody sound very strange. This is a big issue regarding the Portuguese language spoken in Portugal. Contrary to what happens in Brazil, where the language is very open and musical, the Portuguese from Portugal is spoken with many closed vowels and with the end of the words almost vanishing into thin air. The sound becomes muddy and blurry and almost indistinguishable for a non-native. These are characteristics intrinsic to our prosody and they cannot be changed (Frota, 2000). Pattel already analyzed these problems in a wide volume on music, language and the brain (Patel, 2008), and explained how human beings are heavily constrained in their sound and musical perceptions according to the native language they learn since childhood. It is as if one gets locked into a system of sounds and therefore other extraneous sounds and subtleties nonexistent in one's mother tongue remain out of their reach and perception after a certain age. An accent is basically the result of these constrains: after one learns and incorporates their mother tongue into their brains and phonetic system, every other language one learns afterwards will be spoken according to these basic guides and cues one already possess. Therefore Spanish people speaking English will sound very characteristic because they are speaking English with the stresses, rhythm and prosody of the Spanish language. This is certainly true in the case of Fado Novato's vocalist, and most foreign vocalists in general – they are unable to pronounce the words correctly, to provide the adequate stresses in consonants and vowels and to make a correct division of words. Most of the time they just sing with a very strange accent. Since the correct diction and prosody of the narratives of fado are of paramount importance for most of the listeners, as already stressed, the lack of this feature harms the performance irrevocably. Now, what seems of great interest in this experience of bi-musicality is that the fado experience is only ruined for Portuguese natives. For anyone else in the world, the experience will still sound as genuine as any other Portuguese singing fado. We have asked some foreign friends informally what they thought about Fado Novato (one of our friends even understanding a bit of Portuguese) and they could not find anything wrong with the performance. Although we cannot say we have conducted any methodical study or have a reasonable sample to test this hypothesis, the truth is that we can speculate with a fairly reasonable expectation that the experience of a performative genre that depends so heavily on the perception of the language, and the correct accent, is only jeopardized when the listeners are native speakers and the performers are not. This assumption is important because it leads us to think that the cues that may identify the phenomenon of fado may vary accordingly to the language of the speaker. In this specific case, we dare say that some fado performances will not be recognized as fado by Portuguese native speakers, while being cheered and applauded as genuine or acceptable performances by foreigners. Of course, we see none of this as being a problem specific to fado. The same will happen with any performative practice that depends heavily on some national characteristics best recognized by natives. There are certainly similar problems with American country music sang with British accent, for instance, deemed as "ridiculous and laughable" by an American friend, or even all the *couleur locale* references used in many classical Western works that, for sure, must seem also inappropriate in the cultures they are supposed to reference or portray. In the end, the issue of bi-musicality (Hood, 1960) and language problems just reinforce the idea that fado is mostly a Portuguese phenomenon because of some difficulty for a Portuguese native to give credit and recognize a traditional performance by anyone who is not Portuguese[5]. And therefore the issue of the "imagined community" (Anderson, 2006) and of a shared experience among its constituents makes total sense in this case.

5.2.2 The rhythm of the melody

Many practitioners recognize that, in any given traditional fado, the sequence of harmonic progressions is fixed, as well as most of the basic underlying metrical structure, but the melodic line is not, simply following the harmonic contour. "In addition, certain aspects of poetic form in relation to which lyrics can be set to

[5] Although Gray claims to have had some success after intense learning within the Portuguese community and grasping what she believed to be most crucial cues regarding the accent (Gray, 2013, pp. 48-69).

specific traditional fados are also fixed, governed by rules regarding the number of stanzas, number of lines, and, sometimes, the syllabic count and rhyme scheme" (Gray, 2013, p. 145).

The rhythm of the melody can be thought as having two layers: an abstract/notation layer and a performative one. The first one is actually what one sees in most of the musical scores, in the transcriptions and it has been described by Frederico de Freitas (Freitas, 1973), for instance. Freitas presents a semiographic scheme for fado and confronts it with the *lundum* and *habanera*, stating its differences. He describes this rhythm as being usually a seven-note pattern (a feature directly imported from the prosody, since the fado lyrics usually are heptasyllabic lines), written out in a 2/4 time signature, consisting of an eight pick-up note, and then two eight notes on the first beat and a group of three syncopated notes on the second beat, and a final note finishing the phrase on the downbeat of the following measure. Although a very interesting scheme and, in a way, a useful description, it is not entirely congruent with the data. In our musical phrases, gathered in the corpus, it is possible to observe all possible combinations of musical durations arising, as long as they are somewhat consistent with the prosody and emphasize the stressed open vowels. Inspired by the ideas of Nketia regarding some African traditions, that "on the phonological level, the syllables of the words of text lines, which correlate with pulses or beats in music, are the basic constituents of structure" (Nketia, 2002, p. 148) and that "the rhythm of songs reflects, to a large extent, the natural grouping of the words in a text line" (Nketia, 2002, p. 149), we propose to analyze the rhythm of the melody in fado relating it directly to prosody and as a consequence of the lyrics, rather than building up a mere mathematical archetype.

Our own observations of fado suggest that the rhythm of the melody is a direct consequence of prosody and lyrical structure and that the syncopation identified by Freitas is, on the other hand, a consequence of a gestural shaping discussed further ahead. Fado usually employs heptasyllabic lines, although up to twelve syllables per line have been used, to be mapped onto the strong beats of two 2/4 bars. "The aggregate duration of the syllables of the text line must correspond to that of the musical phrase. A number of adjustments are made if there is disparity in the length of the musical and verbal units of structure" (Nketia, 2002, p. 152). The majority of European Portuguese words are stressed in the penultimate syllable; also, most monosyllables, namely articles, conjunctions and prepositions are performed as non-stressed words. Therefore, statistically, one seldom finds a stress at the beginning of a sentence. When trying to pair the first stressed syllable with the first downbeat of the measure, the previous non-stressed ones will inevitably become pick up notes, this being a recurrent trait. Most stressed syllables contain open vowels which are, conventionally, emphasized when sung thus reinforcing a typical feeling of syncopation. For more information on European Portuguese language and its prosody, consult Frota (Frota, 2000) as well as Castro and Lima (Castro & Lima, 2010).

Using an example of a heptasyllabic textual line "O *fadista* que é *fadista*" [the *fadista* who is *fadista*] we exemplify how one could map this line into a rhythm that makes sense.

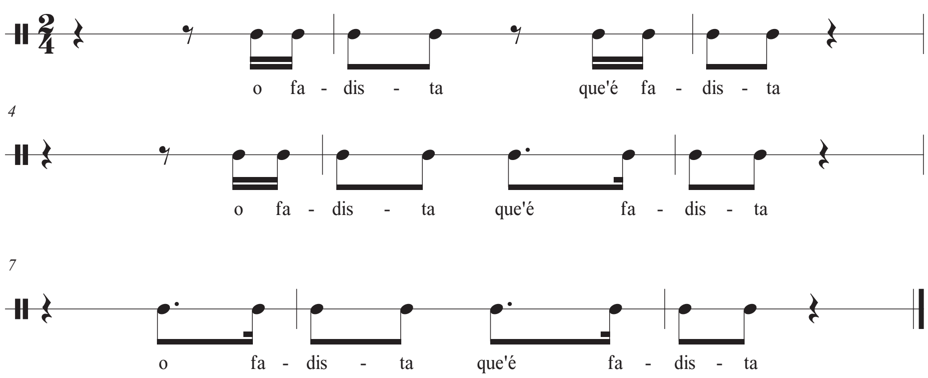

FIGURE 5.1: Possible binary rhythms for a textual line.

All these three versions would be acceptable as normal speech. However, when mapped into this musical structure, the first one generates only two stresses and the tonic syllable "é" is elided and does not sound very natural within the practice. The second version generates three stresses, all tonic syllables correctly mapped onto the strong beats. Also, for reasons detailed ahead, this version would reinforce a fado feeling and be preferred. The third version would generate four stresses, and it would generate even more fado feeling. However, one is mapping the non-stressed syllable "o", onto a strong beat, which also does not sound natural. So, in most cases the second version would be considered the "correct" one. Hence, most lines are sung with three stresses, mapped onto the three strong beats available.

> "Since whatever text a song maker selects to convey his thoughts or sentiments will emerge with its concomitant prosodic features, the choice of words and word groups whose rhythms and tones can give a unit of structure particular character or 'swing' when placed in certain positions is critical for the song maker. So is the matching of a particular pattern of rhythm or tones desired in specific positions with appropriate texts or vocables. The tendency to repeat significant text lines or musical phrases in the body of a song can make this distinctive character a special source of aesthetic interest.
>
> The characteristic 'swing' or distinctive feature could also be established for whole categories of songs, particularly the songs of dances and games with specific sets of motor beats and body movements. This is achieved through the choice of a basic rhythmic structure that recurs in all of the items or serves as a guide to the construction of the units of structure. Sometimes the particular basic rhythm or its outline may be articulated or reinforced in an accompanying percussion or other instrumental form. In some traditions, this relationship is so close that particular instrumental rhythms accompany sets of songs that share the same phraseology" (Nketia, 2002, p. 159).

The prosody of the Portuguese language also shows us that most of the stressed syllables will have open vowels associated with them. Open vowels in fado are, by their nature, and the performative tradition and conventions involved, emphasized when sung, compared to closed and muted ones. So, when open vowels and stressed syllables coincide there is a combination that will stand out by itself, and the singer will tend to make them last longer and with louder dynamics in comparison to the others. This will reinforce the feeling of syncopation, even if one is trying to make all durations sound equal, because one has to shorten the neighboring notes in order to prolong the ones that are naturally being emphasized due to prosody.

What happens in performance adds a new layer of complexity to the semiographic scheme. Usually, the performers do a styling of the melody and that includes manipulating the rhythm in a strange combination between improvisation and groove. What happens is mostly the result of playing and having fun within the limits of the prosody. That skill is highly valued among the older generations of *fadistas*. The art of well "dividing" the words, highlighting the story and emphasizing its meaning is one of the main goals of fado. The ones who are able to perform this task very well are the ones most praised and highly regarded among their peers. What happens in real life is what one could try to describe in notation in the following examples.

FIGURE 5.2: Semiographic schemes of different performances of the same melody.

The musical phrase A should be read as the "normal" notated musical phrase, a common vocal line, with a typical rhythm. We are using the archetype of Freitas in this example. The musical phrases B, C and D are examples of possible renditions of the phrase A. One would rarely expect to actually find them notated in that way, however, it is expectable and possible to hear all possible combinations between B, C and D and even several others with durations in-between, in an actual human performance. One should also note that the division of the beat in two is a characteristic not as typical of fado as one might think: fado performances are very imaginative and fluid and often one can perceive subdivisions of three mixed with subdivisions of two inside the same measure, as shown in the examples. We stress again that we believe most of these subdivisions are the natural consequence of prolonging and emphasizing certain stressed syllables for emotional effects, thus stealing duration from the neighboring ones. The values attached to these emotional effects derive mainly from what it means to embody a tragic narrative and can be found in many other musical traditions around the globe, like Arabic music, flamenco or even American blues. These values also rely on other embodied cues, beyond the language. For instance, "the melodic song forms known as *Arabesques* and *Melismas* are fine examples of Arabic influence upon flamenco. Reminiscent of liturgical chants, Melismas, or extended vocalizations of several notes to a single syllable, are a strong component of flamenco song. Important characteristics include the extension of vowels, expression of profound feelings, and priority of emotions over lyrics" (Ruiz, 2007, p. 75).

The *slight and constant variation of the durations of the rhythm of the melody* is, then, one of the characteristics that define fado nowadays. We believe that the semiographic information, carried in the data, represents a quantized version of an ideal, an *urtext*, an archetype of a parameter that in being consistent holds the piece together coherently. If the rhythm of the melody was purely random and too varied, it would make no sense stylistically. Analyzing phonograms or live performances and measuring objectively the deviations associated with certain artists, and thereby inferring profiles, could constitute an extensive future work project.

5.3 Structure of the text

Most fados present phrases of similar length throughout the whole song, deriving from lines with similar metric. Ernesto Vieira referred to fado lyrics as a four-line stanza developed into four ten-line stanzas as a recent form, not popular, bearing no relation to Arabic poetry (Vieira, 1890, p. 239). Melodically, it would translate directly into three quatrains – the first eight lines being the first two quatrains, and then a third one emerging from the last two lines repeated. Rui Vieira Nery adds that the oldest and more frequently used model of fado lyrical structure was a quatrain with seven metric syllables (*redondilha maior*) sung over a melody repeated as often as the quatrains of the lyrics.

During the nineteenth century the dominant practice seems to have been the use of loose quatrains, without any apparent motivic connection between them, or a vaguely coherent narrative (Nery, 2010c, p. 109). In the beginning of the twentieth century, five and six line stanzas started to be used, and in the middle of the century other complex forms based on free metrical lines also emerged. Gouveia presents a detailed analysis of fado's lyrics over the time and it is possible to see that lines ranging from one up to twelve metric syllables have been used, the most common by far being seven, followed by ten, twelve or four. He also demonstrates how stanzas virtually of all sizes have been used, but the most common are four, five and six lines stanzas (Gouveia, 2010). A common characteristic is the fact that into the same music one can sing several lyrics as long as they share the same metric structure. Contrary to thematic content, there is a clear evolution and change in the format and structure of the fado lyrics along time (with consequences on the music), correlated with the erudition and skill of the poets, but also with censorship practices during the dictatorship period, and the contexts of fado production (Côrte-Real, 2000, Gouveia, 2010, Nery, 2004).

An evolution regarding this strophic model was the introduction of a chorus. We do not know exactly when fados for theater with coplas and refrain, what we called *fado-canção* opposing strophic fados, started being composed. However, we know that around 1910 we find many printed examples of this new sub-genre, mentioning the play where they were featured and the performers who became more famous by singing them. Unlike strophic fados, these *fados-canção* were always mono-lyrical, each melody was associated with one and only one poem, unless the *fado-canção* itself was parodied in another play (Nery, 2010c, p. 161).

According to Pedro Félix, musical theater was the greatest factor in shaping the repertoire during the first half of the twentieth-century (others being censorship, the intervention of previously legitimized erudite authors, and the world-music market). Theater acted as an important local engine for music industry in general and for the phonographic industry in particular, because it promoted singers, authors and repertoire. Theater changed fado structurally because, due to the show format and conventions, the typical song formula with alternating verses and chorus was adopted, instead of the old strophic format. The new form did not easily allow the use of several lyrics in the same music, so it took the name *fado-song*. Often within the community of fado practitioners, these fados received designations like *fado-musicado* [fado put to music] or *fado-próprio* [fado with its own music], meaning that one particular original music was fit into one poem. This also means that the lyrics were associated with that particular performer, with all the consequences that emerge from that fact, namely the usual portraying of the performer's photo in the musical scores and the inscription "creation by" – the notion that although a musical work is composed by someone, it is "created" by the performer[6]. By doing this, and establishing a dichotomy between two formats that reflected two ideologies of authenticity, a traditional repertoire emerged by opposition – the *fado-fado* or *fado traditional*. By portraying and caricaturing stereotypes, theater and operetta were also fundamental in the development of an iconic fado. Also, the several recordings made of the fados that were sang in the shows represent a significant corpus of the recorded repertoire of popular music that was available locally in that period (Félix, 2013).

This evolution is important because it constrains and bonds the literary practice to the musical practice. The narrative is no longer hierarchically superior since the music is tailored and specific to that same narrative. The structure, changed to accommodate a chorus parts away from a literary genre and gets closer to a performative one. No one in their daily life communicates using choruses, repeating the same words over and over in their speech. As Frith explains: "a song does not exist to convey the meaning of the words; rather, the words exist to convey the meaning of the song" (Frith, 1998, p. 166), therefore we see a reversion of the roles derived from the own lyrical structure. Therefore, in this segment of the repertoire it is no longer the literary genre the defining element, instead the music is.

5.4 The vocal group

Typically, the narrative is expressed as a monophonic vocal line by a single performer. Occasionally, the audience might interact by shouting, applauding, or reinforcing a chorus (when it exists), in unison, with minimal blending. Seldom, and usually in familiar contexts and amateur venues, two or more *fadistas* might sing, one after the other, in a kind of a challenge (*cantar ao desafio*).

5.5 The instrumental group

The most common ensemble since the twentieth century consists of one classical six-string nylon guitar (named viola, in European Portuguese) and one Portuguese Guitar (pear shaped twelve-string lute, called *guitarra*). During the nineteenth

[6] As kindly suggested by Fábio Serranito, in a private conversation, this could also be a gallicism since créer means the first time a work is performed in public.

century several written and iconographic sources show *fadistas* accompanying themselves, often with a *guitarra*, playing arpeggiated chords. Sources also mention other string instruments, the accordion or the piano (Cabral, 1982, Castelo-Branco, 1994, Cristo, 2014, Nery, 2004, Sá de Oliveira, 2014). We speculate that one would play with whatever was available in the given context. Due to the limitation of recording technologies in the early twentieth century, often fados were recorded using pianos and wind or brass instruments (Losa, 2013).

The instrumental group's function is to provide a ground for the *fadista* to create on top of, and its spatial organization also reflects a hierarchical organization. Usually the instrumentalists are on the background, they are seldom mentioned and their interaction with the audience is minimal (Côrte-Real, 1991, pp. 30-35). Most instrumentalists are male. The singer is often the only one announced and well known by the audience (Côrte-Real, 2000, Gray, 2013).

The viola provides the beat and the harmony guiding the singer. It is played with a static right hand position to facilitate the rhythmic execution. The thumb is responsible for the bass line while the three middle fingers either produce chords by simultaneously pulling the higher-pitched strings or arpeggiate them. Usually the fingers do not rest, meaning that the strings are not dampened after their execution, except when a deliberate effect of staccato or dry sound is desired. This last situation is appreciated regarding a more traditional repertoire (Sá de Oliveira, 2014, p. 42).

The *guitarra* complements the voice. Whenever the voice wanders (whether for deliberate aesthetic reasons or lack of skill), the players have to react and adjust, back and forth, respecting each other's roles. In nineteenth-century and in early twentieth- century sources, mostly very simple *ostinati*-like accompaniments are observed, usually by a solo instrument. However, during most of the twentieth century and nowadays one can often distinguish three layers: a bass line, a harmonic texture, and a countermelody. The viola plays the bass line and chords using predefined stock *ostinati*. When available, the bass mostly plays the same bass line as the viola. The *guitarra* complements the voice using stock melodic formulas. "The guitarrista José Fontes Rocha emphasized how the most important task of the *guitarra* is to fill in (*preencher*) the silences opened by the *fadista* between vocalizations. Each guitarrista, he said, 'fills the space in his own way' " (Gray, 2013, p. 139). Armando Augusto Freire, "Armandinho" (1891-1946), significantly renewed the accompaniment practice by introducing *guitarra* countermelodies between the sung melodic lines. They were so characteristic that in many cases they were appropriated and integrated by the community on the identity of the fados where they were first performed (Nery, 2010c, pp. 131-132) (Brito, 1994, Freitas, 1973). His composition method was based on his ease in improvising short melodic formulas, which he linked and manipulated until they formed a whole piece. His most complex instrumental works are rhapsodically structured with a set of sections apparently autonomous, but where formerly presented sections often reappear as musical refrains. The timbral uniqueness of these *guitarra* gestures, absent from other practices, makes them a key feature in recognizing fado. These countermelodies and ornamental motifs are largely absent in the musical scores from the nineteenth century and in the earlier recordings, however they become rather common later.

When available, other instruments might join in, namely a bass guitar, or extra *guitarras* and violas resulting in string ensembles. In larger venues, like theatres, an entire orchestra can be used. Especially from the mid-twentieth century on, the addition of bass guitar is rather common in larger shows, and more recently acoustic basses and percussions are used as well, in the context of promoting fado as a world music product.

The resulting sound is polyphonic and polyrhythmic, but with a good degree of blending, since there is usually a perceived tune, and a steady beat that all members coordinate with.

5.5.1 The structure of the accompaniment

The instruments follow the same simple time signature as the voice: usually a 2/4. As mentioned before, the rhythmic figurations are independent from the voice, as the instruments usually play *ostinati* or danceable patterns. The four layers (bass line, *ostinati*, melody and countermelody) usually have different and independent rhythmic patterns – the melody being the most free and syncopated, the countermelody also rather groovy, and the *ostinati* and bass line more regular to keep the beat in place. It is important to note, though, that even the steady *ostinati* provided by the viola usually present a waddled feeling.

Fado narratives are usually styled and improvised on top of stock musical structures. The first definition of these structures appeared on the musical dictionary of Ernesto Vieira, where they were defined as

> "a section of eight bars in binary tempo, divided into two equal and symmetric parts, with two melodic contours each; preferably in the minor mode, although many times it modulates into the major, carrying the same melody or another; harmony built on an *arpeggio* in sixteenth-notes using only alternating tonic and dominant chords, each lasting two bars" (Vieira, 1890, p. 238).

Usually music theory is a consequence of a given practice and here, once again, that seems to be the case. When Ernesto Vieira writes this definition it seems clear that he was observing and describing his own contemporary reality. This description seems very pertinent and somewhat in agreement with the data observed at the time, if we use the 48 songs labeled as fado that appear in the *Cancioneiro* of César das Neves and other similar period sources as a reference. That being said, we do not know exactly the criteria used by César das Neves to transcribe the works in *Cancioneiro* or how faithful his transcription was. Our analysis has shown that, although there is an attempt at standardization, some works reveal shortcomings, deficiencies and small textual incoherences. We also do not know exactly how far away the transcriptions are from the reality they mean to portray. Given the highly erratic and improvisatory character of the melodies, we do not know exactly how the fixation corresponds to the contextual reality. Was it the result of only one of the many possible interpretations of a given singer? An "average" or combination of several of them? Is it possible that different interpretations of the same melody originated different transcriptions? One can only speculate. However, the fact is that, among all of them, there is a considerable complexity fluctuation, which might just show the evolution of the practice during the period it documents.

5.6 Form

Ernesto Vieira's model applies fairly well, but usually doubled. Given one section to be the mapping of two lines of the lyrics, in question-answer format, over four bars using a given harmonic progression, then, Ernesto Vieira's eight bar model would be an AA or AB case.

An introduction (I) is present in 72% of the fados from the corpus. Some have a small introduction (two to four measures) with chordal material, while others present longer ones, most of the time with motives drawn from the main melody; some fados have an eight bar introduction that is, most of the times, a variation of the first section of the fado, but can also be independent material standing by itself.

The first section (A) is representative of the two first lines of the lyrics, in question-answer format. It consists of a four bar section, following the tonic-dominant-dominant-tonic harmonic structure, with two usually arch-shaped or undulating melodic phrases – each one being a sung line of the text – on top of it ($a1a2$). Most of the times this section is immediately repeated with very small or no variation, resulting in an 8 bar section $(AA') = [(a1a2)(a1'a2')]$.

Following this, we have a second section (B), which represents the remaining lines of the stanza. It usually keeps the two bar arch-shaped or undulating melodies, in the question-answer model ($b1b2$), however, most of the times, with harmonic variation on the first phrase ($b1$). The harmony can go virtually anywhere: the data shows that although many fados indeed keep the tonic-dominant shape, or move to the second or fourth degree, others modulate to secondary dominants before returning to the dominant-tonic of the original key. This four bar module is usually also repeated, and so, the fado archetype presents itself as a sixteen measure structure $(AA'BB') = [(a1a2)(a1'a2')(b1b2)(b1'b2')]$.

This archetype is the most frequent pattern, found in 23% of the cases. The $AABB$ formula is then repeated as many times as there is text available to be sung.

A *coda* (O) is present 33% of the time. When there is one it can be as simple as a two bar chordal cadenza or as complicated as a whole eight measures instrumental section based either on the fado melodic material or on the introduction, when the introduction stands by itself.

Most of the fados transcribed in the *Cancioneiro* follow this simple structure, which is basically a small variant on the model as defined by Ernesto Vieira:

$[(I)AA'BB'(O)]$.

When we analyze fados from other sources, however, we realize that this variant can present itself doubled. A second fado immediately follows the first one. Usually the two fados are related by tonality – the second fado is in the relative key of the first one (A minor to C major, for instance), or on the parallel key (C minor to C major). There is usually no other relationship between the material of the two fados, that could stand by themselves coherently, besides the lyrical structure, which usually implies that the notated rhythm of the melody (hence a very important unifying parameter) may remain constant.

Sometimes an intermezzo (Z) linking the two fados might be present (it happens 11% of the time in the database). This intermezzo can be a chordal cadenza on its own, or can be related to either the introduction or the *coda*. Therefore we have a more complex archetype that defines the form of many of the fados found in the sources:

$[(I)AA'BB'(Z)CC'DD'(O)]$

Since this modular archetype is very flexible as it is entirely derivative from the lyrical content, and the lyrical content is itself flexible, performers often opt to repeat verses or to add or omit verses or to change the structure of the poem. Therefore we can find many variations and exceptions to the structural model. It is possible to find fados with twelve bar structures based on ABB or twenty measures based $AABBB$. It is not unusual either to find combinations between the melodic motives themselves: $ABA'B'$.

Much rarer, but still possible, is the combination or alteration inside the basic modular four measure structures. Sometimes instead of the two bar phrase model antecedent-consequent, depending on the lyrical structure, it is possible to find a section (A) with six bars, because it is formed out of three arch-shaped phrases, usually one of them, being the repetition of a previous one ($a1a1'a2$) or ($a1a2a2'$). This may happen when the singer decides to literally repeat a line of the stanza.

Furthermore, we must remember that these archetypes and the sources most of the time reflect only the performance of some of the lyrical content, assuming that all the remaining stanzas will be performed using the same structures. Therefore, in the final realization of one fado, one can have something as complex as this:

$[(I)AA'BB'(Z)CC'DD'AA'BB'(Z)CC'DD'AAB'(O)]$.

The interplay between AB, where the first half of B represents a harmonic shift regarding A (in the simpler and older forms), is in more modern fados replicated on a higher level. As in nature, it is fascinating how self-similarity and self-referential processes repeat themselves in nested structures. Therefore the same idea of harmonic contrast already present in AB, appears when the "modern" transcriptions have as its core a structure of sixteen measures $ABAC$. We can establish a parallel between this structure and the previous one presented if we see the "old A" as AB and the "old B" as the AC.

Continuing this reasoning leads us to think that if we want new sections, an "old C" for instance, one can be made up out of DE. Therefore the "simpler form" in old fados $ABABCC$, often appears in modern fados replicated as $(ABAC)(ABAC)(DEDE)$.

So, the scheme presented above can be also lead to more complex structures as:

$[(I)(ABAC)(A'B'A'C')(DED'E')(Z)(ABAC)(A'B'A'C')(DED'E')(O)]$.

We can understand how this particular scheme is in fact a variant of

$[(I)ABABCC(Z)ABABCC(O)]$, just "doubled".

Most of the times the lyrics and their internal intricacies will decide the shape of the final structure; but also the will of the performers, if they decide to repeat or omit some verses, and even their desire to show off (by vocalizing or humming without singing lyrics, for instance). The same fado, the same musical transcription, can, therefore, have multiple structures when performed live.

Having all these possibilities in mind we realize how complex and different all forms can appear, at first, to one's eye or ear, when, in fact, they are all simple variations of the same model.

Overall, in terms of number of sections, the distribution is as follows:

There are no fados with one single section, and 34% of them have two sections (A and B), this being the most frequent case. Paired structures (and thus symmetry) are preferred since 25% of the fados have four sections (A, B, C and D), compared to only 14% having three (A, B and C) and 15% having five (A, B, C, D and E). Longer fados seem to be rare, since only 8% have six (A, B, C, D, E and F) sections, and 4% have more than six sections. Overall, the cases

Table 5.1: Distribution of Sections

Number of Sections	%
1	0
2	34
3	14
4	25
5	15
6	8
7 or more	4
Total	100
Introduction	72
Intermezzo(s)	11
coda	33

with two and four sections alone account for 59% of the cases, clearly defining the archetypes, and confirming both Ernesto Vieira's model in its simple and doubled versions.

5.6.1 Internal complexity

There is a gradient mirroring several degrees of internal complexity among the analyzed fados. Among most of the Fados in the *Cancioneiro*, the structure is pretty simple, plain, and with a huge number of parameters holding internal repetition, thus gluing the form together. They denote more of an archetypical notated piece than a literal transcription.

Among the more modern transcriptions one can find cases of the opposite, for example occurrence 062[7], which holds a high degree of internal complexity by means of extreme variation. This fado seems to us more of a literal transcription of what a live performance would tend to be than a written structural skeleton. It is possible to clearly outline the sections and perceive the phrases and melodic arcs; however, one finds elisions forcing the overlap between the end of a section and the beginning of the next (hence two consecutive musical sections lasting fifteen bars instead of sixteen). That is a trait that we would imagine occurring in the embodiment of the performance, not among the symbolic data. Also, there is constant new melodic and harmonic material on top of very similar rhythms and shapes.

[7]Identified as"Despedida", composer Luiz de La Cruz Quesada, lyrics by José Coelho da Cunha, edited by Sassetti c.1920.

Again, this denotes, in our opinion, a styling of a repeated idea that would naturally occur when performing a notated score holding internal repetition. The same can be said of slight changes in harmony with passage tones and chromaticism, which are mainly there either for embellishment purposes of a similar passage, or for outlining a bass. Sophisticated elements of this kind are usually not notated, although they often happen in live performance, especially when the musicians are professional and tend to express external influences from other genres.

The occurrence of these various degrees of internal complexity among the data reflect the various approaches of the composer/transcriber/arranger when notating a dynamic and live performative tradition: they may choose to make a void archetypical skeleton and provide just a melodic idea and some chords or instead outline a very detailed set of instructions to be strictly followed and which will mirror conventions and past performances of this tradition. There is no "good" or final answer and many factors influence this kind of decision: not only the background and education of the person in question, but also the target and the desire of making a more "difficult" piece to render in a piano, as well as the will to simply be faithful to a certain occurrence of a live performance. So, these kinds of details inside the data tell us more about the tradition and the person that was responsible for the notation than they tell us about fado itself. Their mere existence is very useful regarding the inference of shapes and gestures when lacking a physical recording, for instance. The main problem, in the end, seems the absence of a uniform way or a set of defined criteria on "how to make a proper transcription" or of a uniform body of transcribers/composers following the same principles. This issue was discussed further in the sub-section "How social class shapes a canon".

5.7 Tempo

Usually fados are categorized according to their mood, given the character of their lyrics. So, there are sad or mournful fados and cheerful ones. Sometimes a cheerful fado is also called *marcha* [march], because they are accompanied using the *ostinato* and tempo of a popular march. Sometimes these genres seem interchangeable, and most fado singers also have marches in their repertoire. We have realized (and confirmed this assumption with both *fadistas* and the critical sources), that a march is basically the name given to a fado in double tempo (or cut tempo, depending on the way one sees it). Most transcriptions do not have a precise indication of tempo, instead, most of the times, they have a subjective, textual one. However, a precise initial tempo is a crucial numeric parameter, not only for performance, but also as a reference for the calculation of note durations and rhythms in seconds. The initial tempo is simply the "tempo in beats per minute at the start of a recording" (McKay, 2004, p. 71). Therefore, we had to assign a specific tempo to each transcription from the corpus, even when one was absent or was subjective. Our criterion was the original guidance from sources, complemented with our subjective internal feeling regarding the character of each song, compared to our own experience as long time fado listeners, improvisers and composers. Therefore the tempo parameter in this study is to be read in relative and not precise factual terms. According to the sources, most original fados seemed to be played at around 72 to 84 beats per minute, this range averaging at 78 and equating the indication of *Allegretto* (Nery, 2004, p. 82), (Vieira, 1890, p. 55). We have tried to approximate the average of the corpus to this value. The truth is that most fados sounded too fast and aesthetically unpleasant when played at that same speed. Our own intuition placed most of them at 64, while a few dramatic ones still sounded too fast and were placed at 56, and others, clearly marches (and therefore more suited to cut-tempo) were placed ranging from 92 to 128. The *rallentando*, *tenuto* and *fermata* indications were added when notated, and are responsible for the small deviations, minding that the overall corpus contains the introductions, intermezzos and *coda*s, while the corpus of melodies misses them. We are aware that these choices somewhat condition the calculations and, in order to reproduce them with precision, the table of tempos is necessary and therefore made available. In relative terms, however, we believe the results reflect the practice.

Table 5.2: Statistics of Tempo

Initial Tempo	Avg	Med	St Dev	Var	Min	Max	Range	Skew	Kurt
Corpus	79.93	64.00	24.25	588.21	56.00	128.00	72.00	1.00	-0.83
Melodies-only	78.41	64.00	23.26	541.05	56.00	128.00	72.00	1.17	-0.41

We have also done a comparative data visualization of this feature regarding other musical taxonomies (figure 5.3).

This feature is highly problematic because it is very sensitive to encoding and transcription decisions. Basically, the initial tempo of every recording can be

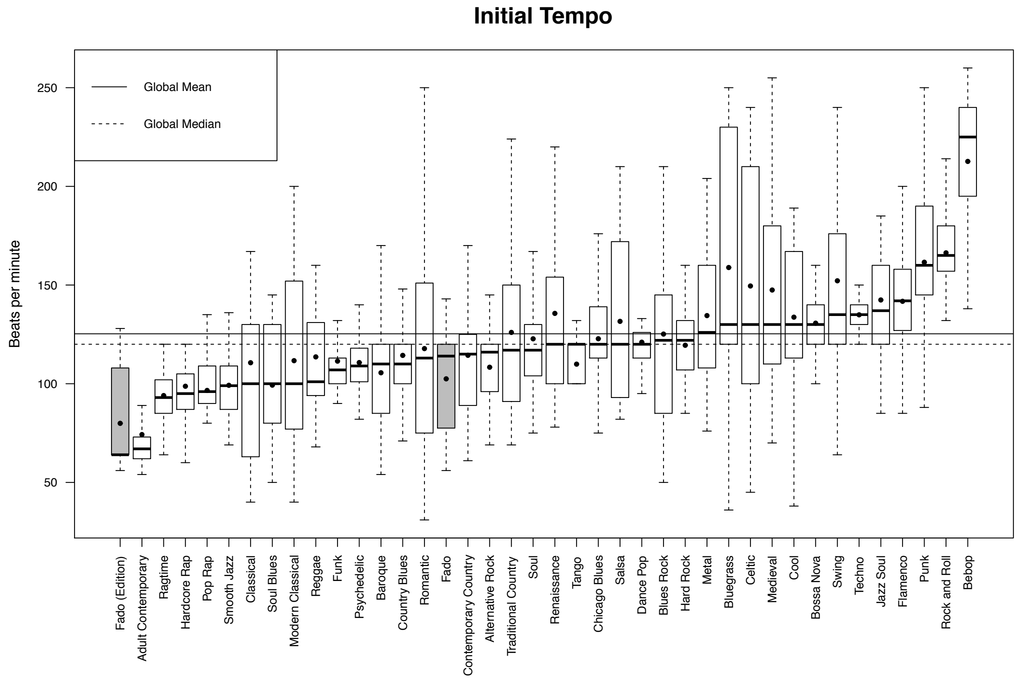

FIGURE 5.3: Initial Tempo.

halved or doubled depending on the time signature chosen. In some cases dealing with complex measures the multiplicative factor can vary as well. As one can see, editorial decisions to conform most of the corpus to Ernesto Vieira's model (thus assigning a time signature of 2/4 to most fados) had a tremendous effect in the relative position, because a high number of initial tempos were halved. If one looks at how bebop is on the high part of the spectrum with values ranging above 200 one is led to think most of its values are certainly doubled. So, overall, it seems difficult to make a comparative study and draw meaningful conclusions based on this feature as it is. Still, looking at the relative distribution with a grain of salt, one might also assume that the number of doubled or halved tempos in each style are also randomly distributed and so, they might compensate each other. Taking that assumption as an initial guide, and then discarding the edition corpus bias, one can notice that fado is just slightly on the lower part of the spectrum with a mild tendency to present slower songs than most styles.

5.8 Rhythmic Patterns

The transcriptions show accompaniment figures based on *alberti* figurations, *corridinhos*, marches, fox, *habaneras*, or a combination of these (figure 5.4).

The analysis of the data has shown that the accompaniment figure repeats itself over and over during a certain period. Sometimes it goes along throughout the entire work (it happens in 80% of the transcriptions), but other times it just spans through some sections, having other contrasting *ostinati* in the other sections (20 transcriptions show two or more different *ostinati*). The same *ostinato* might show some variation at crucial points in each section – namely at cadential points, where, often, it just pauses so that it signals the audience the end of the section. Furthermore, it might pause randomly or present small tweaks to increase variety. Some fados present very elaborate and elegant hybrid figurations, including slurs and articulation marks, which might just reflect the commitment of the transcriber to present a more idiomatic notation. Clearly there are *ostinati* that are written to be played on a piano (namely *alberti* and *arpeggio*), while others resemble more what a viola would do (namely fox, marches, *corridinhos* and fingered figurations). Usually, and again, as with many other parameters and situations, the musical scores are very strict regarding the *ostinati* patterns and just present them as an archetype. When in performance, the players sometimes improvise, somewhat freely, and the same fado may be played with different *ostinati* in different occasions. Therefore, there is a clash between the semiographic schemes and what one can actually hear in a live rendition.

Some of these figures might be dated or linked to very specific contexts. The *alberti* and *corridinho* figuration are massively present in the transcriptions and they can be heard in the early recordings, however they are rarely used nowadays. *Chula* (or *malhão*) figuration appears as the main *ostinato* in only one score, but shows up in some other scores, mainly as a secondary *ostinato* and not as the prevalent one. *Habanera* figuration is almost non-existent as well. The ballad figuration is often mentioned in the nineteenth-century literature, and can also be heard in the early recordings, but today seems mostly associated with serenades and with the Coimbra repertoire. On the other hand, we highlight the fact that figurations like fox and bolero, almost non-existent in the transcriptions, at present are often used in live performances and recordings, which might indicate a change and the gradual popularization of these styles of accompaniment. Also, the name

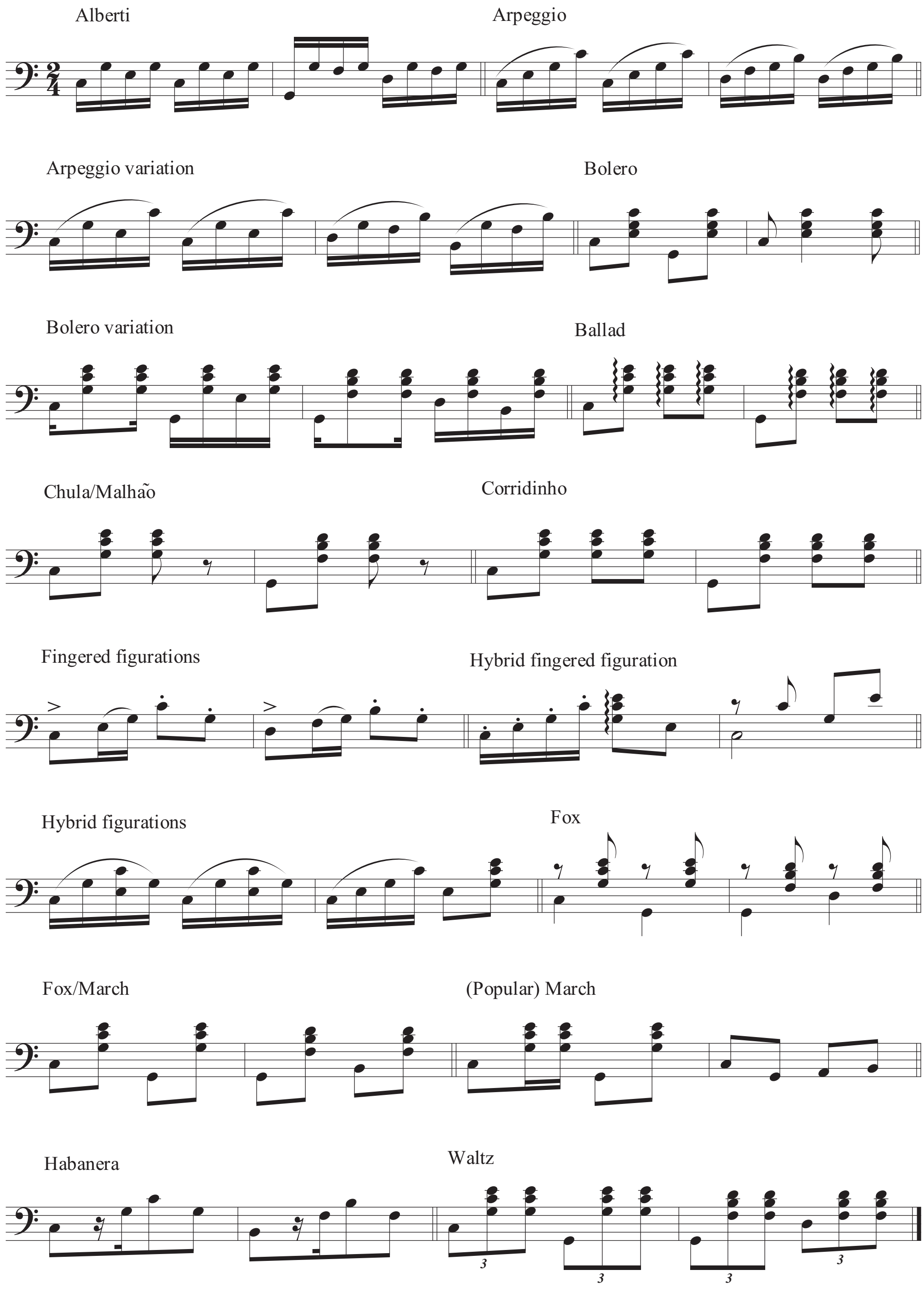

FIGURE 5.4: Ostinati.

TABLE 5.3: Main accompaniment figure present in each transcription.

Ostinato	#
Alberti	21
Arpeggio	5
Bolero	1
Ballad	5
Chula/Malhão	1
Corridinho	30
Fingered	3
Fox	1
Habanera	2
Hybrid	5
Marcha	25
Waltz	1
Total	100

of these figurations might be emic and not consensual: the bolero, for instance, corresponds to the figure of the Cuban bolero, which is similar to a *beguine* or a *baião*, and very different from the Spanish bolero, based in triplets.

There are two main contrasting grooves appearing in the fado accompaniments. Probably derived from the sad military marches and sorrowful songs, it is common to convey a processional feeling in slow tempi, with emphasis on the downbeats and resonating chords (not dampened). On the other hand, in more vivid fados, they are played favouring an uptempo, waddled feeling, and the chords plucked, *stacatto*, and sometimes even dampened. When played the first way, the alternation between a bass note and a chord is called fox, when played in the second way it is often called march. The figuration is the same, it only changes the tempo and the groove. The distinction between a fado and a march seems blurred. The repertoire is interchangeable and among the transcriptions there are many popular marches which are considered fados. Vital Assunção (viola player, composer) told us that a march is basically a fado in double or cut tempo. In the popular parades and traditional festivities, with band accompaniment, the same patterns and confusions occur: often the snare drum plays a processional figuration, instead of the typical military march one (Pinto, 2004, p. 120). Many times fados are sung as part of the marching band repertoire in those festivities (namely the traditional neighbourhoods). Conversely, most *fadistas* sing popular marches in their typical contexts. So, it seems that, basically, while many fados are not marches, most popular marches are considered fados, or at least suitable to be sung by *fadistas* and appreciated by the same audience, in the same contexts.

These accompaniment figures are usually learned by imitating older, experienced players, sometimes in real performance situations[8]. Often, also by listening and imitating the records. They seem to depend mostly on the taste, skill and inventiveness of the players, hence, their frequency distribution, as seen on the table, to us, does not reflect the actual practice. Empirical experience and the listening of performances, recordings and videos, highly suggests that fox, bolero and march are the archetypes nowadays, among traditional players, and complex fingered figurations, among the virtuosos.

Regarding the *guitarra*, examples of typical stock formulas found in performance were described by Salwa Castelo-Branco (Castelo-Branco, 1994, p. 139), and we present a reproduction of her transcriptions (figure 5.5), with her permission. Sometimes they are present in the musical transcriptions, other times they are not.

[8] `https://www.youtube.com/watch?v=6xg1MeCeEJY`, accessed June, 6, 2015, in the video we can see how the male viola player whispers the chord names to the female viola player who is imitating and following him, learning in real time.

FIGURE 5.5: *Guitarra* countermelodies.

5.8.1 Note density

The note density was defined as simply the "average number of notes per second" (McKay, 2004, p. 70). We have calculated the average number of notes per second in the corpus, which range from a minimum of 4,03 to a maximum of 13,46, averaging on 7,48. If one considers only the melodies, then the average is considerably smaller (which is logical), ranging from a minimum of 1,73 to a maximum of 5,03 and averaging at 2,47 as shown in the table below.

TABLE 5.4: Statistics of Note Density

Note Density	Avg	Med	St Dev	Var	Min	Max	Range	Skew	Kurt
Corpus	7.48	7.26	1.74	3.02	4.03	13.46	9.43	0.83	1.03
Melodies-only	2.47	2.25	0.66	0.44	1.73	5.03	3.30	2.15	5.37

In comparative terms with other taxonomies (figure 5.6):

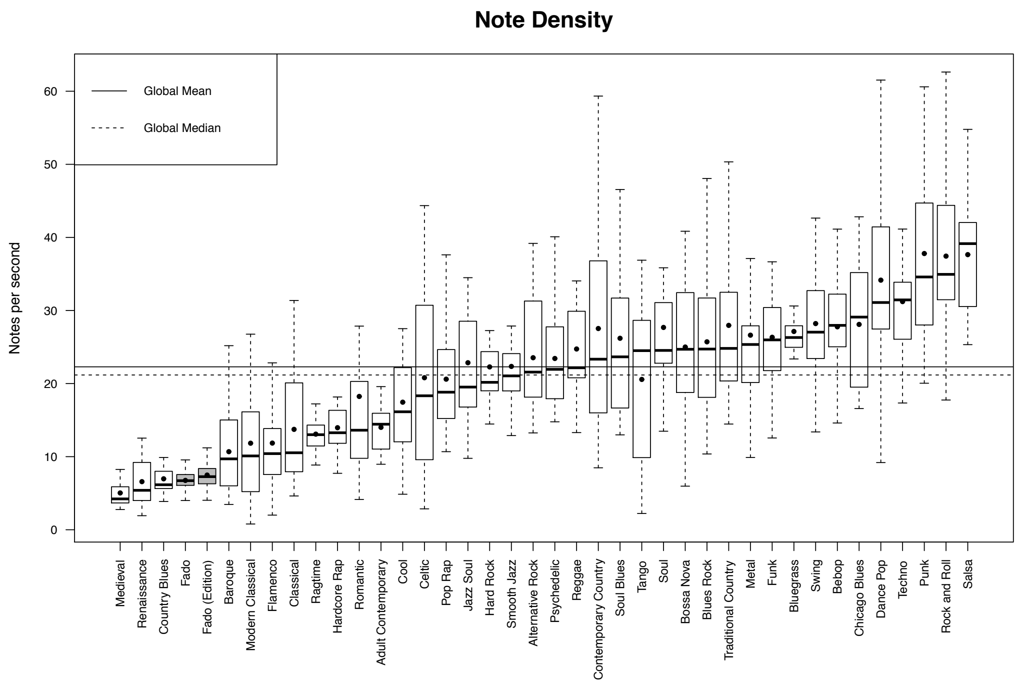

FIGURE 5.6: Note Density.

Fado is one of the less dense genres in the database, in both versions of the corpus, alongside with the early music genres and country blues. This particular feature seems a useful one to characterize the practice. One contributing factor to this situation might be the arrangements privileging sparse instrumentation. On the opposite side of the spectrum we find salsa, rock and roll, punk and techno, which are intuitively rhythmic driven genres in the sense that percussion instruments are highly involved and are important in defining such genres.

5.8.2 Strongest Rhythmic Pulse

The strongest rhythmic pulse corresponds to the "bin label of the beat bin with the highest magnitude" (McKay, 2004, p. 69).

Any song has a defined tempo, that may largely vary, and therefore that statistical value might not by itself be very relevant. However, accounting for that variation, one still knows that if information relative to the strongest rhythmic pulses is retrieved then one is able to draw meaningful conclusions: "the two highest peaks of the beat histograms tend to have particular importance, as they are likely to represent the main beat of the music or one of its multiples or factors" (McKay, 2004, p. 69). The relationship between those pulse values and the tempo values will indicate the presence and relevance of groovy genres and regular or irregular rhythms. For instance, if in a given song the strongest rhythmic pulse (in beats per minute) is consistently half of the tempo value (also in beats per minute) then, one deduces that the figure representing half of a beat is the most relevant one. If this happens consistently in a given genre, then one might have a defining feature. On the other hand, even if these kinds of features might be elusive, or have great variability, their frequency might reveal more hints. The numerical value of the strongest rhythmic pulse might not be relevant, however, the frequency in which it occurs is. It will say a lot about the variability of the rhythmic figurations present in a given song. If one, then, combines that frequency with the frequency of the second most important rhythmic pulse, then one might not only deepen that discussion but also infer conclusions about the complexity of the rhythms as well (figure 5.7).

As expected, there seems to be great variability regarding this feature, especially among the taxonomies soul, alternative rock, classical, country blues, techno, flamenco, fado and bluegrass. Fado has the second highest median value of the list, with an overall span of values above the global mean and median. In this particular case one can see how the effect of edition strongly affects the corpus since the edited corpus has actually the lowest median value. In its raw state it seems

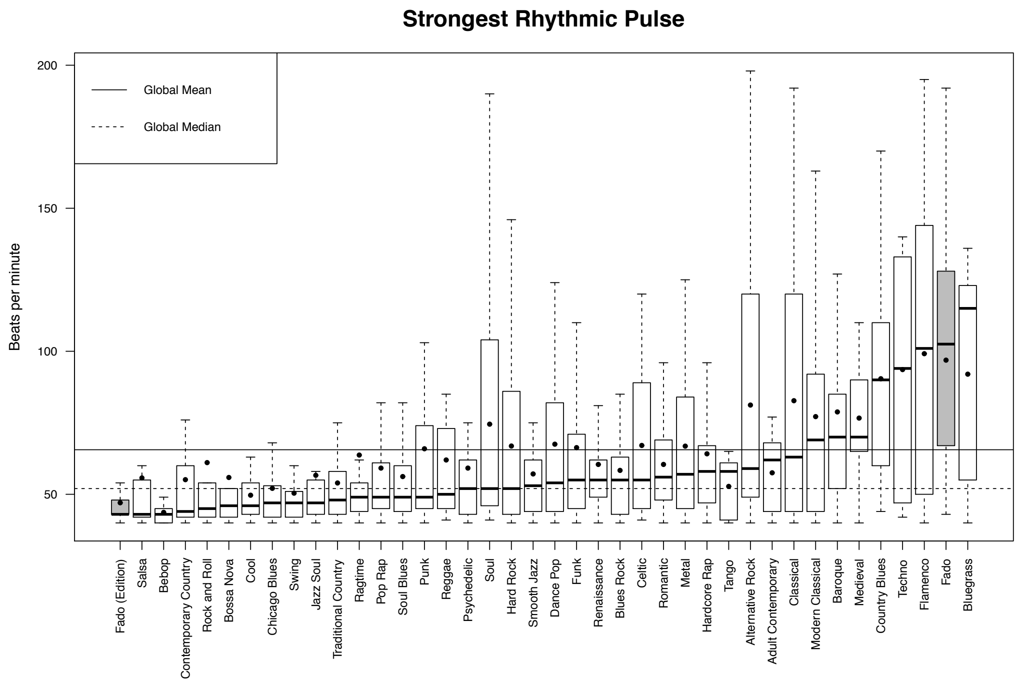

FIGURE 5.7: Strongest Rhythmic Pulse.

impossible to discern what the strongest pulse in fado is or even if there is one. The edited version, which is conformed to the Ernesto Vieira's model, following a binary time signature and a humanized performance of a median tempo of 64 beats per minute, in most recordings, reveals a scattered pulse around what would be each eight-note.

5.8.3 Second Strongest Rhythmic Pulse

The second strongest rhythmic pulse is defined as the "bin label of the beat bin of the peak with the second highest magnitude" (McKay, 2004, p. 70).

As observed in figure 5.8, the variability regarding this feature seems to be even larger than the previous one. One might notice how salsa and bebop show up again at the bottom of the list, indicating some expected consistency, since these are usually groovy genres, but fado is now at the middle. What seems perplexing is that both corpora actually almost coincide, hinting that the edition does not seem to particularly affect this feature. The mean value at around 64, however, shows that in the edition corpus the second most important pulse is

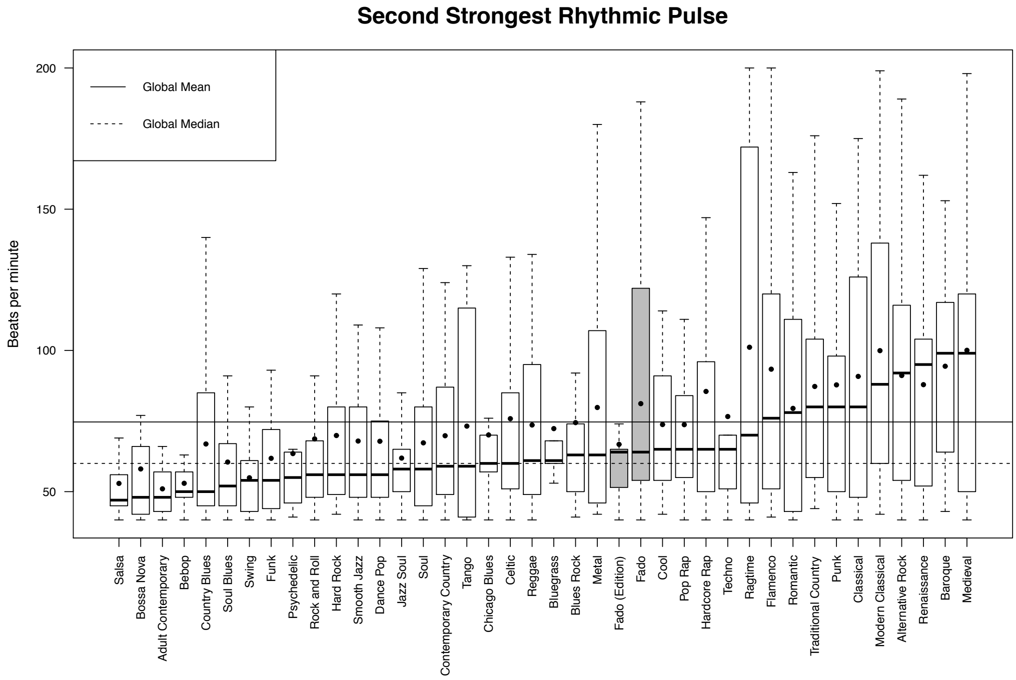

FIGURE 5.8: Second Strongest Rhythmic Pulse.

indeed the beat, therefore the quarter note. On the other hand, among the raw data it shows precisely the same value. Taking into consideration that the time signatures are not harmonized, and represent mainly both binary and quaternary ones, one expects both quarter notes and half notes to be considered, which is consistent with the variability and span graphically displayed. Still, as predicted, these seem to be rather confusing features to infer anything particularity relevant, by themselves, and the additional information presented ahead might make more sense.

5.8.4 Harmonicity of Two Strongest Rhythmic Pulses

The harmonicity of two strongest rhythmic pulses is defined as "the bin label of the higher (in terms of bin label) of the two beat bins of the peaks with the highest magnitude divided by the bin label of the lower" (McKay, 2004, p. 70). Basically this information will confirm the importance of groove in a given style. When the harmonicity approaches 1, it means that the two strongest rhythmic pulses are concentrated around the same bin label. This will emphasize the amount of scatter around the pulses, and thus might indicate rather fluctuating performances.

However, when that is not the case, it generally means that the second strongest rhythmic pulse will be a factor or a multiple of the strongest one. This indicates not only more tidy rhythmic performances but also the preference for regular or irregular rhythms, depending if the factor is an even or an odd one.

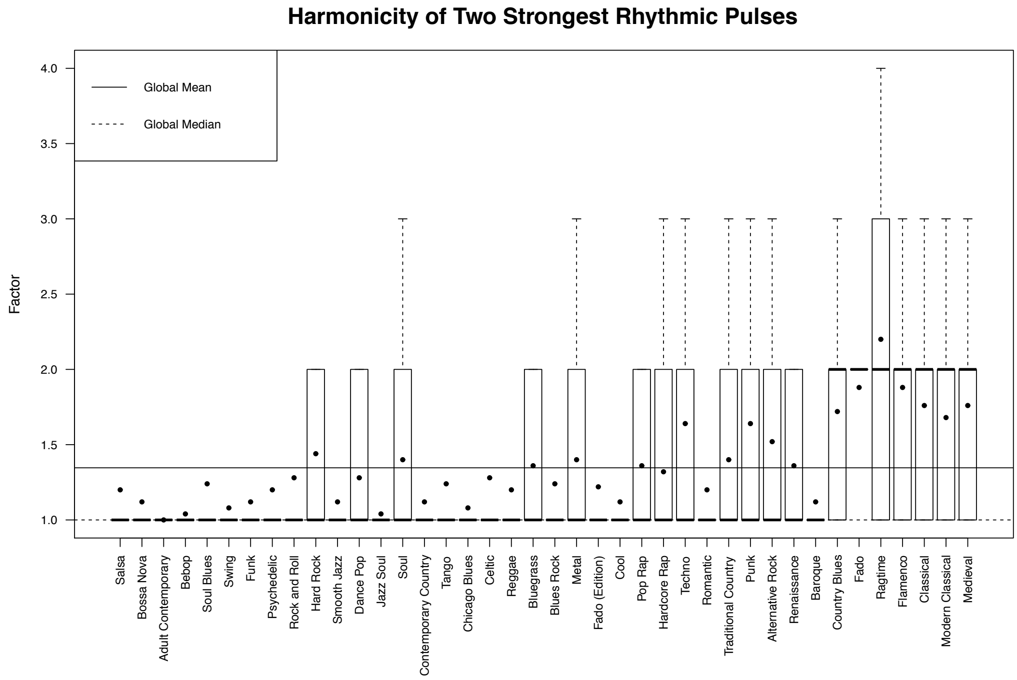

FIGURE 5.9: Harmonicity of Two Strongest Rhythmic Pulses.

As seen in figure 5.8, not surprisingly most genres have harmonicities of either 1 or 2. The most improvisatory and jazz-related genres tend largely to 1, while the more conservative and regular ones tend to 2. Ragtime seems to be the most varied including the whole range up to 4. This graphic helps clarify what happened to fado – while the raw data conforms to a harmonicity of 2, clearly indicating a notated tendency for a dichotomy between the half beat and the beat, the edited version conforms to 1, which we believe better reflects the actual improvisatory and fluctuating practice.

5.8.5 Strength of Strongest Rhythmic Pulse

The strength of strongest rhythmic pulse is defined as the "magnitude of the beat bin with the highest magnitude" (McKay, 2004, p. 70).

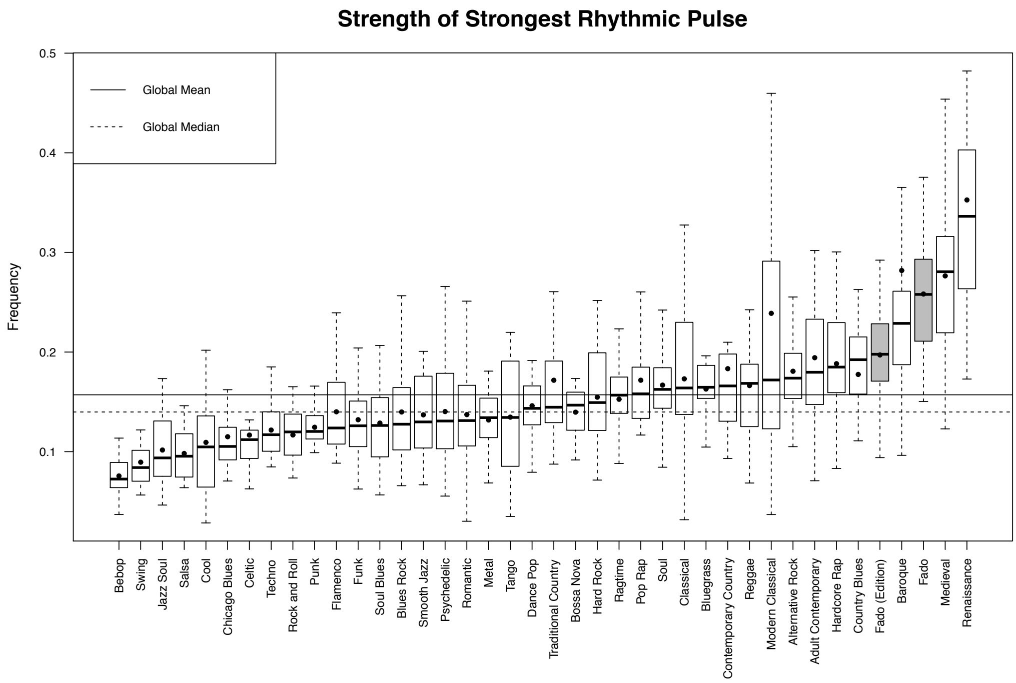

FIGURE 5.10: Strength of Strongest Rhythmic Pulse.

This graphic (figure 5.10) reveals that the strength of strongest rhythmic pulse is a rather important feature in the case of fado. Both the raw data and the edition corpus show up among the highest median values, above the global median and mean. This trend is shared by other folk traditions like country blues and hardcore rap, but also by the early written music, which might reflect the conventions of western written notation and how they are encoded in the MIDI files. As expected, on the opposite side, all the improvisatory, groovy, swing-styled and jazz-related genres show up.

5.8.6 Strength of Second Strongest Rhythmic Pulse

The strength of second strongest rhythmic pulse is defined as the "magnitude of the beat bin of the peak with the second highest magnitude" (McKay, 2004, p. 70).

This feature (figure 5.11) mirrors the trend found in the previous one, with the early music, country blues and hardcore rap being above median and mean values, and the jazz-related, swing and improvisatory genres being at the bottom

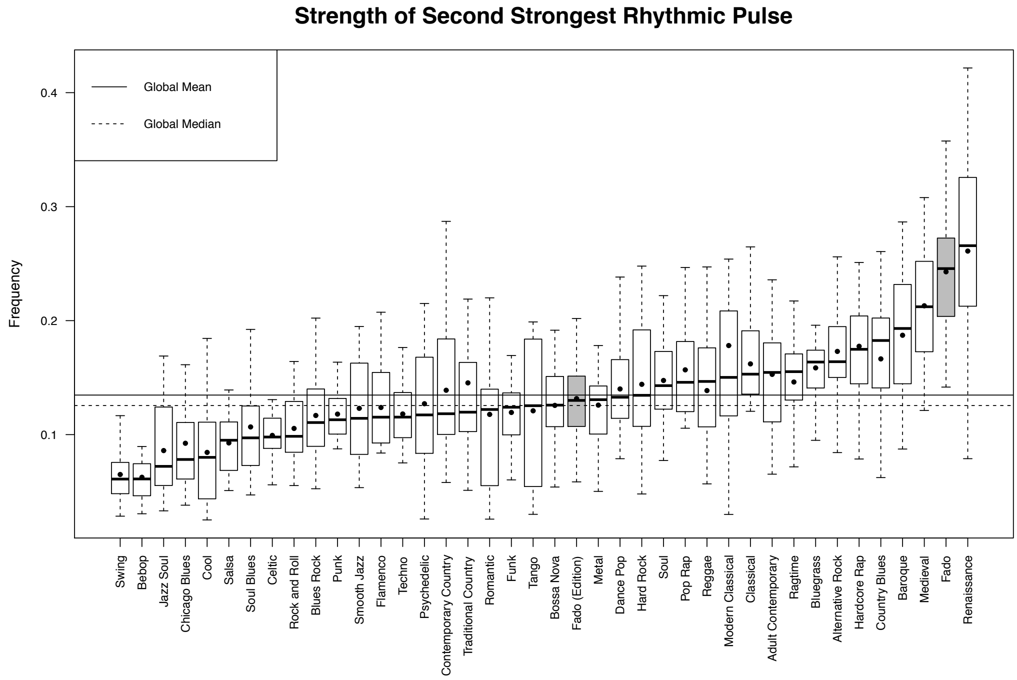

FIGURE 5.11: Strength of Second Strongest Rhythmic Pulse.

part. The mere existence of the same trend in both features indicates that two pulses alone seem to have too much weight in some styles while equally being less important in others. What remains to be seen is whether in the case where these weights are important they actually represent similar pulses, multiples, or factors of one pulse. One can also notice how the edition process affected the fado corpus in particular – while the raw data still displays one of the highest magnitudes, the edited corpus approaches the global mean and median.

5.8.7 Strength Ratio of Two Strongest Rhythmic Pulses

The strength ratio of two strongest rhythmic pulses is defined as “the magnitude of the higher (in terms of magnitude) of the two beat bins corresponding to the peaks with the highest magnitude divided by the magnitude of the lower” (McKay, 2004, p. 70).

The relationship between the strongest and the second strongest rhythmic pulse (figure 5.12) should show how important is a given pulse regarding all others. Given the trends shown by the previous features one should expect an inversion

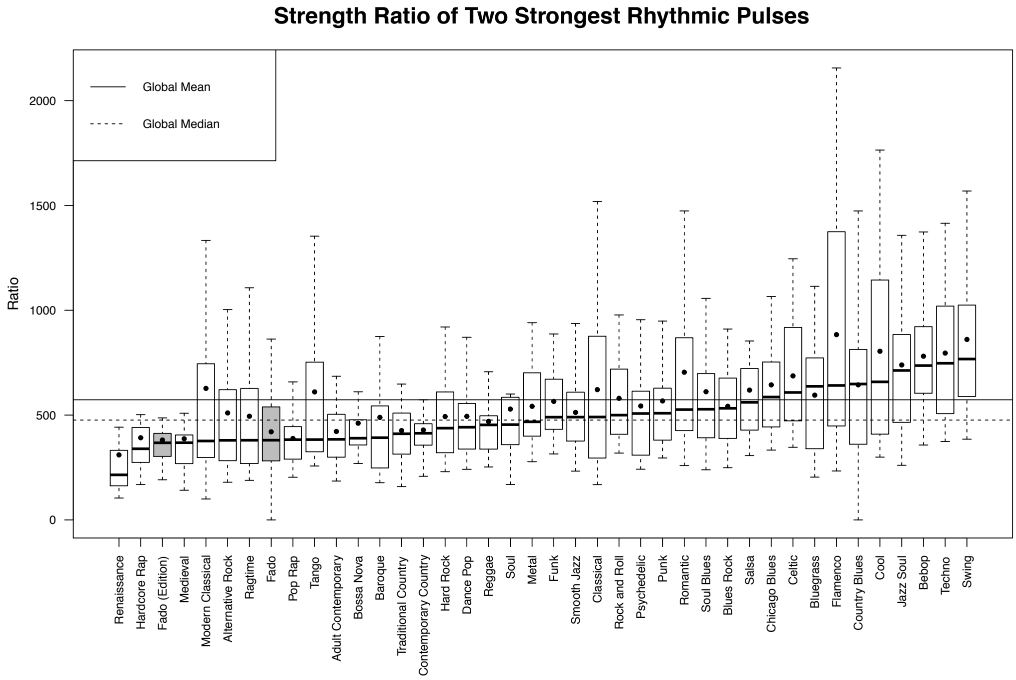

Figure 5.12: Strength Ratio of Two Strongest Rhythmic Pulses.

of the relative places regarding this feature. The most curious observation is how most genres conform to the expected inversion – the early music, fado, and hardcore rap appear now at the bottom, while the jazz-related, improvisatory and swing genres are at the top – except for country blues. This clearly shows what can be a defining set of features for this genre and, at the same time, a way to tell it apart from fado.

5.8.8 Combined Strength of Two Strongest Rhythmic Pulses

The combined strength of two strongest rhythmic pulses is defined as "the sum of the frequencies of the two beat bins of the peaks with the highest frequencies" (McKay, 2004, p. 70).

This feature (figure 5.13) both confirms and reinforces the trends already observed in the individual strength of each of the two strongest pulses: fado is

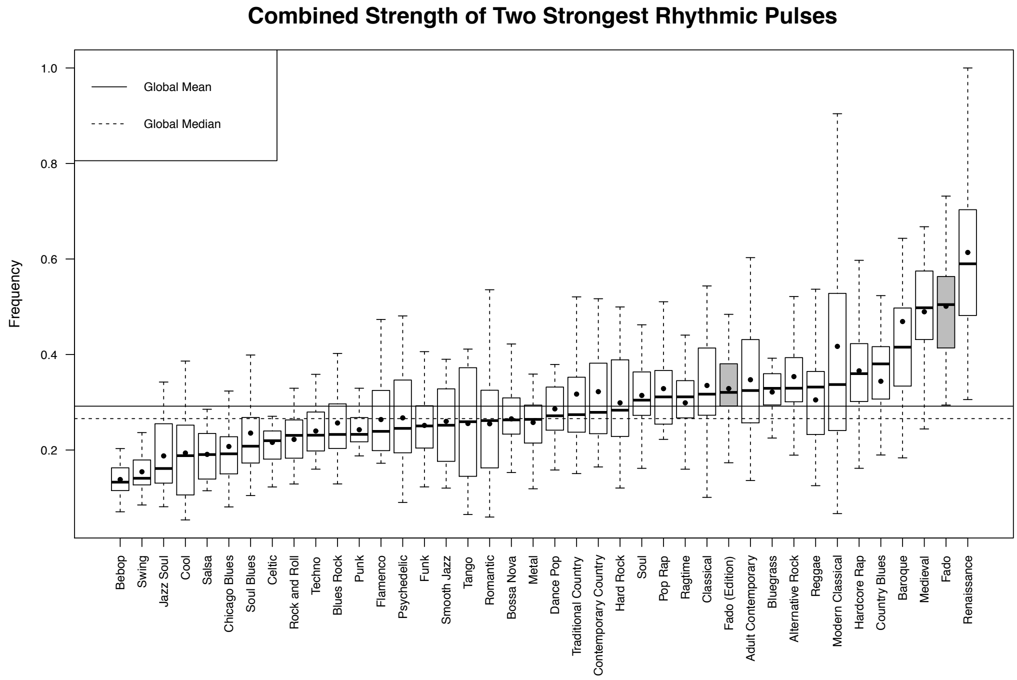

FIGURE 5.13: Combined Strength of Two Strongest Rhythmic Pulses.

placed above global mean and median, along with the early music genres, country blues and hardcore rap, clearly contrasting with the improvisatory, swing and jazz-related ones.

5.8.9 Number of Strong Pulses

The number of strong pulses is defined as the "number of beat peaks with normalized frequencies over 0.1" (McKay, 2004, p. 70).

The number of strong pulses ranges from 0 to 9 in the global database (figure 5.14). The original fado corpus has a median of four strong pulses, which is slightly above global median and mean, and still on pair with country blues or hardcore rap, and this time also accompanied by flamenco. One can notice that punk is the style with the highest values overall, but how the improvisatory, swing and jazz-related styles still appear at the bottom. The edited version of the corpus loses half of its strong pulses, which might be related to the change of time signature in most of the recordings.

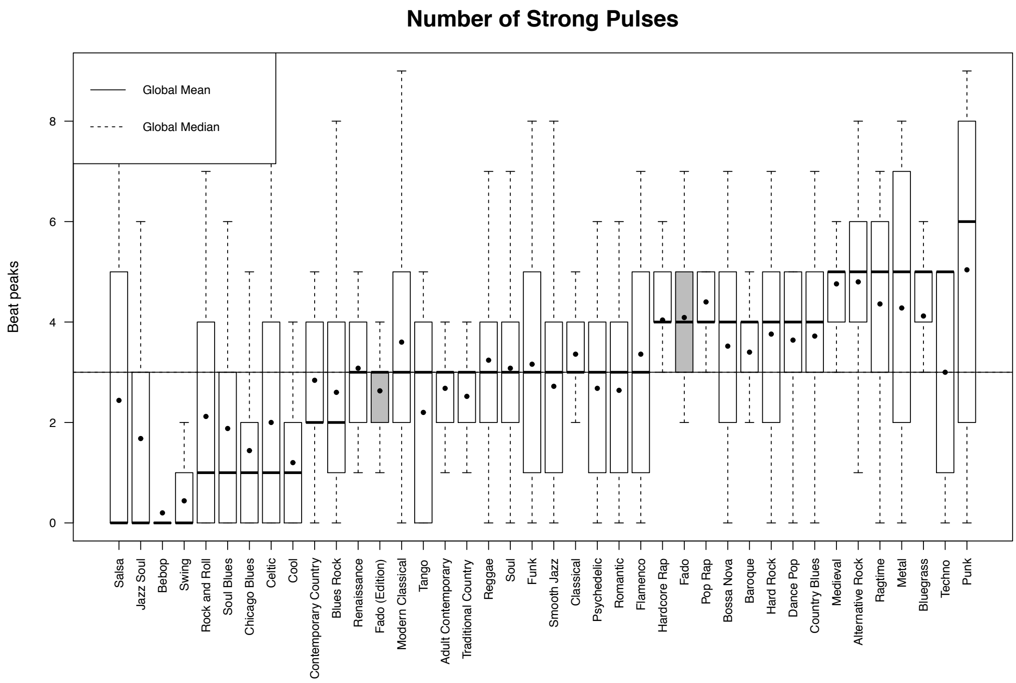

FIGURE 5.14: Number of Strong Pulses.

5.8.10 Number of Moderate Pulses

The number of moderate pulses is defined as the "number of beat peaks with normalized frequencies over 0.01" (McKay, 2004, p. 70).

This feature (figure 5.15) ranges from 1 up to 26 and one can see a reasonable amount of variability among the several genres. What is noticeable is how fado, despite having a relatively high number of strong pulses, has a remarkably relative low number of moderate pulses (both in the raw and edited version of the corpus), along with the early music genres, adult contemporary and ragtime. Usually related styles like country blues and hardcore rap depart from this tendency for medium positions, while flamenco appears at the opposite side of the spectrum, which is topped by romantic music. There seems to be a tendency for the improvisatory, blues, swing and jazz-related genres to cluster around the high end of the spectrum as well.

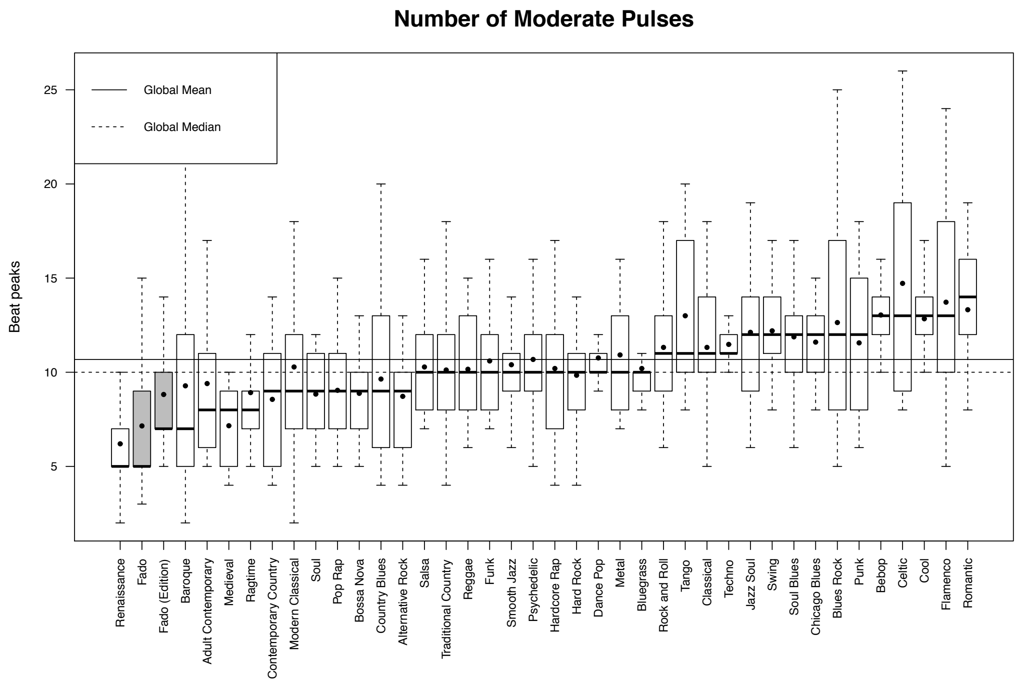

FIGURE 5.15: Number of Moderate Pulses.

5.8.11 Number of Relatively Strong Pulses

The number of relatively strong pulses is defined as the "number of beat peaks with frequencies at least 30% as high as the magnitude of the bin with the highest magnitude" (McKay, 2004, p. 70).

This feature (figure 5.16) varies between 1 and 16. It has some similar trends with the number of moderate pulses: fado is again at the bottom part of the spectrum alongside with the early music genres and adult contemporary; however, ragtime shifted to the middle of the spectrum. At the high end, romantic and flamenco keep their very high values; they are, however, surpassed by techno, which has made a huge shift. This seems to be a good unique feature to help characterize techno music. The cluster of improvisatory, blues, swing, jazz-related genres is a bit more scattered around the mid and high part of the spectrum. It seems remarkable how tango has almost all of its recordings concentrated around the value 5, while also displaying distant outliers.

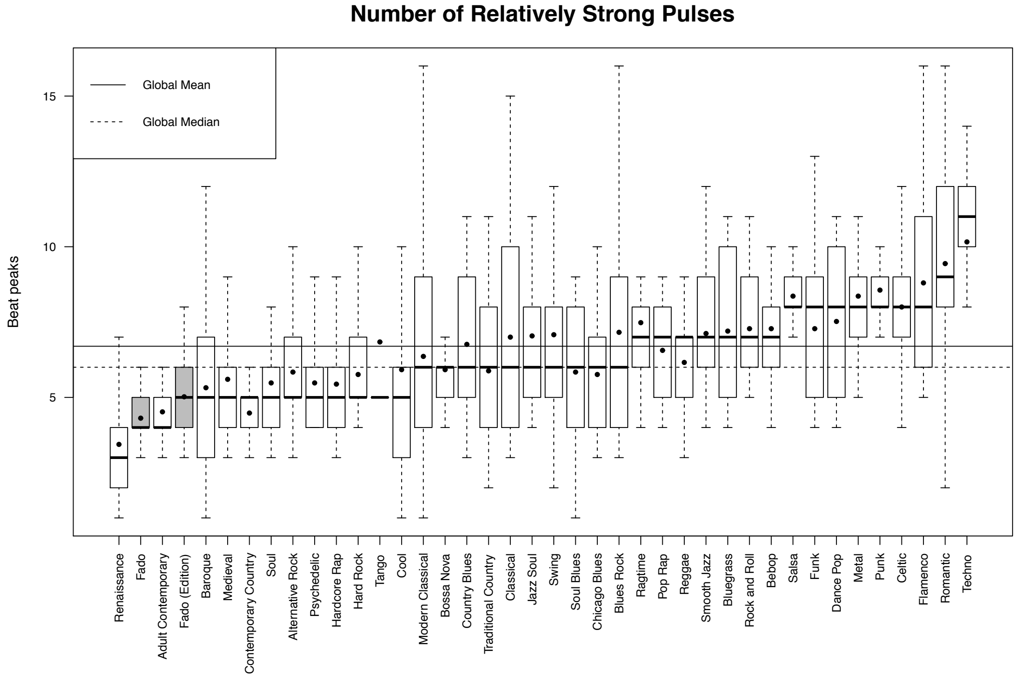

FIGURE 5.16: Number of Relatively Strong Pulses.

5.8.12 Rhythmic Looseness

The rhythmic looseness is defined as the “average width of beat histogram peaks (in beats per minute). Width is measured for all peaks with frequencies at least 30% as high as the highest peak, and is defined by the distance between the points on the peak in question that are 30% of the height of the peak” (McKay, 2004, p. 70).

This feature (figure 5.17) seems a highly contrasting one. While most genres appear to have very few rhythmic looseness, a relevant cluster show great variety in this matter, highly distorting the scale. This cluster, as expected, belongs to the improvisatory, blues, swing, jazz-related genres. What also seems noticeable is how the original fado corpus shows no rhythmic looseness at all, alongside with the early music genres, however, the edited corpus displays a very relevant value at the opposite side of the spectrum. We attribute this fact to encoding issues: while the raw data has quantized values, the edited corpus has the humanizer included. We strongly believe the edition better reflects the actual practice.

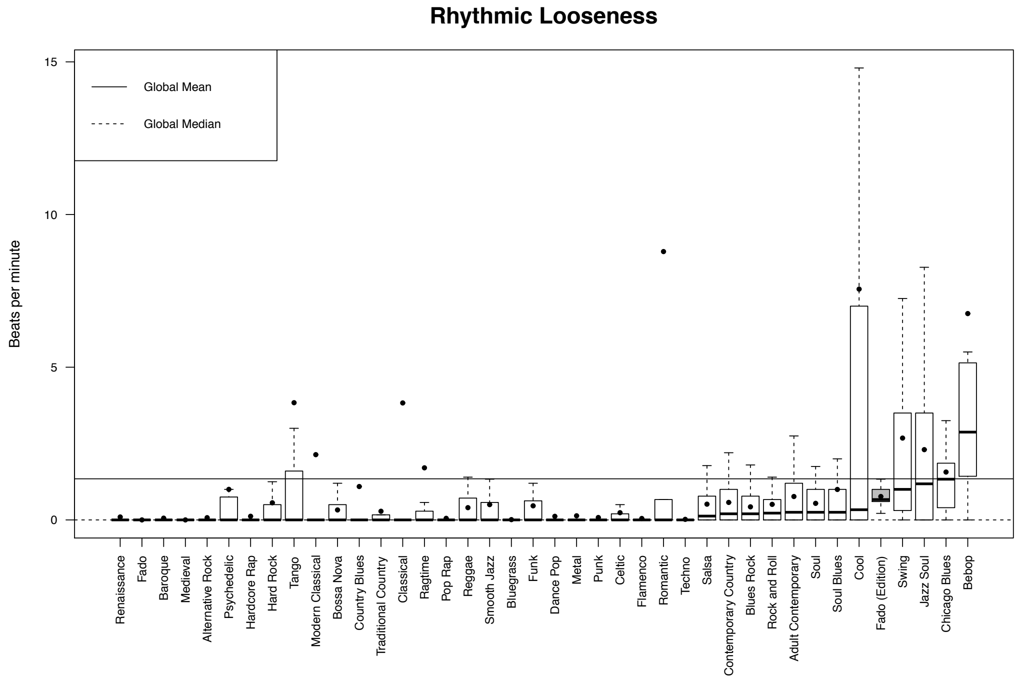

FIGURE 5.17: Rhythmic Looseness.

5.8.13 Polyrhythms

Polyrhythms is defined as the "number of beat peaks with frequencies at least 30% of the highest magnitude whose bin labels are not integer multiples or factors (using only multipliers of 1, 2, 3, 4, 6 and 8) (with an accepted error of +/- 3 bins) of the bin label of the peak with the highest magnitude. This number is then divided by the total number of beat bins with frequencies over 30% of the highest magnitude" (McKay, 2004, p. 70).

According to this definition one might see (figure 5.18) that fado is among the genres in which the polyrhythms prevalence is higher, and our edition slightly emphasizes that aspect. Traditional and contemporary country genres, adult contemporary and soul appears at the high end of the spectrum, which is topped by renaissance music, certainly driven by polyphonic recordings. On the other hand, dance pop and bossa nova, Celtic music and surprisingly funk seem relatively poor regarding this feature.

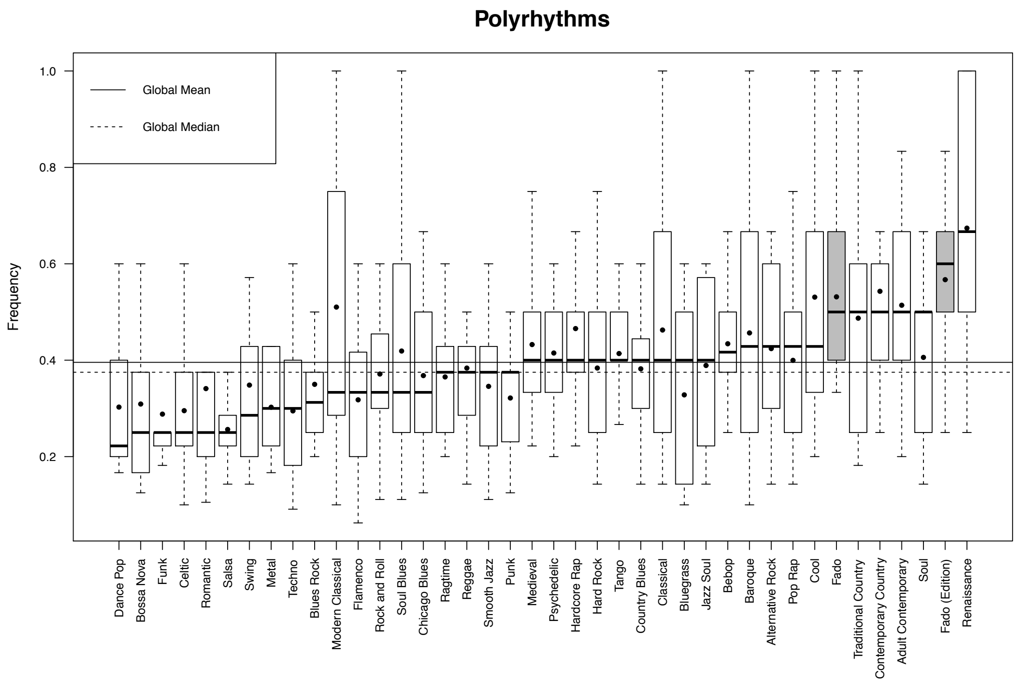

FIGURE 5.18: Polyrhythms.

5.8.14 Rhythmic Variability

Rhythmic variability is defined as the "standard deviation of the bin values (except the first 40 empty ones)" (McKay, 2004, p. 70).

Looking at the figure 5.19, it seems that fado, alongside with renaissance music, top the genres with more contrasting rhythmic figurations, which in a certain way can be expected, since they can have very short and quick passages but also very prolonged, hovering notes. Our edition, thanks to the standardization of time signatures, and the conformation of note durations to fit into those binary time signatures, obscures that effect and throws fado into the middle of the spectrum. On the lower part of it one can encounter bebop, swing and jazz soul, which can be also expected, since one often encounters very similar figurations: the variability is, instead, obtained by small and micro-deviations.

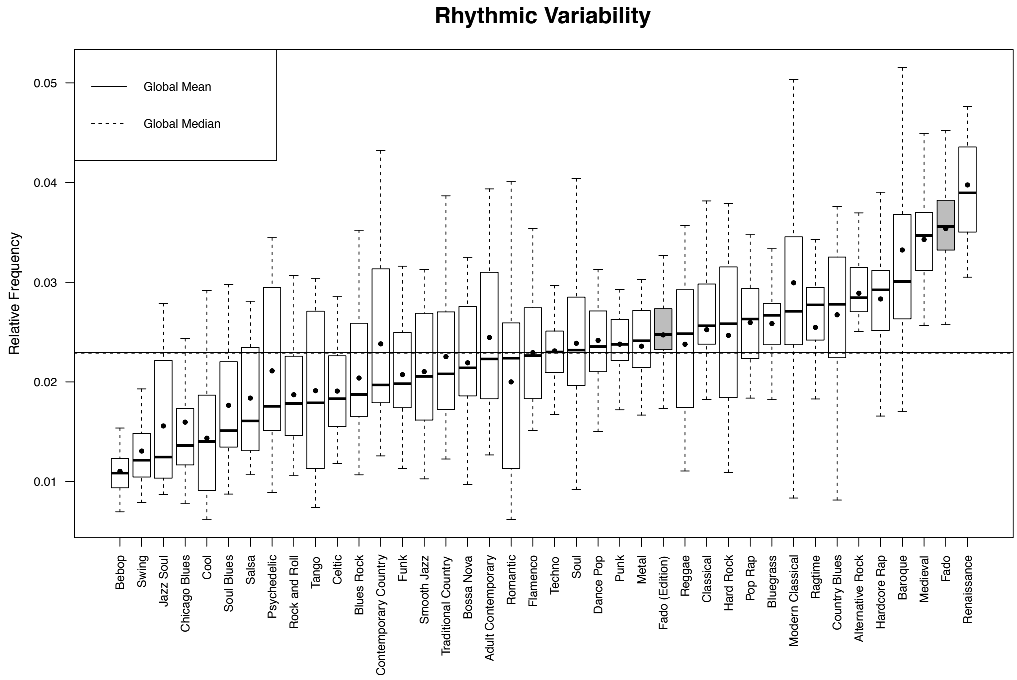

FIGURE 5.19: Rhythmic Variability.

5.9 Note Duration

The average note duration is simply the "average duration of notes in seconds" (McKay, 2004, p. 70). Looking at the table 5.5, the average note duration, in seconds, is quite similar when considering both the corpus (0,36) and only the melodies (0,38). If one considers the average tempo of fados at around 78 bpm, then this average approximates an eight note value (0,384). When including the average note variability (0,22 and 0,26) one obtains an average span (0,14 – 0,58 and 0,12 – 0,64) from a little less than a sixteenth note (0,192) to a bit more than a dotted eight note (0,577) as preferred durations for the rhythms. Overall the maximum note durations on the melodies alone are inferior (average 0,57 versus 0,71 and absolute 4,97 versus 5,00), as well as the average minimum (0,18 versus 0,23) but the absolute minimum note durations are superior (0,05 versus 0,01), which is consistent with the range of the average note duration being inferior (0,38 versus 0,48). This fact implies more uniformity (and slight brevity, probably due to ornamentation) and a more constrained range in the rhythm of the melodies opposed to a wider number of possible rhythms for the accompaniments, which also might contain extreme values. We have calculated the *staccato* incidence as well, which is defined by the number of notes shorter than 0,1 seconds divided by the total number of notes (McKay, 2004, p. 71). This parameter would capture mainly grace notes, melismas and similar ornamentations. This ratio is negligible within our corpus (0,02), and only slightly superior on the melodies (0,04), with a highly skewed distribution (5,30 and 5,05) and kurtosis (35,90 and 33,61), which confirms the existence of only a few melodies in which ornamentations are notated. In real performances and recordings this number should be more uniform and relevant.

Table 5.5: Statistics of Note Duration

Note Duration	Avg	Med	St Dev	Var	Min	Max	Range	Skew	Kurt
Average	0.36	0.36	0.09	0.01	0.23	0.71	0.48	0.81	1.37
Variability	0.22	0.20	0.10	0.01	0.08	0.59	0.51	1.42	2.78
Maximum	1.73	1.66	0.78	0.61	0.53	5.00	4.47	1.19	2.43
Minimum	0.12	0.11	0.07	0.00	0.01	0.25	0.23	0.28	-1.35
staccato inc.	0.02	0.00	0.06	0.00	0.00	0.46	0.46	5.30	35.90
Melodies-only	Avg	Med	St Dev	Var	Min	Max	Range	Skew	Kurt
Average	0.38	0.39	0.08	0.01	0.18	0.57	0.38	-0.37	0.23
Variability	0.26	0.24	0.11	0.01	0.10	0.73	0.63	1.27	2.37
Maximum	1.47	1.38	0.75	0.56	0.48	4.97	4.50	2.04	5.76
Minimum	0.14	0.12	0.06	0.00	0.05	0.25	0.20	0.12	-1.72
staccato inc.	0.04	0.00	0.09	0.01	0.00	0.70	0.70	5.05	33.61

The average note duration can be also seen in comparative terms (figure 5.20).

Fado is among the taxonomies with a higher median of average note duration along with the early music, modern classical and country genres, including country blues. Notice the incredibly large span of modern classical music standing out of all the rest. At the opposite side of the spectrum salsa, rock and roll and bebop seem to be the most busy genres, which is somewhat expected.

5.9.1 Variability of Note Duration

The variability of note duration is defined as the "standard deviation of note durations in seconds" (McKay, 2004, p. 71).

This particular feature (figure 5.21) is useful to understand the kind of rhythms involved in the different taxonomies. Fado is positioned at the lower part of the spectrum alongside with genres like ragtime, bluegrass, country blues, flamenco, punk, salsa, reggae, rock and roll and bebop. On the other side, one can find

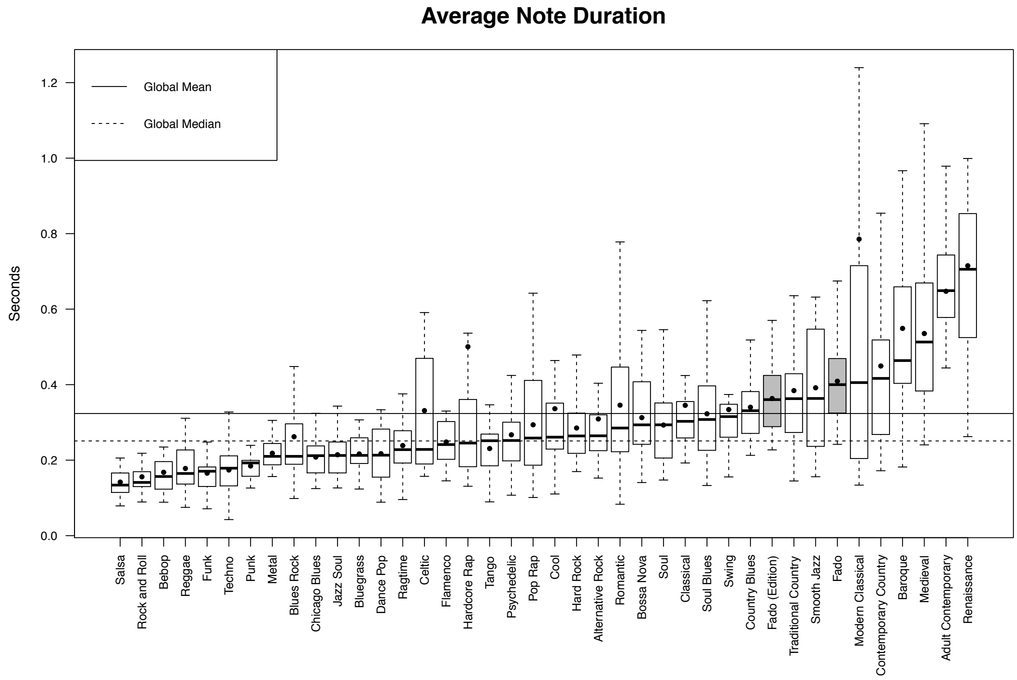

FIGURE 5.20: Average Note Duration.

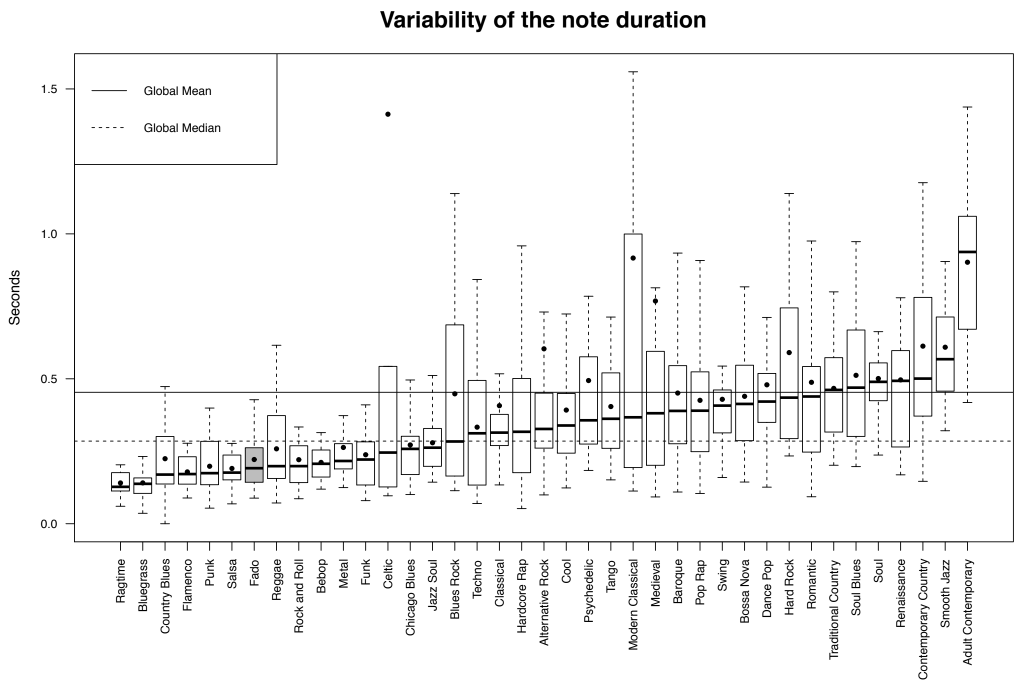

FIGURE 5.21: Variability of Note Duration.

adult contemporary, smooth jazz, contemporary country and renaissance. This seems surprising because neither one can find relevant connections with the previous graph (average note duration) nor does one seem to be able to find a tendency among clusters of taxonomies that have been paired so far in many features. Therefore this seems a unique feature in that many styles actually behave independently: fado and country blues had high average note durations but small variation; adult contemporary had also high average note durations while maintaining high variation. Rock and roll and salsa have low average note durations and also have low variation, while ragtime and bluegrass have remarkably low variation while having a more generous average note durations.

One can infer based on this graph that the low variation on average note duration must represent similar rhythm figurations, or at least the avoidance of contrasting durations.

5.9.2 Maximum Note Duration

The maximum note duration is defined as the "duration of the longest note (in seconds)" (McKay, 2004, p. 71).

Observing the figure 5.22, fado has low maximum note durations, which also happens in the cases of ragtime, flamenco, country blues and bluegrass, all below the four seconds mark. At the other side of the spectrum, adult contemporary, romantic and hard rock styles present recordings which have at least one very long note. This is also the case of some recordings among several genres, remarkably on celtic and hardcore rap, which have very high averages compared to the median, indicating extreme outliers. This might simply indicate the existence of some recordings which, for some reason, have at least one very, very long note, which is not representative of the practice, by itself. On the other hand, the total absence of such notes (including outliers), in the genres present at the bottom of the spectrum, seems to point out to a defining condition of these genres. The reason for that condition might be something as simple as the instrumentation conventionally used to actually be unable to produce such long notes.

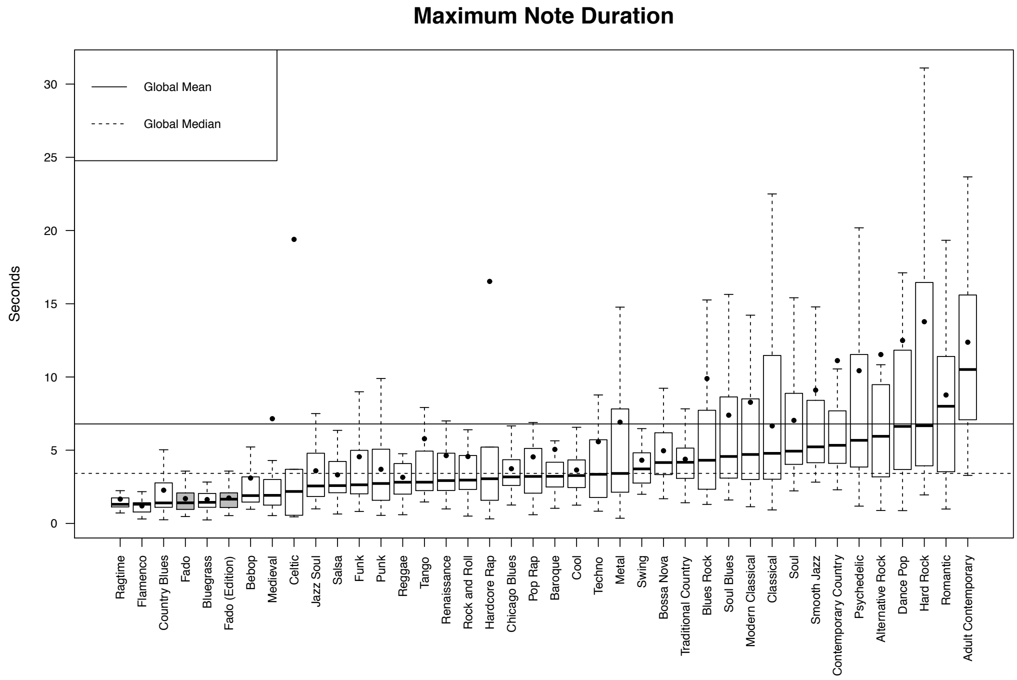

FIGURE 5.22: Maximum Note Duration.

5.9.3 Minimum Note Duration

The minimum note duration is simply the “duration of the shortest note (in seconds)” (McKay, 2004, p. 71).

Looking at the figure 5.23, the minimum note duration in fado is among the highest ones along with the early music genres, hardcore rap and flamenco. This confirms the idea that the overall variability of durations in fado comprises a rather short span when compared to other taxonomies, indicating relatively rather uniform rhythms. On the other side of the spectrum, swing, funk, Chicago blues and salsa have the shortest short notes.

5.9.4 *Staccato* Incidence

The *staccato* incidence refers to the “number of notes with durations of less than a 10th of a second divided by the total number of notes in the recording” (McKay, 2004, p. 71).

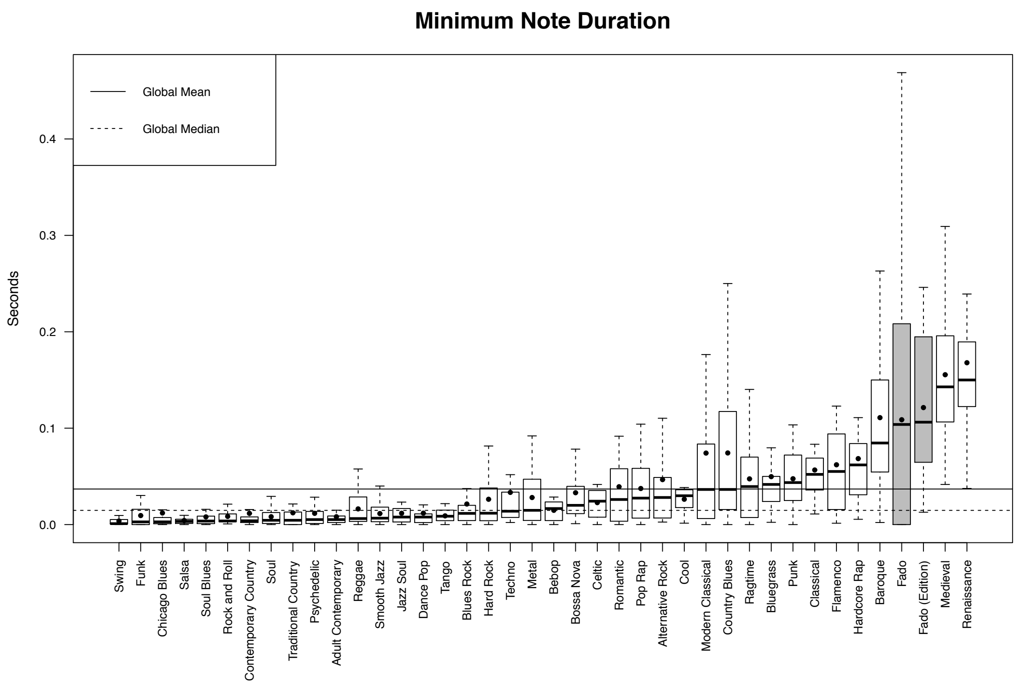

FIGURE 5.23: Minimum Note Duration.

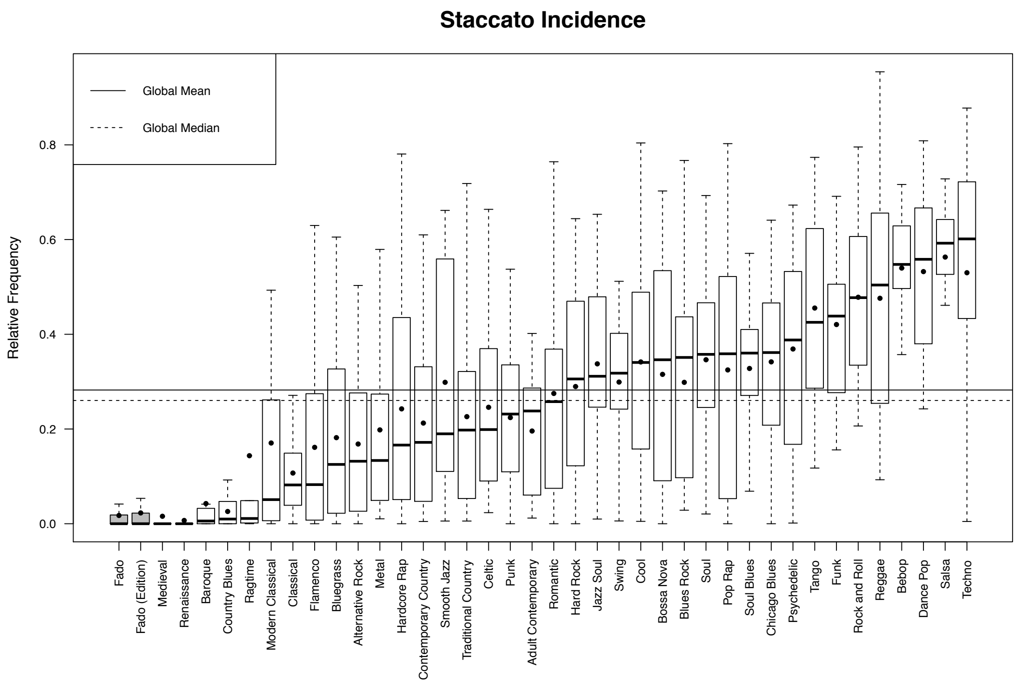

FIGURE 5.24: *Staccato* Incidence.

Looking at the figure 5.24,as expected, based also on the previous graphs, fado is actually the genre with the lowest value regarding this feature, next to the early music, country blues and ragtime. At the opposite side one finds techno, salsa, dance pop and bebop. Given the way this feature is defined, more than the true meaning of *stacatto*, which is fact an articulatory feature implying a pause of equal value following a certain note duration, we think this feature allow us to find the prevalence of short note durations overall. Having that in mind, one realizes that it makes sense for genres known to have speedy rhythms and highly percussive figurations to stand out, while slower genres to stay behind. We also think the way the musical transcriptions were notated has influence, in this feature, reflecting the near absence of melismatic and ornamental notation in most scores, while in the most recent practice they could actually appear.

5.9.5 Average Time Between Attacks

The average time between attacks is defined as the “average time in seconds between Note On events (irregardless [sic] of channel)” (McKay, 2004, p. 71).

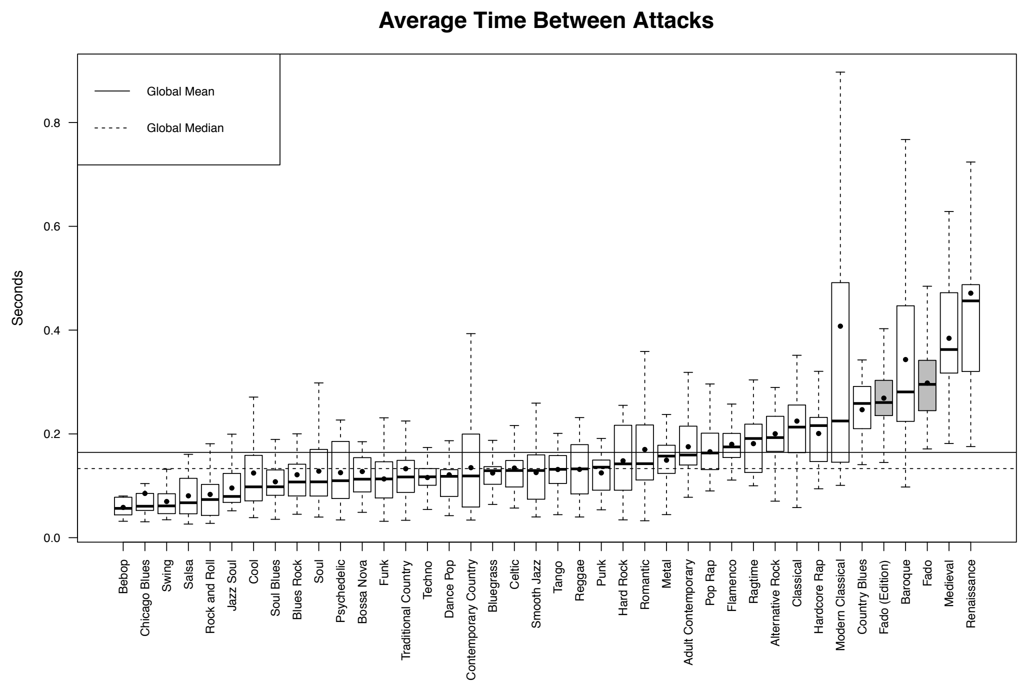

Figure 5.25: Average Time Between Attacks.

This feature (figure 5.25) is especially useful to discern how "busy" a certain genre is. One can see how fado is among the genres with highest time between attacks next to the early music, country blues and modern classical music. This is expected given the usual slow, dragged pace, on big part of the repertoire of these genres and also the absence or minimal presence of percussion. On the other hand, bebop, Chicago blues, swing, salsa and rock and roll seem rather busy, and of course, the amount of different instruments playing at the same time, and percussive lines, will highly contribute to this effect.

5.9.6 Variability of Time Between Attacks

The variability of time between attacks is defined as the "standard deviation of the times, in seconds, between Note On events (irregardless [sic] of channel)" (McKay, 2004, p. 71).

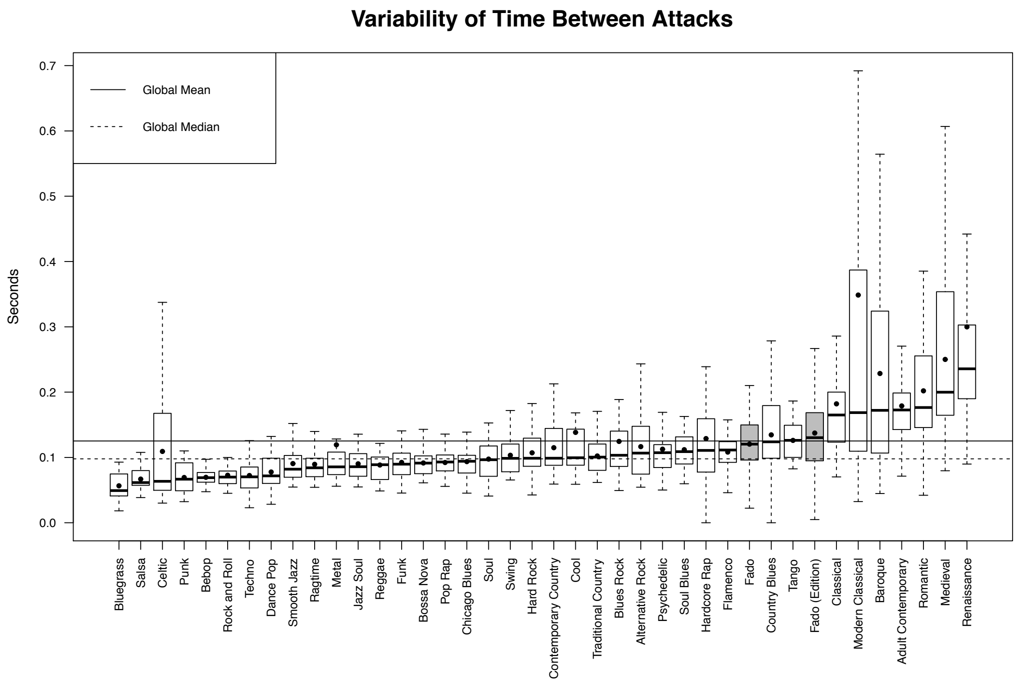

Figure 5.26: Variability of Time Between Attacks.

In this feature (figure 5.26), compared to the previous one, one notices that fado is slightly less high in relative terms. Although the cluster of early music styles and country blues remain close, romantic, adult contemporary and tango now show up mingled in the lot. This seems to imply that these styles actually have more places to “breathe in” and privilege the existence of rests and suspensions here and then, which is certainly true in the case of fado. On the opposite side, bluegrass, salsa, Celtic, funk and bebop have very low variability, implying relative busyness all along.

5.9.7 Average Time Between Attacks For Each Voice

The average time between attacks for each voice is defined as the “average of average time in seconds between Note On events on individual channels that contain at least one note” (McKay, 2004, p. 71).

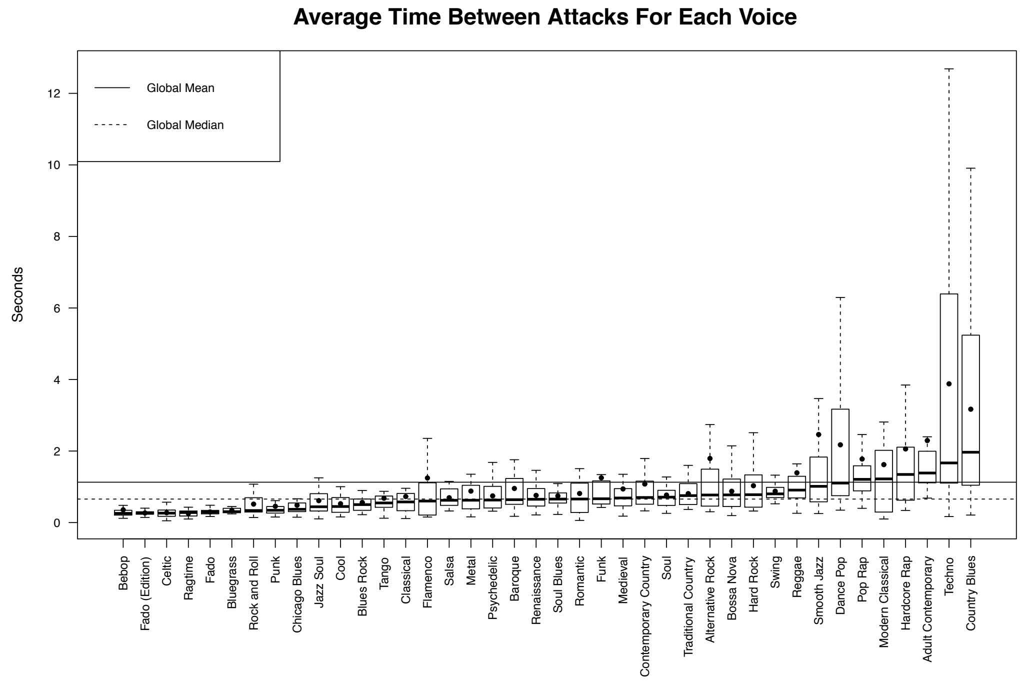

FIGURE 5.27: Average Time Between Attacks For Each Voice.

It is relevant to notice the discrepancies between this feature (figure 5.27) and the previous ones. While, on the whole, fado seemed to be one of the less busy taxonomies, when analyzed voice by voice one realizes that in fact each voice of fado is rather busy. Fado is among the genres with less average times among with bebop, Celtic and bluegrass musics. At the opposite side lie country blues, techno, adult contemporary and hardcore rap, a fact that seems to dissociate fado from their usual counterparts of story-telling music genres.

This also seems to point out the idea that some taxonomies might have a huge contrast among their voices: some voices might be incredibly busy while others are rather sparse, or, even if they have relatively sparse voices they might not be aligned, thus increasing the overall business, while remaining sparse when analyzed voice by voice. The fact that fado is relatively much busier when seen voice by voice might mean that its voices are well aligned with each other, when played as a group, thus increasing the blending.

5.9.8 Average Variability of Time Between Attacks For Each Voice

The average variability of time between attacks for each voice is defined as the "average standard deviation, in seconds, of time between Note On events on individual channels that contain at least one note" (McKay, 2004, p. 71).

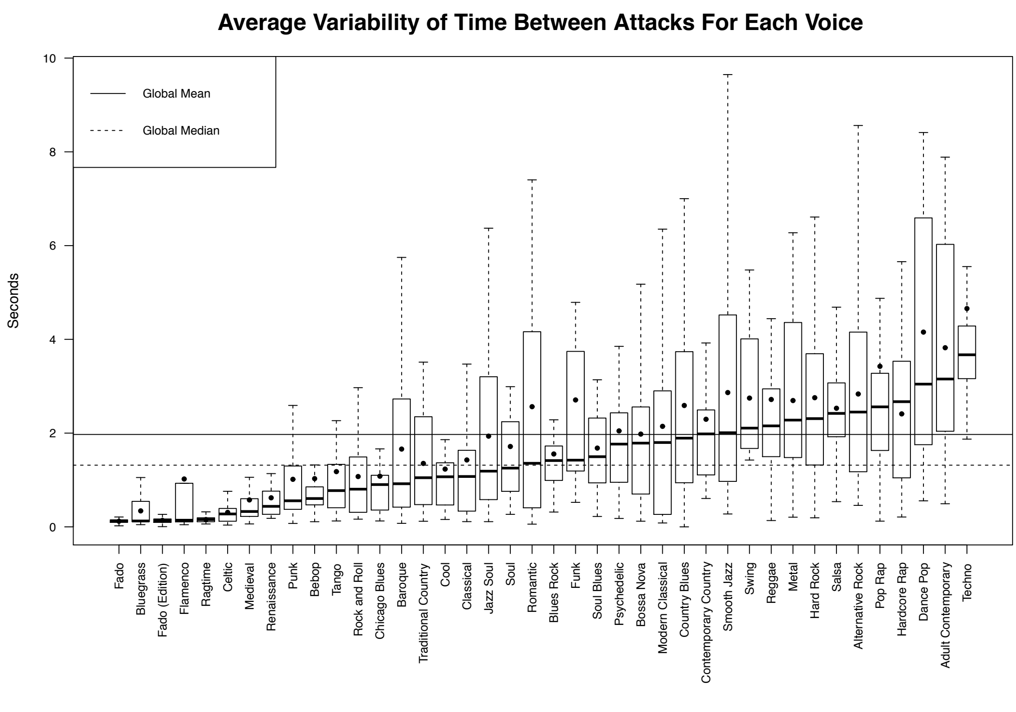

Figure 5.28: Average Variability of Time Between Attacks For Each Voice.

Looking at the figure 5.28, fado stands out at the bottom of the spectrum alongside bluegrass, flamenco and Celtic music, while techno, adult contemporary, dance pop and hardcore rap occupy the highest slots. This could well be a defining feature for the genre, possibly meaning the existence of very similar clusters of rhythms. When one thinks about the constant repetition of the *ostinati* it makes sense, and if one thinks of the constant repetition of the melodic rhythms due to the strophic nature of the practice (bearing in mind that the transcriptions do not account for groove or improvisation), then it seems to make total sense. We believe that, if this feature was measured taking into account human performances then the relative outcomes would be much different.

5.10 Harmonic Progressions

Through the analyzes of the standardized data it was possible to study the harmonic progressions commonly used in fado and confirm the suspicions about the vast recurrence of the tonic-dominant and dominant-tonic patterns. Tables were built comparing the progressions within the different sections and we have used them to perform calculations regarding their frequency. These figures are important since they reveal empirically what are exactly the frequencies of the harmonic progressions through history. This provides concrete values and weights, so the progressions can be modeled in a representative way, and also the internal complexity and variety among different sets of sources.

Within section A it is possible to observe 33 different chord progressions (table 5.6), from which 7 are recurring and 26 are unique suggesting some variety across the repertoire. 93% of the fados start in the tonic degree, 5% in the dominant and 2% in sixth degree. An ending perfect cadence is overwhelmingly present in 92% of the cases (one via a pivotal parallel modulation), with only 7% of the section A progressions ending with a half cadence, and a single 1% ending in a pivotal relative. The tonic-dominant-dominant-tonic progression (T|D|D|T) is clearly the archetype, as Ernesto Vieira described, accounting for 36% of cases in Major mode and 25% in minor mode, for a grand total of 61% of total cases. The other recurrent progressions are, as predictable, the tonic-subdominant-dominant-tonic movements (T|S|D|T), with 9% of the cases (either via second or fourth degree motions). Secondary dominants and diminished chords are extremely rare.

Within section B the variety increases (table 5.7): there are 55 different chord progressions, from which 45 are unique (although some are highly derivative). Far fewer section B progressions start in the tonic degree (54%). The ending in a perfect cadence is still overwhelmingly present in 90% of the cases. The T|D|D|T progression is still an important archetype, accounting for 15% of cases in Major mode and 17% in minor mode. The cluster of T|S|D|T movements represent 10% of the cases (either via second or fourth degree motions). Clusters of two chained cadences emerge: a plagal cadence followed by a perfect cadence (S|T|D|T) represents 8% of the cases, while a chain of two perfect cadences (D|T|D|T), considering the clusters of both dominant and secondary dominant movements (V/x to x), account for 20%. Such a high value is enough for them to be considered an archetype within the *B* section.

The *C* and *D* sections have to be analyzed having in mind that our sample is smaller (not all fados have these sections) and two different sets of formal possibilities emerge – often *C* and *D* sections are not true *C* and *D* sections but are, in fact, the equivalent of *A* and *B* sections of a juxtaposed fado. As discussed previously, often a simple *ABAB* fado in a minor mode is followed by another *ABAB* fado in the Major mode (either relative or parallel), the melodic and rhythmic material having little to no connection to the previous material. Therefore, in these cases, the *C* and *D* sections will display the same patterns as an *A* and *B* section would. Other times, however, the *C* and *D* sections are indeed *C* and *D* sections, this meaning they are related to the former material and are derivatives, variations or evolutions on the previous *A* and *B* sections. And in these cases they will tend to improve on the harmonic material in more interesting and complex ways.

Within section *C* it is possible to observe that there are 40 different chord progressions (table 5.8), of which 28 are unique. This shows an increase in variety compared to sections *A* and *B*. Only 50,8% of the fados start in the tonic degree, 22,5% in the subdominant, 18% in the dominant, and a few others in other degrees. An ending perfect cadence is overwhelmingly present in 91% of the cases (3% via secondary dominants). The T|D|D|T progression is still the archetype accounting for 15,4% of cases in Major mode and also 15,4% in minor mode, for a grand total of 30,8% of total cases. We believe this value reflects mostly the fados that are indeed behaving like *A* section fados. The cluster of S|T|D|T represents 7,5% of the cases, while D|T|D|T account for 15% considering the clusters of both dominant and secondary dominant movements (V/x to x). Such a high value is enough to consider them an archetype within the *C* section. It is noteworthy the presence of a cluster of unique progressions containing movements departing from the second degree (9%) and a considerable increase of the presence of diminished chords (10,5%) and also borrowed chords from the parallel (namely the typical bVI and bVII chords appearing in this section in 6% of the progressions). These later clusters of more complex progressions reflect true *C* sections that are evolutions on the previous sections.

Within section *D* it is possible to observe that there are 37 different chord progressions (table 5.9), of which 20 are unique. This represents an increase in variety compared to sections *A* and *B*, but a decrease in relation to *C*. 65,8% of the fados start in the tonic degree, 19% in the subdominant, 13,3% in the dominant, and few others in other degrees. An ending perfect cadence is overwhelmingly present in 86,7% of the cases (3,8% via secondary dominants). The T|D|D|T progression is still the archetype accounting for 17% of cases in Major mode but only 9,5% in minor mode, for a grand total of 26,5% of total cases. The cluster of T|S|D|T movements represent 13,3% of the cases (either via second or fourth degree motions). We believe these values reflects fados that are behaving like section *B* fados. The cluster of S|T|D|T represents 7,6% of the cases, while D|T|D|T accounts for 9,5%. While such value is still enough to consider them an archetype within the *D* section, it clearly loses strength compared to *B* and *C* sections. The presence of diminished chords increases (13,3%) and overall there are more solutions for closing segments.

TABLE 5.6: Harmonic Progressions of section A.

A_1	A_2	A_3	A_4	Total
I	I	I	V7	1%
		V7	I	1%
	I-V7	I-V7	V7	1%
	IV	V7	I	1%
	ii	V7	I	3%
	V7	V7	I	36%
	vii	V7	I	1%
I-#i07	V7	ii-V7	I	1%
I-i07	V7	V7	I	1%
I-V	I	IV-V	I	1%
IV	IV	IV	I	2%
i	i	i	V7	1%
		i-V7	V7	1%
		iv	i	1%
	i-iv	V7	V7-i	1%
	i-V7	V7	V7-i	1%
	iv	iv	V7	1%
		V7	I	1%
			i	4%
	V7	V7	i	25%
		vii07-V7/III	III	1%
	V7/V	V7	i	2%
i-bVII7	V7	V7	i	2%
i-V7	i	ii0	i	1%
		iv-i	V7	1%
	i-V7	i-V7	i-V7	1%
i07-ii07	i-V7/iv	iv-V7	i	1%
V7	I	V7	I	1%
	i	V7	i	2%
	V7	I	I	1%
		I	vi	1%
vi	I	IV	I	1%
	ii	V7	I	1%
11	25	32	33	100%

TABLE 5.7: Harmonic Progressions of section *B*.

B_1	B_2	B_3	B_4	Total
I	IV	I-V7	I	1%
		V7	I	1%
	ii	V7	I	5%
	V7	V7	I	15%
	vii0	V7	I	1%
I-V7/ii	ii	V7	I	1%
	V7	V7	I	1%
III	V7	i	i	1%
	V7/III	V7	i	1%
	V7/III-V7/V	V7	i	1%
IV	I	V7	I	3%
	IV	V7	I	1%
i	i	V7	i	2%
	ii	V7	i	1%
	iv	i-V7	i	1%
		V7	i	1%
	V	ii	V	1%
	V7	i-V7	i	4%
		iv	V7	1%
		V7	i	13%
	V7/iv-iv	iv-i	V7-I	1%
		V7	i-V7-i	1%
i-V7	i-V7	i-V7	NC	1%
i-V7/iv	ii0	V7	i	1%
	iv	i-V7	i	1%
ii	V7	I-V7	I	1%
ii-V7	V7	V7-I	I	1%
ii0	i	V7	i	1%
ii7	i	V7	i	1%
iv	i	V7	i	2%
	V7	iv	V7	1%
iv-V7	i	i-V7	i	1%
#iv07	I	ii-V7	I	1%
V	V	V	I	1%
V7	I	V7	I	1%
	i	i-V7	i	1%
		iv	V7	1%
		V7	V7	1%
		V7/V	V	1%
	iv	V7	i	1%
	V7	I	I	1%
		I-V7	I	1%
		i	III	1%
		ii-V7	I	1%
V7-iv	iv-V7	V7-i	V7-i	1%
V7/III	III	iv-V7	i	1%
		V7	i	2%
V7/ii	ii	V7	I	6%
		V7/iii	iii	1%
V7/iv	iv	V7	i	3%
Vi/vi	vi	V7	I	1%
VI	VI	V7	i	1%
vi	V7	V7	I	1%
vi-V	V7	V7	I	1%
vi-V7/vi	vi-IV	I-V7	I	1%
25	42	55	55	100%

Table 5.8: Harmonic Progressions of section C.

C_1	C_2	C_3	C_4	Total
I	ii	V7	I	3%
	ii-V7/ii-ii	ii-V7	I	1.5%
	V7	I-V7	I	1.5%
		V7	I	14.9%
	vi-ii	I-V7	I	1.5%
I-i0	V7	V7	I	1.5%
I-#iv07	V7	IV	I-V7	1.5%
I-V7	I-V7	I-V7	I-V7	1.5%
I-V7/ii	ii	V7	I	1.5%
I/III	V7/III	V7/III	I/III	1.5%
III	III	V7/III-V7/V	V	1.5%
	iv-V7	i	V7	1.5%
IV	V	i-V7	i	1.5%
IV-#iv07	I	I-V7	I	1.5%
IV-V7	I-V7/ii	ii-V7	I	1.5%
i	bVII	bVII	bVI	1.5%
	iv	V7	i	1.5%
	V7	i-V7	i	1.5%
		V7	i	14.9%
i-bVI	V7	i-bVI	V7-i	1.5%
i-V7	i-V7-i-V7/iv	iv	V7/III-III-V7/iv	1.5%
i-VII	vi	V7	i-I	1.5%
ii-i	i-V7/V	V7	I	1.5%
ii-ii0	I	V7	I	1.5%
ii-V7/iii	I	V7	I	1.5%
ii-V7/vi	vi	V7	I	1.5%
ii0	i	V7	I	1.5%
ii07-V7	i	ii07-V7	i	1.5%
iv	i	V7	I	3%
		V7	i	4.5%
		V7/V-V7	V7/IV	1.5%
V7	I	V7	I	4.5%
	i	V7	i	4.5%
V7/III	III	V7	I	1.5%
V7/ii	ii	V7	I	3.0%
V7/iv	iv	i-V7	i	1.5%
V7/V	IV-#i07	V7/V-V7	I	1.5%
V7/vi	IV	V7/ii	ii	1.5%
bVI	I	ii	I	1.5%
bVI-V7	V7	V7-i	i	1.5%
29	36	39	40	100%

TABLE 5.9: Harmonic Progressions of section *D*.

D_1	D_2	D_3	D_4	Total
I	I	I	ii	3.8%
			V7	3.8%
		V7	V7	1.9%
	IV	i-V7	I	1.9%
	ii	V7	I	3.8%
	V7	I-ii-V7	I	1.9%
		I-V7	I	1.9%
		V7	I	15.1%
I-i07	ii-V7	V7	I	1.9%
I-V7	I-V7	I-V7	I	1.9%
I-V7/ii	ii	V7	I	1.9%
	ii-ii07	V7	I	1.9%
	V7	V7	I	1.9%
IV-#iv07	I	V7	I	1.9%
i	ii	i-V7	i	1.9%
	ii07	V7	i	1.9%
	iv	V7	i	1.5%
	V7	V7	I	1.9%
		V7	i	7.5%
	V7/V	V7	i	1.9%
	vii07	V7	i	1.9%
i-V7	i	iv-V7/iv	iv	1.9%
i-V7/iv	iv	i-V7	i	1.9%
ii	I	V7	I	1.9%
ii0-I	I-V/V	V7-I	I	1.9%
iv	i	V7	i	5.7%
		V7/V	V7	1.9%
	V7	iv	V7	1.9%
		V7	i	1.9%
iv-V7	iv-V7	i-v7	i-V7-i	1.9%
V7	I	V7	I	1.9%
	i	V7	i	3.8%
V7/III	III	iv-VI	V7	1.9%
V7/ii	ii	V7	I	1.9%
V7/iv	iv	V7	i	1.9%
bVI	V7	V7	i	1.9%
vii07	V7	i-V7	i	1.9%
18	30	35	37	100%

In order to better perceive the trends analyzed, it is useful to visually aggregate the distribution of Harmonic progressions in terms of functional clusters (figure 5.29). We have highlighted the Tonic-dominant-dominant-tonic (T|D|D|T) movements, but also the tonic-subdominant-dominant-tonic (T|S|D|T) one and the chain of plagal-dominant cadences (S|T|D|T), as well as Dominant-dominant (including secondary dominants – D|T|D|T) ones.

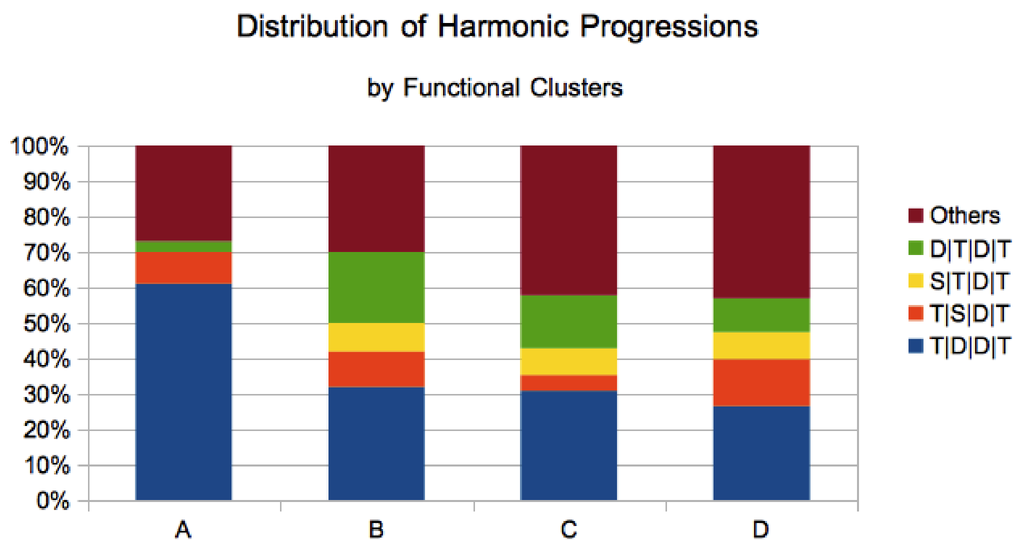

FIGURE 5.29: Distribution of Harmonic Progressions.

It seems clear from observing the figure that there is an enormous variety of unique or infrequent different harmonic progressions among the data, which seems to elude, again, Ernesto Vieira's model. However, some patterns arise. It is overwhelmingly frequent that all sections end with the dominant-tonic movement in their third and fourth bars, and what really varies are the first two bars. The archetype T|D|D|T is clear within the *A* section, but loses some of its strength in the remaining ones. However, it can be noticed its preponderance overall. The T|S|D|T movement is preferred as a "closing" movement with notorious preponderance in even sections (*B* and *D*), almost vanishing in *C* section. The chain of dominant cadences is an important archetype regarding the *B* and *C* sections, but loses strength in *D* section in favor of T|S|D|T. The chain plagal cadence – perfect cadence does not exist in section *A* and is then found on all other sections in similar relevant percentages. The overall complexity of the progressions augments as noticed by the increasing weight of the "others". This implies a fragmentation and absence of clear tendencies in favor of unique movements, which is consistent with how most tonal traditions work: starting simple and then becoming increasingly more complex and varied through the span of time. One of the criteria that most clearly shows that is the complexity found as we depart from Ernesto Vieira's simple model, in relation to harmonic progression. If it is true that many fados respect that model as it is, others add sub-dominant degrees (second or fourth degree chords), while others venture into diminished seventh and augmented sixths chords, various modulations and secondary dominants.

The notation of dynamics and articulations varies, and some fados are presented following the typical conventions and complexity of Romantic piano music (for instance the "Canção da Noite" [Night song] or "Fado das Três Horas" [3 a.m. Fado], attributed to Reynaldo Varella (Neves, 1893, p. 208) is fairly similar to a Chopin Nocturne). These discrepancies seem to point not only to the documentation of several musical occurrences in different stages of its evolution, but also to their composers' music erudition. The transcriptions of fados coming across the oral tradition (with unknown composers and based on intermediary sources distant from their origins) are very different from the ones whose composers were still alive, present or were schooled. This does not mean that there was a linear evolution in the complexity of fado instrumentals, and that a fado with only two chords is more primitive than a more complex one. It is probable that such an assumption might be true in most cases; however, one should not ignore the coexistence of several composers, with many different backgrounds and erudition, and multiple cultural and social contexts occurring in the same space and time. Even nowadays, very simple fados with two or three chords are being composed. Harmonic complexity, in itself, is a very limited criterion to determine the social context or date of a given fado. It seems that the model of Ernesto Vieira evolved and, even on the date it was written, it was already not enough to fully characterize the practice.

5.11 Tonality

Both the initial and final tonality of the fados reflect a distribution privileging simplicity of execution (figure 5.30), since most practitioners are amateurs. 54% of the fados start in the Major mode, almost evenly distributed among the preferred G major (11%), D major (10%), C major (9%) and F major (8%). All other Major options have much lesser frequencies and some, like C#/Db Major or F#/Gb

Major are even non-existent. The other 46% of the fados are in the Minor mode with strong emphasis on D minor (14%) and A minor (13%), followed closely by G minor (9%) and C minor (5%) at distance. Six minor tonalities (C#/Db, D#/Eb, F#/Gb, G#/Ab, A#/Bb and B) are inexistent.

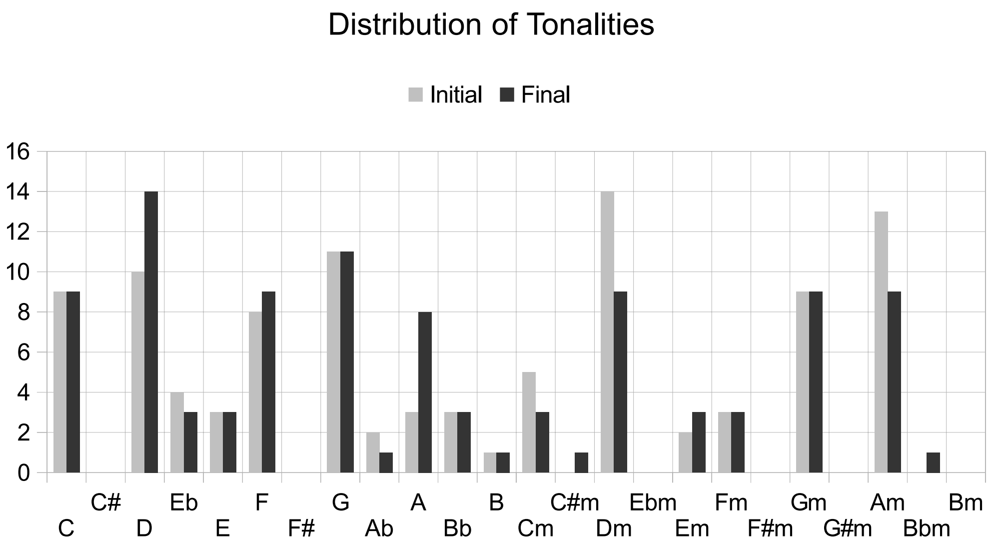

Figure 5.30: Distribution of tonalities.

Ernesto Vieira's assumption that most fados are in the minor mode is not confirmed by the data. These tonality choices seem logical, favoring the use of few accidentals combined with the easiness to play them on the *guitarra* and the viola (favoring open string positions, knowing their tunings to be B-A-E-B-A-D and E-B-G-D-A-E). This last factor could explain the very few fados in Bb major, despite having fewer accidentals when compared to E or A major. There are also fewer fados than one would expect in E minor (2%), and that is probably related with how one modulates within the same work as explained further ahead.

As a way to complement the distribution of tonalities we have also calculated the Dominant Spread, defined as the "largest number of consecutive pitch classes separated by perfect 5ths that accounted for at least 9% each of the notes", as well as the "number of peaks in the fifths pitch histogram that each account for at least 9% of all Note Ons" in order to perceive strong tonal centres (McKay, 2004, p. 74). These methods identified one to three tonal centres for fados, averaging on two, which is consistent with the results found and calculated by us manually, also complemented with the information that on average there are four relevant pitches at a perfect 5th distance – reinforcing the fact of a paired tonic-dominant relationship on each fado.

Table 5.10: Statistics of Tonal Centres

Corpus	Avg	Med	St Dev	Var	Min	Max	Range	Skew	Kurt
Dominant Spread	3.85	4.00	1.16	1.34	2.00	7.00	5.00	1.02	1.02
Strong Tonal Centres	2.04	2.00	0.62	0.38	1.00	3.00	2.00	-0.02	-0.32

5.11.1 Strong Tonal Centres

Comparative features regarding tonality could be useful so we have calculated them and build figures (figure 5.31).

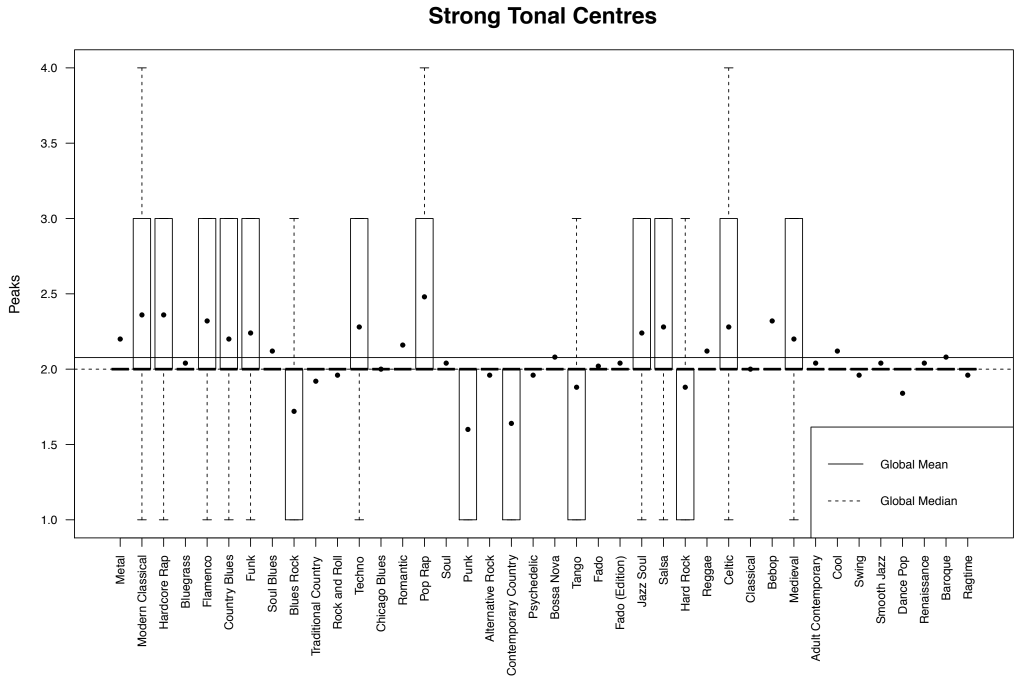

Figure 5.31: Strong Tonal Centres.

In a disappointing way this feature seems almost useless to define any of the taxonomies proposed, since all of them have median and mean around two tonal centres. Fado stands near the middle of the spectrum not standing out.

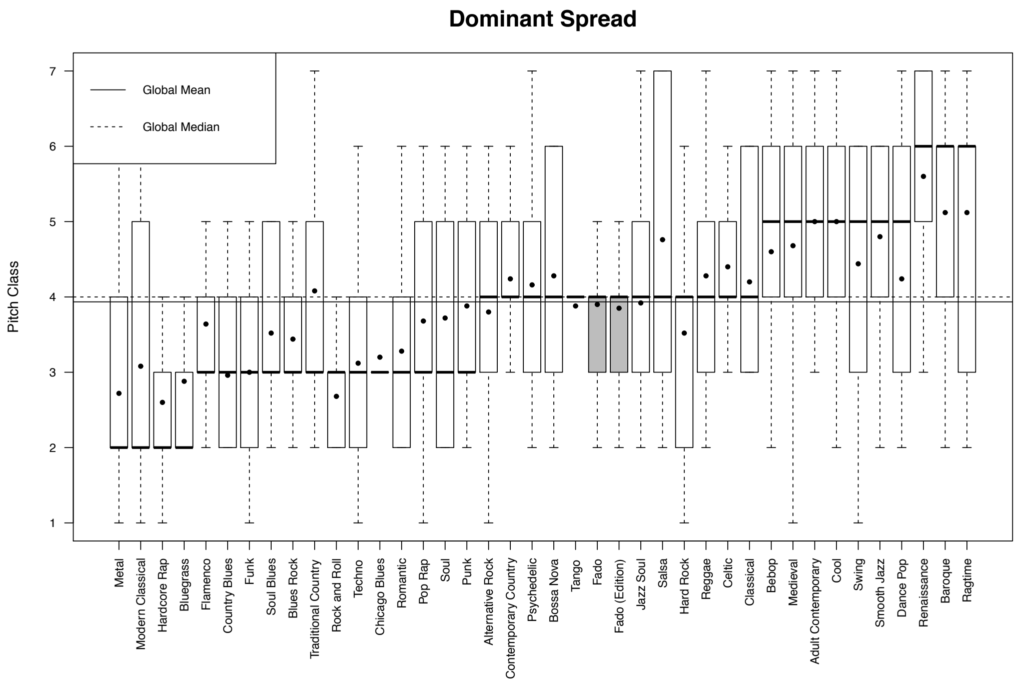

FIGURE 5.32: Dominant Spread.

5.11.2 Dominant Spread

Looking at the figure 5.32, this feature does not seem very useful to define fado, as well, as it does not stand out in any way, aligning in the middle, along with tango, bossa nova, jazz soul and salsa. Metal, modern classical and hardcore rap lie at the bottom part of the spectrum, while renaissance, baroque and ragtime occupy the top part.

5.12 Modulations

53% of the fados are monotonal, which contributes to the idea of simplicity associated with these songs. However the remaining 47% have one or more relevant modulations. By relevant modulations we mean the clear establishment of a new tonal center for at least an entire section. While many fados only have one relevant modulation, thus being purely bitonal, others return to the initial tonality, while others present several tonalities. This aspect is also linked with the overall form (and thus with the lyrical structure) since, for instance, in a bitonal fado an

AABB form will have one modulation from *A* to *B*, while an *ABBA* form will carry on two modulations – from *A* to *B* and then back from *B* to *A*. 20% of the fados modulate to the relative tonality, while 19% modulate to the parallel. These modulations imply an alternation between the minor and the Major mode, which seems to be archetypical to Ernesto Vieira, even if they only occur in 39% of the overall cases. Only 4% of the fados modulate to the dominant, and 4% modulate to other non-related tonalities.

Table 5.11: Types of Modulations

Modulations	%
None	53
Relative	20
Parallel	19
Dominant	4
Others	4
Total	100

This behavior implies that often the initial tonality of a fado has to be chosen not in isolation but taking into account the combinations of possible modulations. Therefore, tonalities like D minor and A minor, are highly common since both the parallel and relatives of these tonalities have few accidentals and are fairly easy to perform, while tonalities like C major, although having a desirable relative, has a not so friendly parallel. The case of the infrequent initial tonality of E minor can then be explained due to having a poor parallel, therefore being more suitable as a middle-section relative for the numerous fados starting and ending in G major. These assumptions are also confirmed by the data in the graphical display. The first graph presents the initial tonality versus the first relevant modulation (figure 5.33), while the second graphical representation contrasts the initial with the final tonality (figure 5.34).

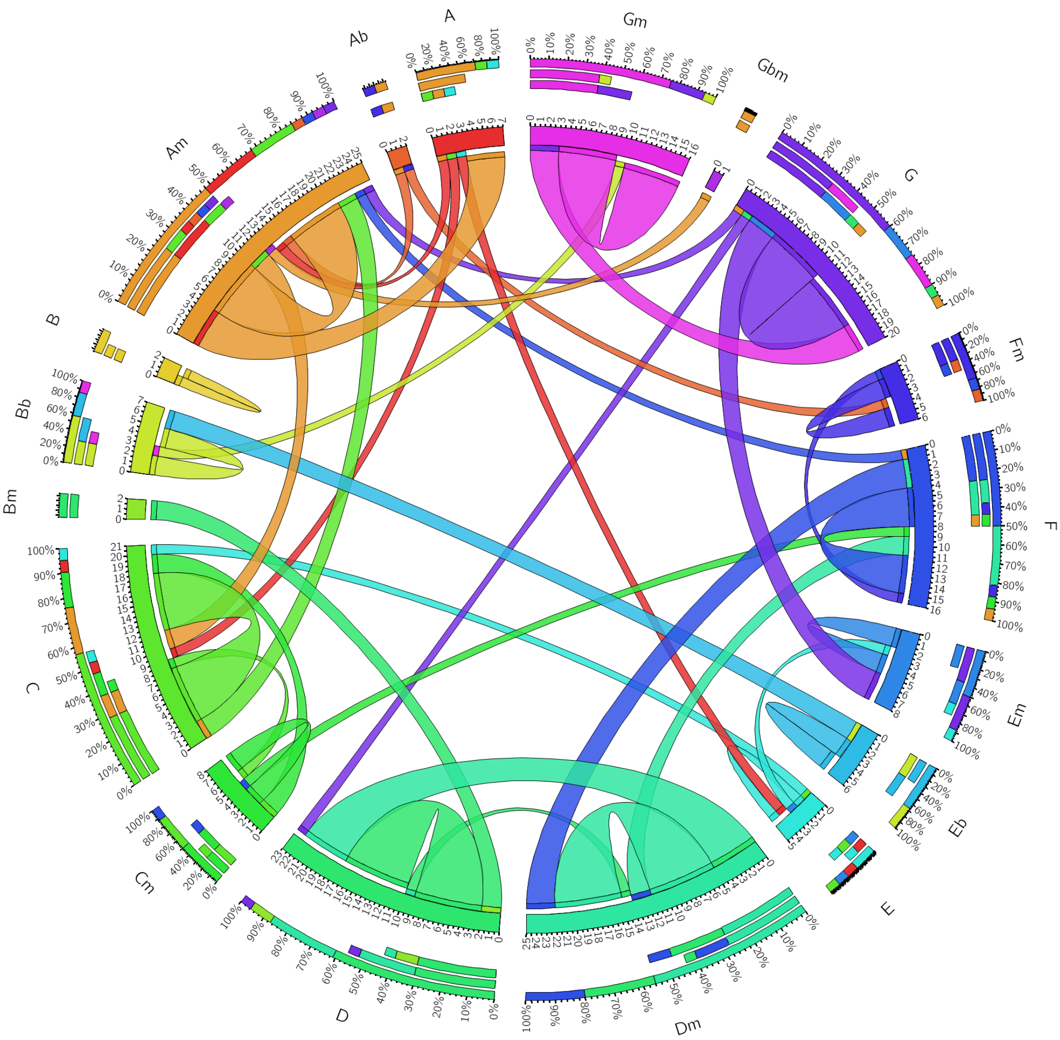

FIGURE 5.33: Initial tonality versus first relevant modulation.

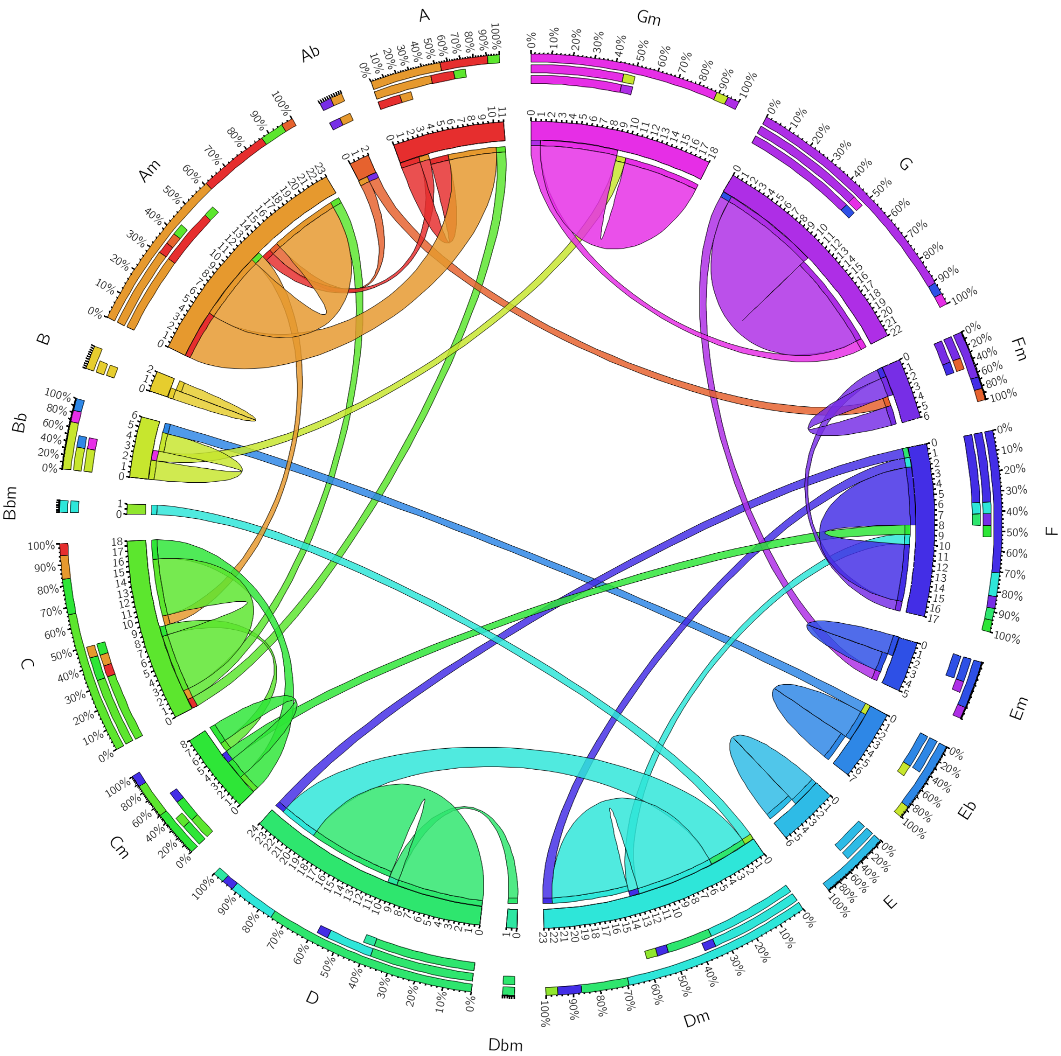

Figure 5.34: Initial tonality versus Final tonality.

Observing the final tonalities one can see the relevant migrations of the fados starting in D minor and A minor to their Major counterparts, while the movements from G minor to G major, G major to E minor, F major to D minor and D major to B minor seem somewhat relevant in the first graph and almost non-existent in the second one showing how these tonalities are privileged as middle sections on fados returning to their original key. Overall the Major fados increase from 54 to 62%, while the minor decrease from 46 to 38%. This highly suggests an overall tendency for the politonal fados to have a first part based on a minor tonality and a final part based on a Major one.

5.13 Range

Defining the range as the difference between the highest pitch and the lowest one (McKay, 2004, p. 74), one can see that there is enormous variance among the transcriptions. There are fados as concentrated in as little more than two octaves up to fados spread along more than five octaves. On average a fado is delimitated within the confines of three and a half octaves. Most melodies in the sources have a range of approximately one octave-and-a-half, since they are sung mostly by amateurs. In the transcriptions analysed the average range was of 17 semi-tones, with a minimum of 9 and maximum of 52. However, each *fadista* may style the melody, the typical range changing according to their limitations and ability. Constrained singers use narrower quasi-spoken ranges, while remarkable divas might use more than two octaves, modifying their register. Taking into account that the melodies alone average the range of an octave and half (which is consistent with most vocal practices), one can assume that the accompaniment will be placed on the two octaves below. The most common pitch is a value obtained by dividing the most common pitch by the number of all possible pitches (127) (McKay, 2004, p. 74). The calculated ratio tells us that on most fados the most common pitch lies slightly below the center, indicating possible tonics ranging from C3 to D5 averaging on A3. The primary register, which is the average MIDI pitch (McKay, 2004, p. 74), complements and validates this information since it ranges from G3 to C5. This minor difference is consistent with the idea of the most common pitch being a tonic and a departure place, from which the melodies are built arch shaped on top, and thus skewing the average pitches to a range slightly above. The importance of bass register is the percentage of note-ons[9] below F#3 (McKay, 2004, p. 74), and while there are notable cases of fados not having notes in this register, up to fados having two thirds of them, it averages on less than a third of the fados having notes on the bass register. On the other hand, and as expected, most note ons occur in the middle register (G3-C5). The notes happening in the high register, meaning above C5, account for an average of only 13%. The astonishing low variances regarding these values indicate us that most fados really follow the trend and the notable exceptions seem to be clear outliers.

Table 5.12: Statistics of Range

Corpus	Avg	Med	St Dev	Var	Min	Max	Range	Skew	Kurt
Range	43.96	43.50	8.29	68.73	26.00	67.00	41.00	0.40	0.03
Range of Melodies-only	17.38	16.00	5.58	31.19	9.00	52.00	43.00	2.79	14.13
Most common pitch	0.45	0.45	0.04	0.00	0.38	0.58	0.20	0.70	1.05
Primary Register	60.10	60.00	2.72	7.40	55.00	72.00	17.00	1.12	3.26
Importance of Bass Register	0.28	0.27	0.12	0.01	0.00	0.66	0.66	0.70	1.67
Importance of Middle Register	0.60	0.61	0.12	0.01	0.28	0.84	0.55	-0.63	0.44
Importance of High Register	0.13	0.11	0.10	0.01	0.00	0.51	0.51	1.48	2.96

We have calculated these range features in comparative terms as well (figure 5.35).

Range seems to be a very useful feature to define fado, since fado is the fifth lowest value along with medieval, flamenco, renaissance, country blues and punk. This is due to being genres anchored in vocal traditions, with instrumentation lacking extreme registers. At the opposite side of the spectrum, romantic, modern classical and the cluster of jazz-related genres appear to use a wide range of registers. This finding somewhat confirms the empirical analysis made on fado phonograms by Antunes et al. (Antunes *et al.*, 2014), claiming that fado could be easily identified because of its overall narrow range of frequencies, mainly concentrated in the center of the frequency spectrum.

5.13.1 Most Common Pitch

The most common pitch is defined as the "bin label of the most common pitch divided by the number of possible pitches" (McKay, 2004, p. 74).

This feature (figure 5.36) allow us to visualize the relative place of the most common pitch regarding to the overall range of the genre. Fado is at the bottom

[9] in the MIDI protocol a note-on is a message to turn on a MIDI note.

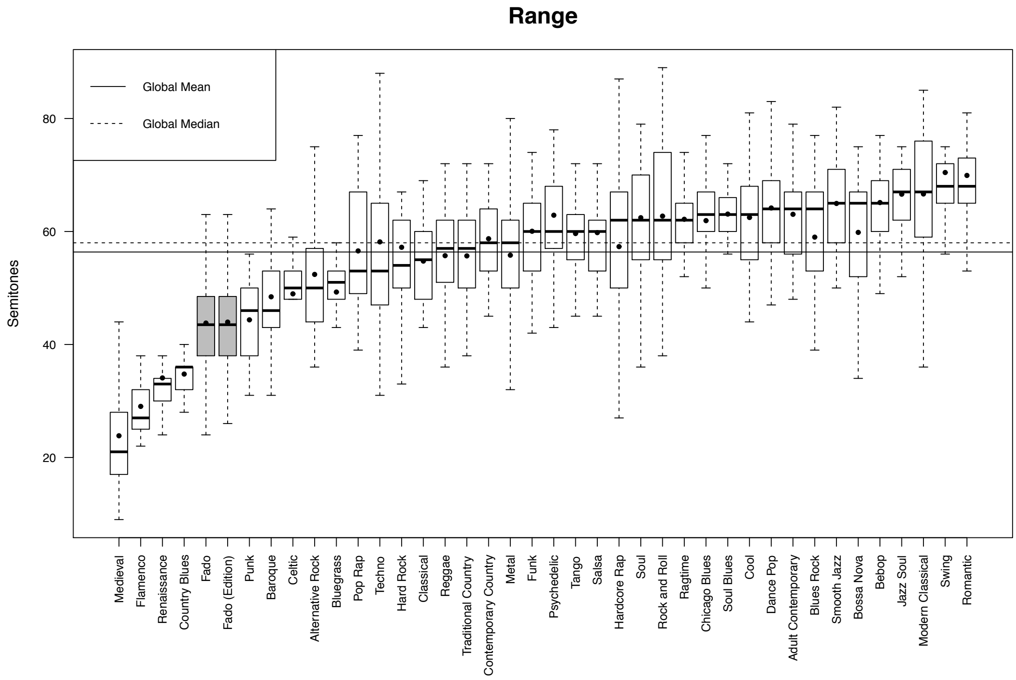

FIGURE 5.35: Range.

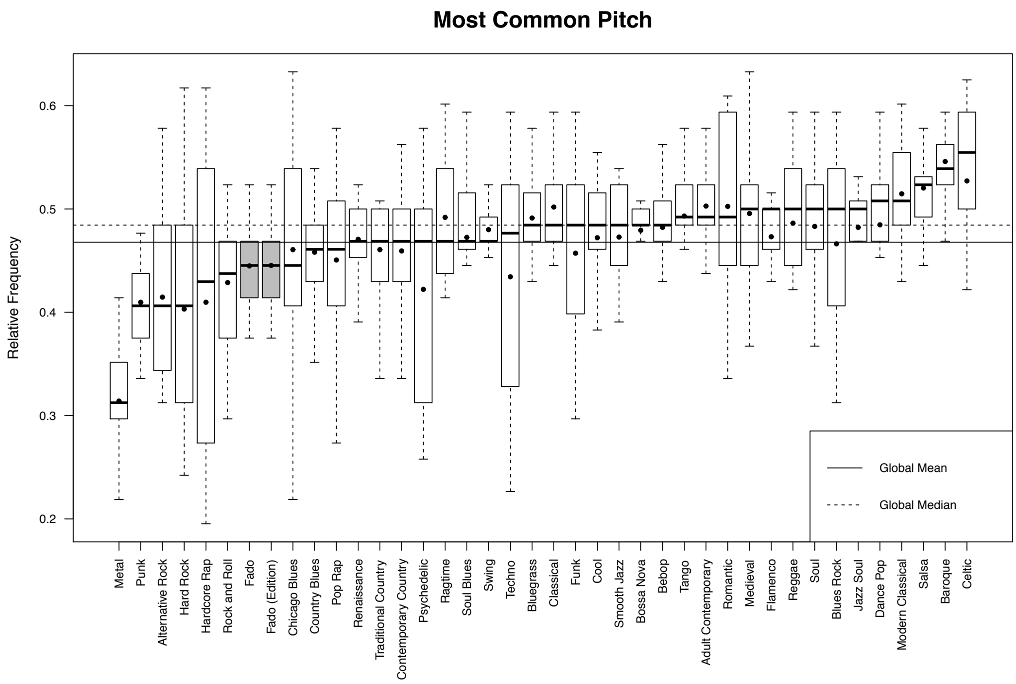

FIGURE 5.36: Most Common Pitch.

third of the spectrum, along with metal, punk, alternative rock, hard rock, and rock and roll. This seems to indicate that the most common pitch is one that occurs in the accompaniment and not in the voice. This also seems to point out to reiterated pitches in the accompaniment (either a reiterated bass note, or chord tone) and to favor more simple *ostinati*-like genres. Celtic, baroque, salsa and modern classical music appear at the other side and it seems that their most recurrent pitch occurs in the melodic or ornamental lines.

5.13.2 Primary Register

The primary register is basically the "average MIDI pitch" (McKay, 2004, p. 74).

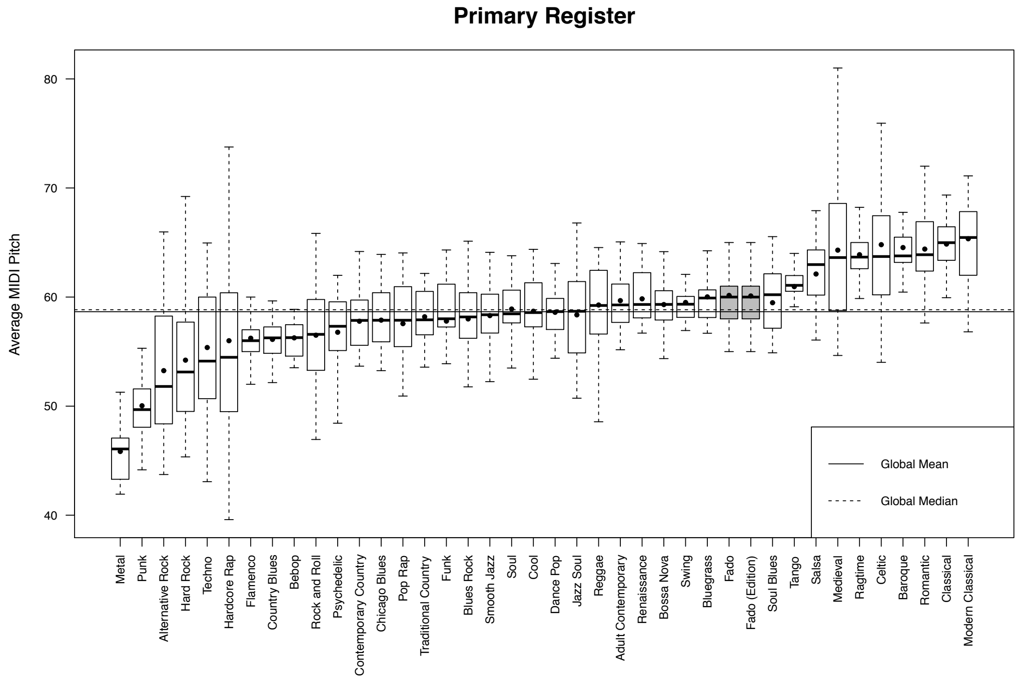

FIGURE 5.37: Primary Register.

This feature (figure 5.37) complements the last one, and gives an idea about the span of the overall range of a given style. It was previously shown that fado possesses a relatively short range, and now one can see how its average is slightly above global mean and median, confirming that it is a genre in which the bass notes seem to not play a relevant role, thus relying more on the melody. At the lower side of the spectrum one finds taxonomies like metal, punk, alternative rock, hard rock and techno, confirming the idea that the sound of these genres is skewed towards the bass and accompaniment notes. Modern classical, classical, romantic and baroque music appear at the higher side of the spectrum. This also shows us how, historically, notated music seems to be much more contrived and valuing higher registers and melodies.

5.13.3 Importance of Bass Register

The importance of bass register is defined as the "fraction of Note Ons between MIDI pitches 0 and 54" (McKay, 2004, p. 74).

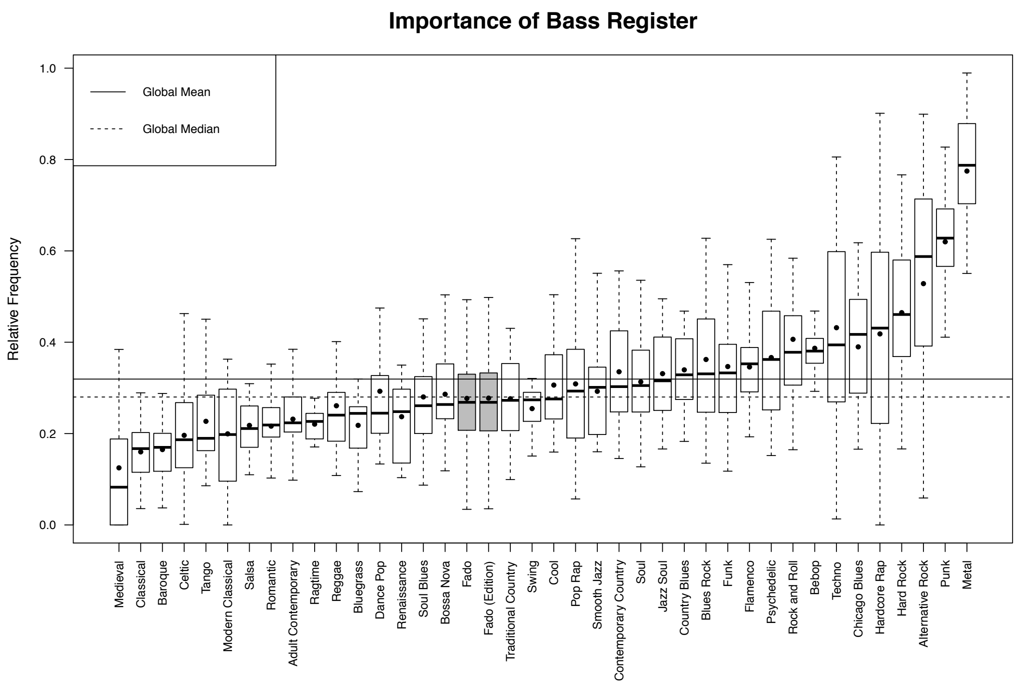

FIGURE 5.38: Importance of Bass Register.

The pitch 54 corresponds to the F#/Gb below the central C (usually named C4). This feature (figure 5.38) analyzes the percentage of notes in a given genre that lay there, therefore and probably, mostly bass notes and chords, since usually melodies do not go that low. Surprisingly, in relative terms, fado is on the average regarding this feature. Although fado has a narrow range, and therefore one should not expect to find many notes along the low register, it seems that their percentage is indeed relevant. This is consistent with the idea that fado has a strong component relying in bass notes and chords, even if they are not played in the extreme low registers. It just means that the accompaniments are mostly played rather close to the central register. On the other side, the weight of these bass notes and chords is not something that makes fado stand out in any way, meaning that most genres have a similar percentage of notes in the lower registers. Medieval, classical and baroque seem to be exceptions, in the sense that they, indeed, have fairly low percentages of notes in the lower registers, while metal, punk, alternative rock and hard rock, confirm the relatively huge amount of notes within this register.

5.13.4 Importance of Middle Register

The importance of middle register is the "fraction of Note Ons between MIDI pitches 55 and 72" (McKay, 2004, p. 74).

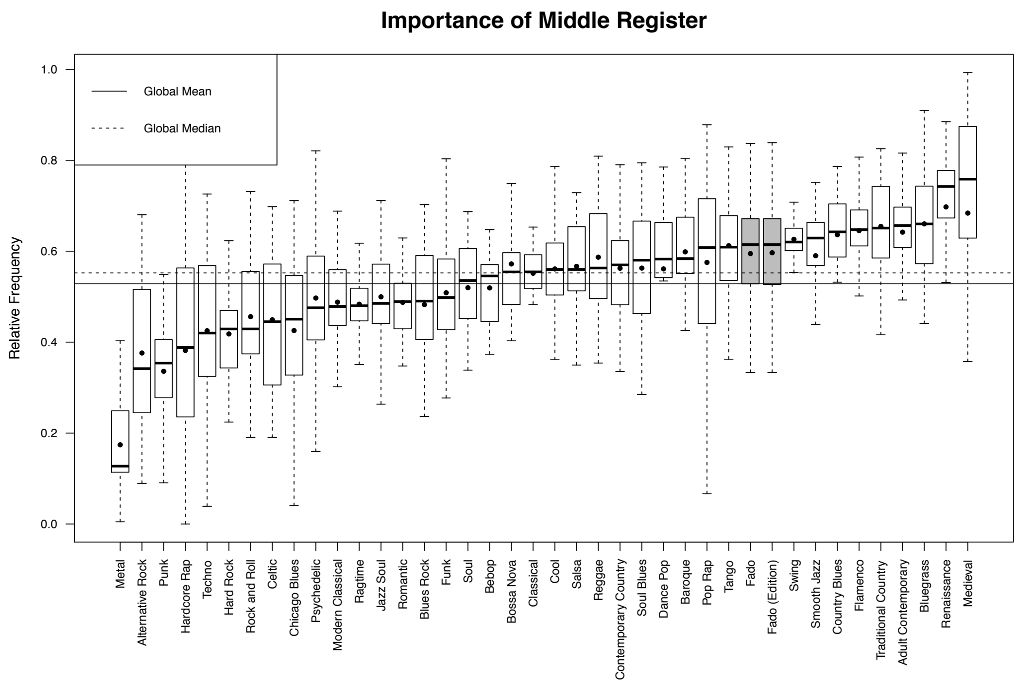

FIGURE 5.39: Importance of Middle Register.

The pitch 55 corresponds to the G below the central C, while pitch 72 is the C above. This range is roughly the main range where most vocals and most melodies occur. Looking at the figure 5.39, fado is slightly above average, at the top third of the spectrum, indicating the importance of this central register in the genre. On the lower part, metal, alternative rock, punk and hardcore rap are the genres to which this register seems less relevant, while medieval, renaissance, bluegrass and adult contemporary highly depend on it.

5.13.5 Importance of High Register

The importance of high register is the "fraction of Note Ons between MIDI pitches 73 and 127" (McKay, 2004, p. 74).

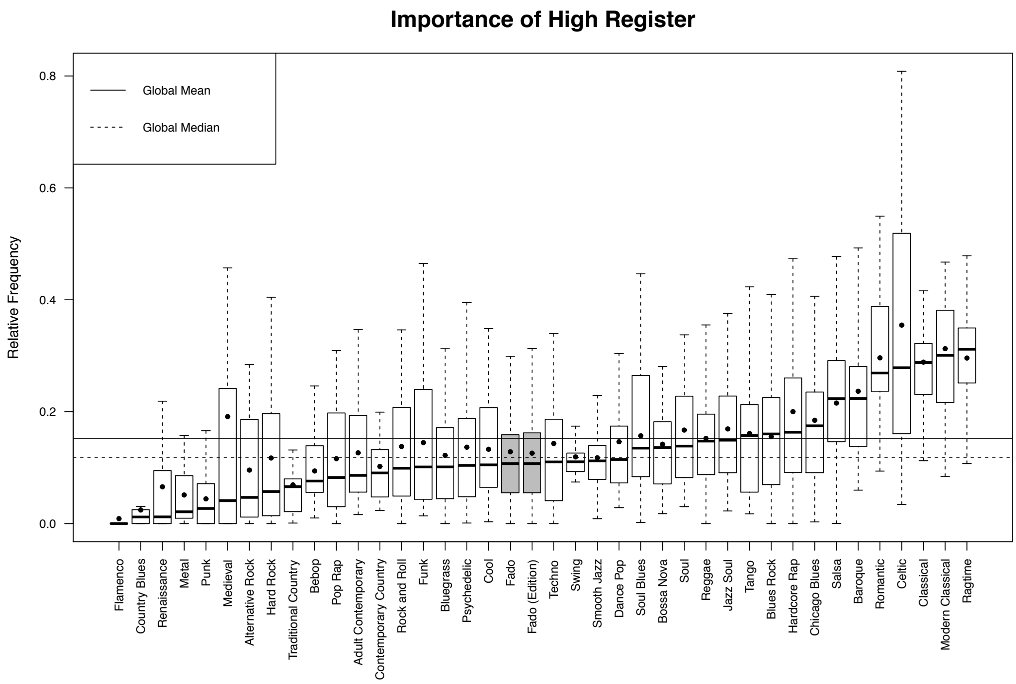

Figure 5.40: Importance of High Register.

The pitch 73 corresponds to the C#/Db, a minor ninth above the central C. This feature (figure 5.40) is useful to understand the practices that highly value melodic, lyrical and ornamental features, which usually transcend the uneducated voice, since most of these notes are unsingable or only singable by sopranos.

Fado is within the average regarding this feature, meaning that although the percentage is not relevant to define the practice, most of other genres also do not depend on this register to be defined by it. This is extremely evident in the cases of flamenco, country blues, renaissance, metal and punk, with marginal percentages of notes within this register. On the other hand, ragtime, modern classical, classical, Celtic and romantic music have high percentages of notes in the higher register, reinforcing the idea of melodies and motives played by melodic instruments, transcending the normal vocal range. Also, it is very common within these genres the doubling of melodies one or two octaves higher, which reinforces, even further, the percentage of notes in this register.

5.14 Pitch Prevalence

We calculated the fraction of note-ons corresponding both to the most common pitch and pitch class. Then, we did the same for the second most common pitch and pitch class and calculated the ratio between them in order to obtain the relative strength of the top pitches and top pitch classes. We also calculated the interval between these two top pitches and top pitch classes for each fado. All these calculations were both performed in the corpus overall, and in the Melodies-only. We have confirmed that indeed fados rely on strong tonal centres and have a fairly skewed distribution of pitches. The most common pitch is consistently prevalent, averaging at 16% and peaking at 33%, when compared to the average of 4,2% in a perfectly even distribution for a two-octave range fado. This tendency is highly reinforced if one regards pitch class, noticing a minimum of 16% and a notable peak of 49%, compared to an average of 8,3% in a perfectly even distribution.

While the high ranges in the relative strength show that there are fados where the second pitch is only a quarter prevalence from the top pitch (indicating a strong tonicization, possibly huge repetition and a more fragmented distribution of the remaining pitches), they also show that there are fados where there is an equilibrium suggesting an alternation of tonics. However these seem to be more the exception than the rule since the average (and median) is considerably relevant: usually the second most common pitch represents 70% of the top's strength, which implies that two pitches alone average at being one third of the pitches in a given fado, and ranging up to an average of 45% of those same pitch classes.

We have also analyzed the interval between the top pitch and second most common pitch (figure 5.41), as well as their respective pitch classes (figure 5.42). It is noteworthy that within the entire corpus the intervals reinforcing the main

Table 5.13: Statistics of Pitch Prevalence

Pitch Prevalence Overall	Avg	Med	St Dev	Var	Min	Max	Range	Skew	Kurt
Most common pitch prevalence	0.16	0.13	0.06	0.00	0.08	0.33	0.25	1.17	0.48
Most common pitch class prevalence	0.27	0.26	0.07	0.00	0.16	0.49	0.33	0.93	0.56
Relative Strength of top pitches	0.70	0.72	0.20	0.04	0.29	1.00	0.71	-0.38	-0.81
Relative Strength of top pitch classes	0.69	0.70	0.18	0.03	0.25	1.00	0.75	-0.18	-0.70
Melodies-only	Avg	Med	St Dev	Var	Min	Max	Range	Skew	Kurt
Most common pitch prevalence	0.22	0.21	0.06	0.00	0.12	0.45	0.33	1.22	2.51
Most common pitch class prevalence	0.24	0.23	0.05	0.00	0.16	0.45	0.30	1.34	2.32
Relative Strength of top pitches	0.74	0.74	0.18	0.03	0.20	1.00	0.80	-0.46	-0.05
Relative Strength of top pitch classes	0.76	0.76	0.17	0.03	0.32	1.00	0.68	-0.54	-0.12

tonal functions take the lead – therefore the perfect fourth relationship seems to imply fados where either the subdominant above or the dominant below the tonic is the second most common pitch (assuming the tonic is the top pitch), while the perfect fifth relationship seems to indicate the opposite – the subdominant below the tonic or the dominant above. The octave and double octave relationship imply, of course, the doubling of the tonic. When one looks only at pitch classes then the octave and double octave intervals vanish, and the percentages relative to perfect fourths and fifths increase naturally. Among the transcriptions, the accompaniments rely mainly on *ostinati* consisting on chordal material referring mainly to the tonic, dominant and subdominant functions. Therefore, their main pitches are, of course, reinforced and their weight statistically increased when compared to Melodies-only. Among the melodies, which have by its nature a smaller range and increased repetition due to the typical stepwise movement, the interval of a second is privileged. This seems to imply a strong emphasis on the tonic and the dominant of the dominant, which is consistent with the idea that to form an arch-shaped melody departing from the tonic, the most obvious step is the second degree, immediately above and also easily harmonized with the dominant. The tritone relationship is never to be seen in this context, either in the corpus or in just the melodies.

5.14.1 Most Common Pitch Prevalence

The comparative statistics based on pitch do not take into account temporal locations, and consider each recording as a whole. Furthermore "all notes occurring on channel 10 were ignored for all of these features, as pitch values on that channel correspond to percussion patches, not to pitches" (McKay, 2004, p. 72). The most

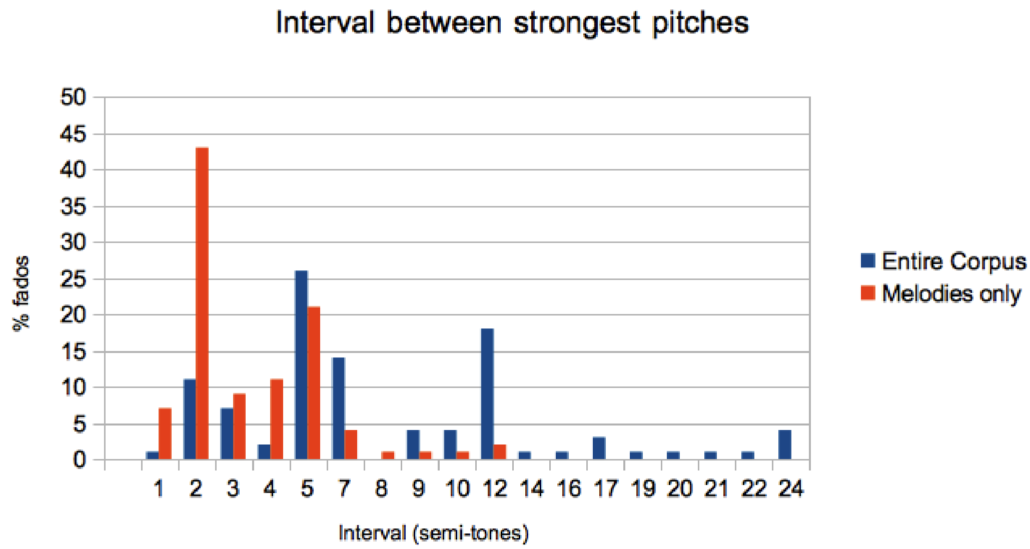

FIGURE 5.41: Interval between strongest pitches.

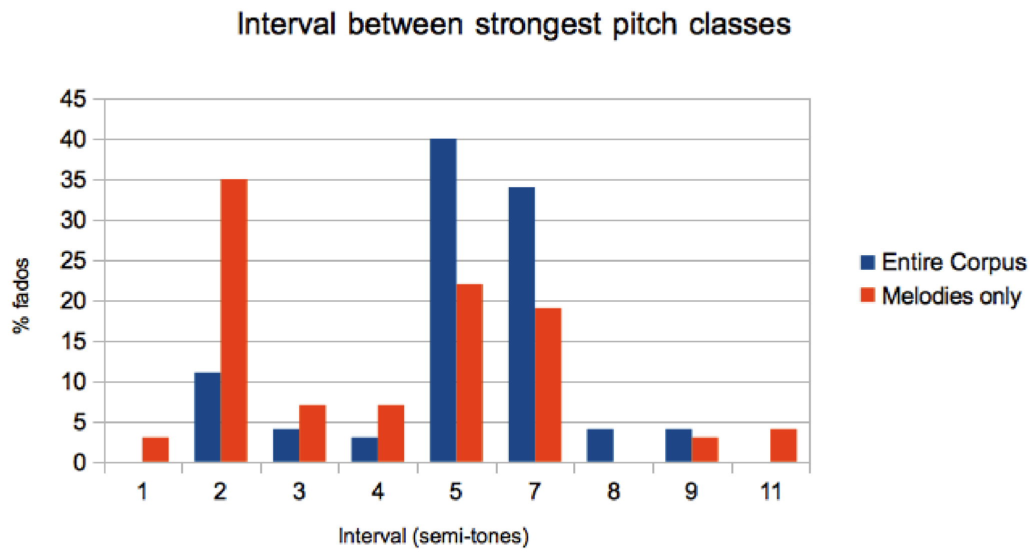

FIGURE 5.42: Interval between strongest pitch classes.

common pitch prevalence refers to the “fraction of Note Ons corresponding to the most common pitch” (McKay, 2004, p. 72).

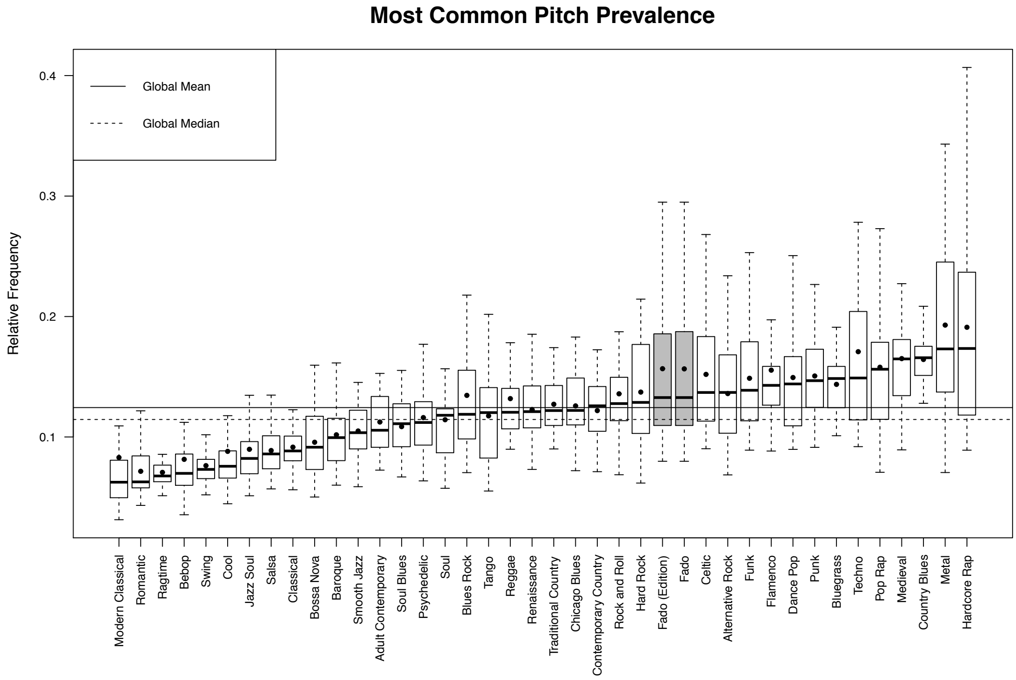

FIGURE 5.43: Most Common Pitch Prevalence.

Looking at the figure 5.43, fado is within the average regarding this feature not standing out in any particular way. While hardcore rap, metal and country blues seem to be characterized by having one pitch that is substantially prevalent (we speculate it to be either a repetitive drone or a reiterated tonal center), on the opposite side, one can find modern classical, romantic, ragtime and bebop as taxonomies with much more variety, no pitch particularly standing out, in relative terms. One can also observe that the ratio between the opposite sides is superior to four.

5.14.2 Most Common Pitch Class Prevalence

The most common pitch class prevalence is defined as the “fraction of Note Ons corresponding to the most common pitch class” (McKay, 2004, p. 72).

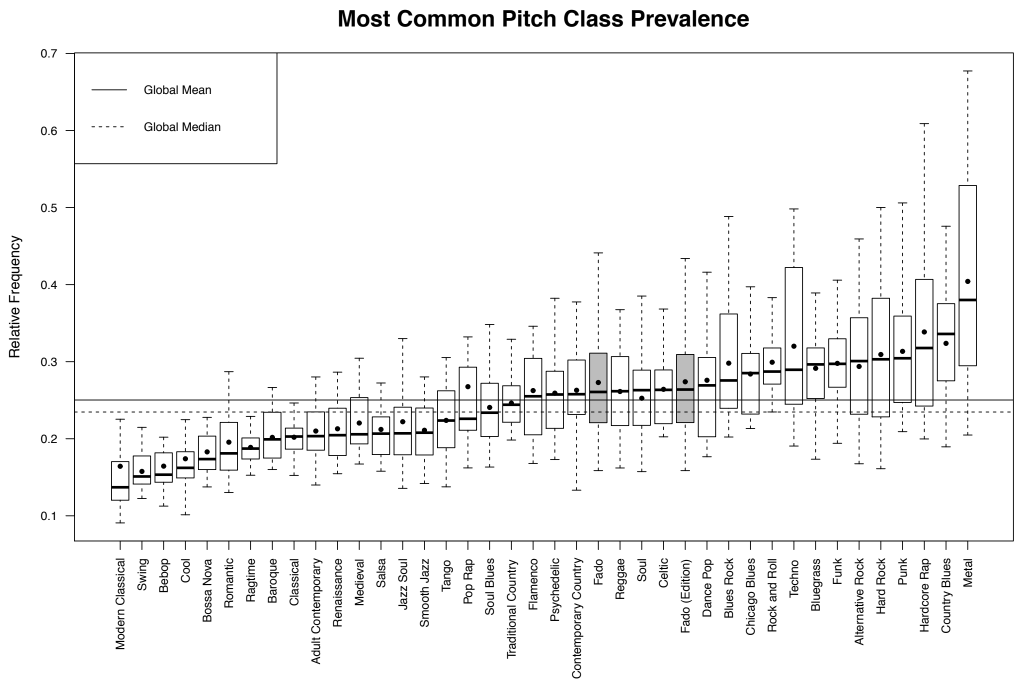

FIGURE 5.44: Most Common Pitch Class Prevalence.

This feature (figure 5.44) reinforces some ideas expressed in the previous one. Fado is among the average, not standing out, while metal, country blues, hardcore rap and punk clearly state one strong tonal center. Minding that in these recordings the prevalence of such pitch class approaches 40%, which is five times an evenly distribution, one has to consider that there is little room for all other possible pitch classes. On the other hand modern classical, swing, bebop and cool have much more even distributions, possibly indicating more variety, chromaticism and complexity.

5.14.3 Relative Strength of Top Pitches

The relative strength of top pitches is defined as "the magnitude of the 2nd most common pitch divided by the magnitude of the most common pitch" (McKay, 2004, p. 72).

Observing the figure 5.45, while fado seemed average regarding the prevalence of a unique pitch and could not be told apart by such feature in itself, when observing the relative strength of the second most common pitch, one finds that

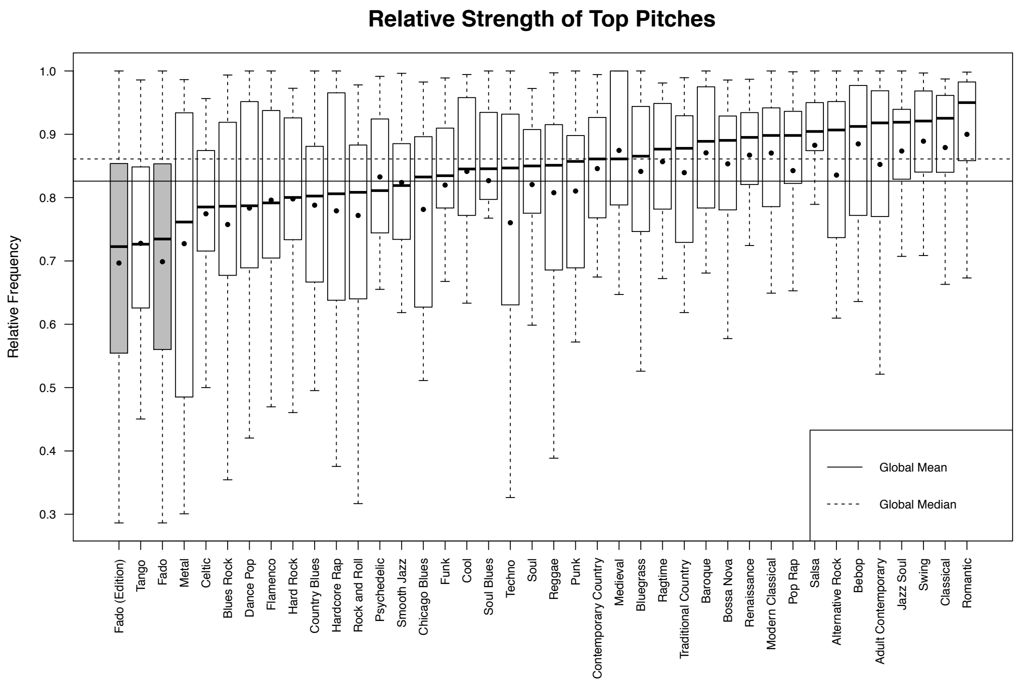

FIGURE 5.45: Relative Strength of Top Pitches.

fado is clearly at the bottom of the list, along with tango, metal and Celtic music. This indicates that fado is indeed a genre in which a tonal center is important, regarding all other pitches, although the particular pitch of the tonal center is not as strong as when compared with other ones. This probably means that such tonal center, in fado, is played in different octaves while in other genres it is reiterated as the same pitch all along. Romantic, classical, swing and jazz soul appear as practices in which the second most prevalent pitch is almost as important as the main one, which corroborates the idea of more variety and complexity.

5.14.4 Relative Strength of Top Pitch Classes

The relative strength of top pitch classes is defined as “the magnitude of the 2nd most common pitch class divided by the magnitude of the most common pitch class” (McKay, 2004, p. 72).

And this feature (figure 5.46) corroborates our thesis that fado is indeed a genre that depends on a strong tonal center, along with metal, hard rock, country blues, and funk. While on a genre like metal it seems that such tonal center is often

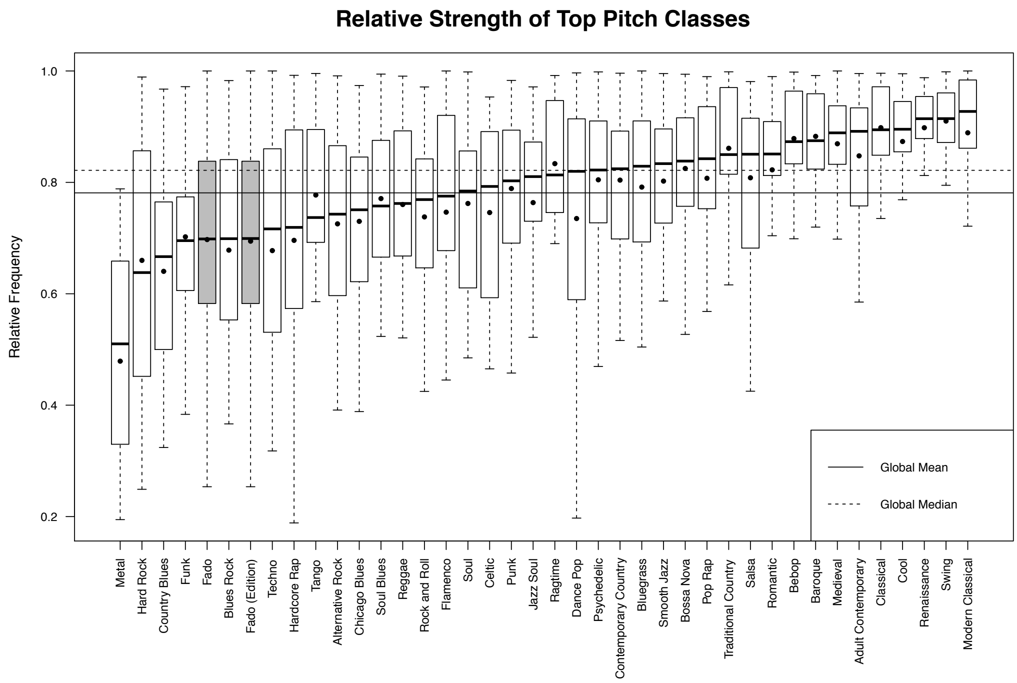

FIGURE 5.46: Relative Strength of Top Pitch Classes.

played in the same octave, in fado the octave is not really important. Modern classical, swing, renaissance, cool and classical are at the opposite side of the spectrum, indicating either the absence of tonal centres, or the presence of at least two.

5.14.5 Interval Between Strongest Pitches

The interval between strongest pitches is defined as the "absolute value of the difference between the pitches of the two most common MIDI pitches" (McKay, 2004, p. 73).

Observing the figure 5.47, fado is included in a cluster of taxonomies in which the most relevant interval between the strongest pitches is the perfect fifth (seven semi tones), as denoted by the median value. Other important values seem to be the perfect fourth and the octave among these styles. A huge cluster of other taxonomies has instead the perfect fourth as the main value while also retaining the perfect fifth as important. The exceptions seem to be hard rock and ragtime with a remarkable preference for the octave. All these taxonomies seem to be

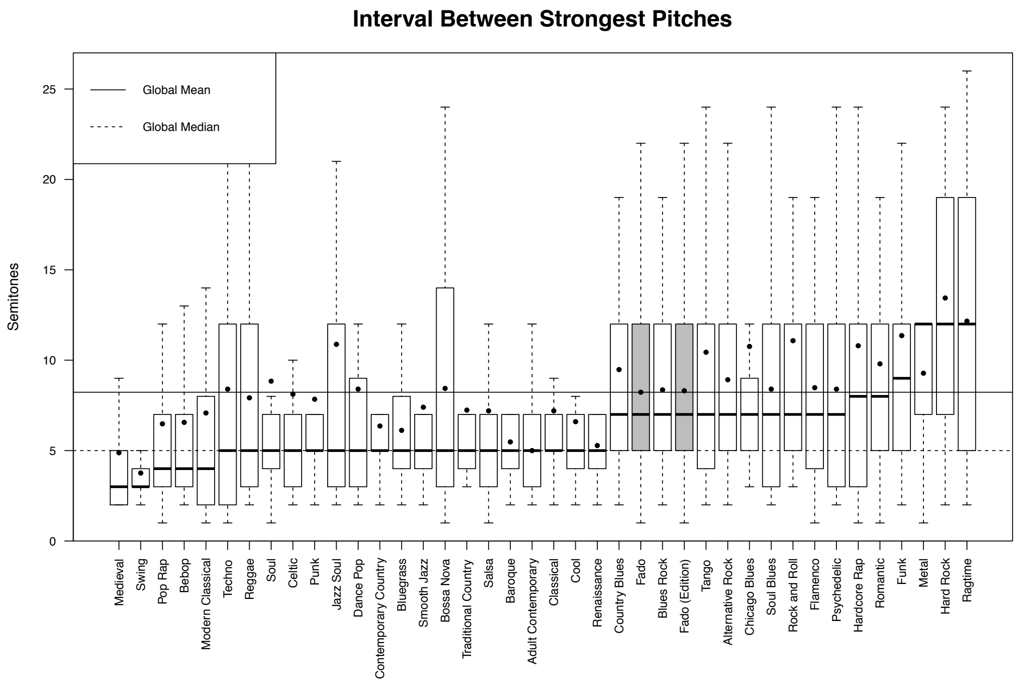

FIGURE 5.47: Interval Between Strongest Pitches.

tonal oriented though. At the other side of the spectrum, medieval and swing privilege the minor third, while pop rap, bebop and modern classical prefer the major third. These choices seem to point out to more ambiguous genres regarding tonality, probably approaching modality or other kind of theoretical systems which can make sense.

5.14.6 Interval Between Strongest Pitch Classes

The interval between strongest pitch classes comprises the "absolute value of the difference between the pitches of the two most common pitch classes" (McKay, 2004, p. 73).

This feature (figure 5.48) simply reinforces the last one. Being aware that the factor octave has vanished, one can observe how indeed the majority of the genres, in the database, are tonal. The perfect fourth and perfect fifth, are privileged as the main interval between the strongest pitches, indicating a clear prevalence of a tonic and a dominant or a subdominant. Swing, medieval, pop rap, techno and hardcore

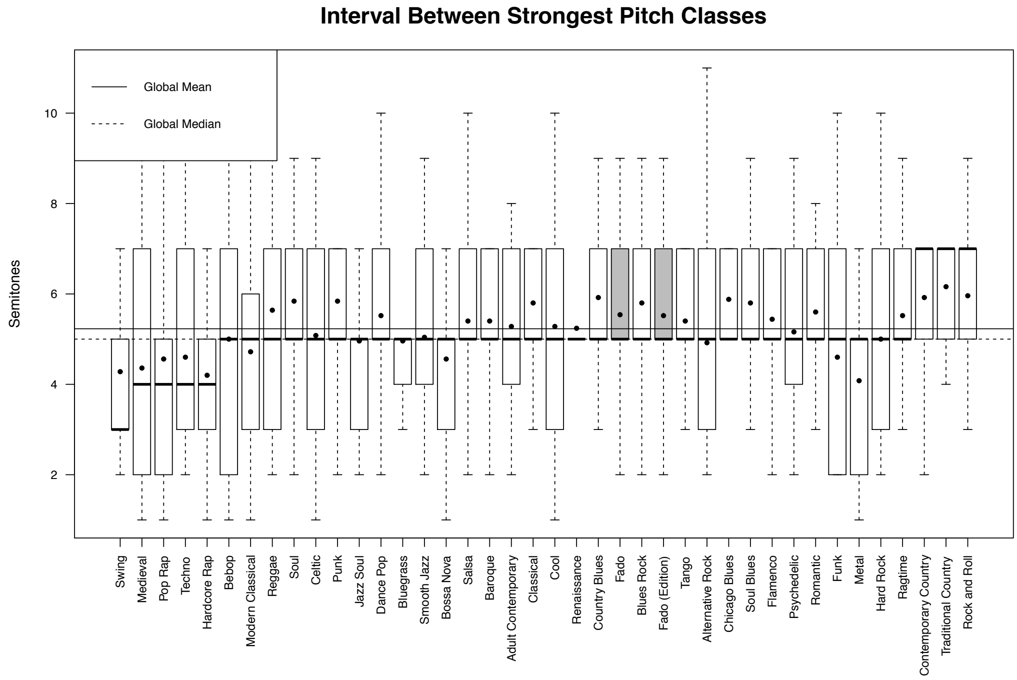

FIGURE 5.48: Interval Between Strongest Pitch Classes.

rap are the notable exceptions, with the third being the most predominant interval, among the strongest pitches.

5.14.7 Number of Common Pitches

The number of common pitches is defined as the "number of pitches that account individually for at least 9% of all notes" (McKay, 2004, p. 73).

This feature (figure 5.49) is useful in suggesting the complexity or intricacy of a style and fado does not stand out, being part of an enormous cluster of taxonomies which revolve around two main pitches. Medieval seems clearly the exception, accentuating probably its modal character, as well as its expected narrow range. An interesting, and somewhat expected, cluster of genres comprising swing, bebop, modern classical, afro soul, salsa, classical, cool, romantic and ragtime seem characterized by a profusion of different pitches.

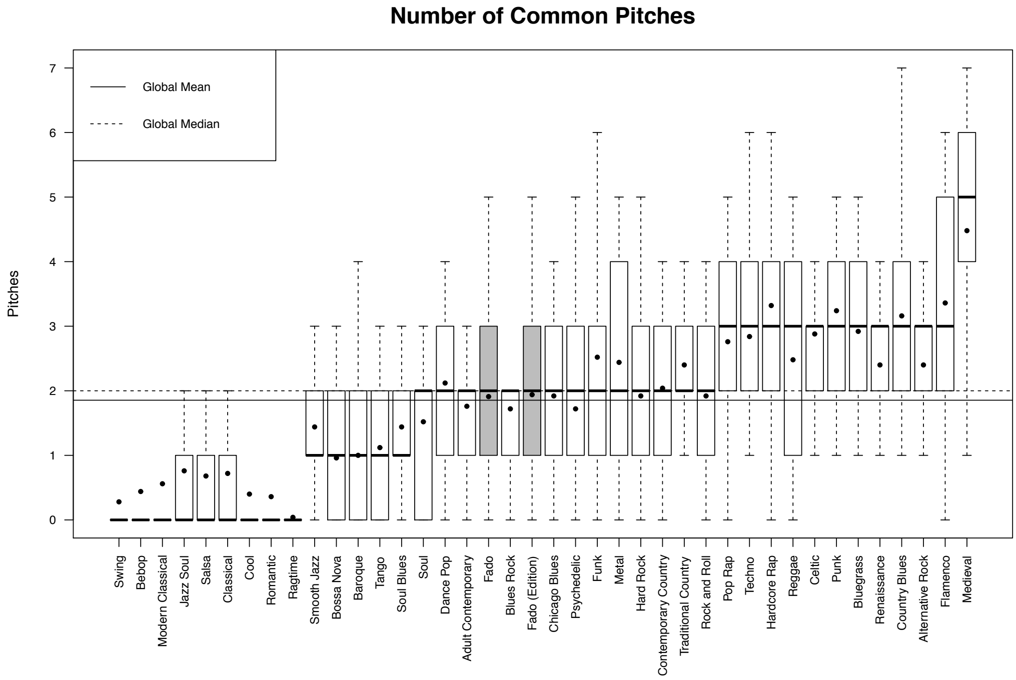

Figure 5.49: Number of Common Pitches.

5.14.8 Pitch Variety

The pitch variety is the "number of pitches used at least once" (McKay, 2004, p. 73).

This feature (figure 5.50) is an excellent complement to the previous one, because it allows us to determine the real distribution of pitches overall. Accounting just for the number of common pitches there might exist genres that, while having some common ones, could still have many more scattered with very low occurrences, or a great number of unique pitches. This is the case of Romantic music, being the overall style with most pitches, while still having few common ones, which seems to be compatible with the idea of large range, while preserving some tonality.

Fado is at the low side, in this feature, being a practice with relatively few pitches overall. This seems to point out, not only for its simplicity, but possibly also for a somewhat narrow range. Medieval, flamenco, hardcore rap, renaissance and country blues are the lowest ones.

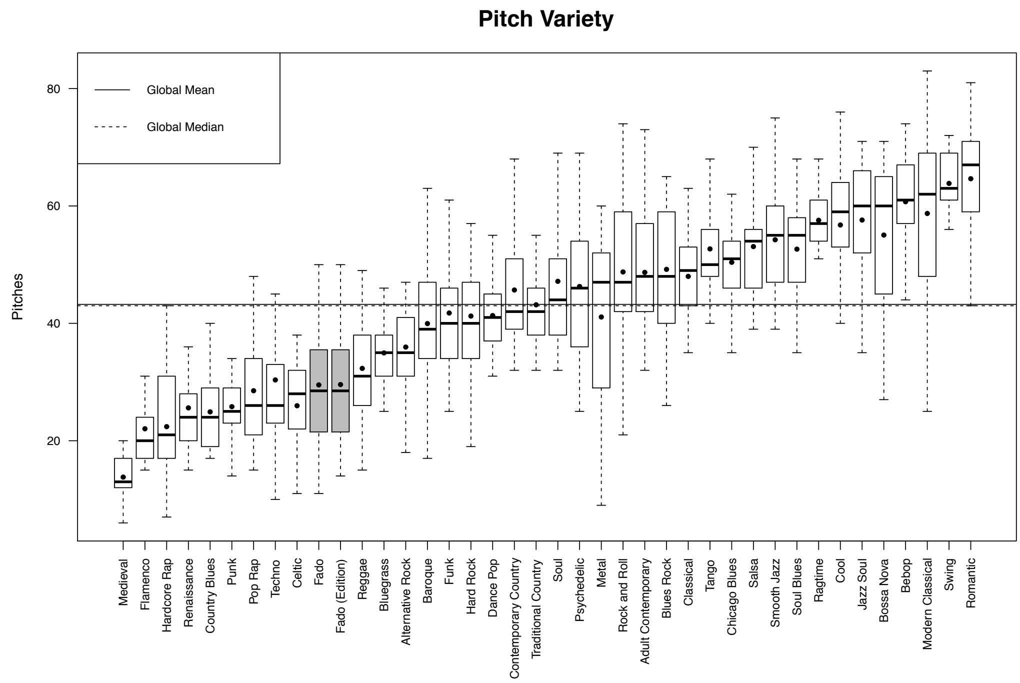

FIGURE 5.50: Pitch Variety.

5.14.9 Pitch Class Variety

The pitch class variety is the "number of pitch classes used at least once" (McKay, 2004, p. 73).

This feature (figure 5.51) complements the last one, allowing us to differentiate between the genres that seem complex because they have many pitches, but are indeed octave doublings. Analyzing only the pitch classes it can be seen how most genres use all, or nearly, the full template of the twelve pitches available. So, while fado averaging at ten pitches could seem to be a rather complex or nearly chromatic practice, when seen in relative terms is actually on the lower third of the spectrum. This, again, points to its simplicity, in pair with country blues, dance pop or flamenco. Medieval, hardcore rap and punk seem to be the simplest of them all, while romantic, swing, modern classical, and the overall cluster of jazz-related genres confirm themselves as the most complex ones.

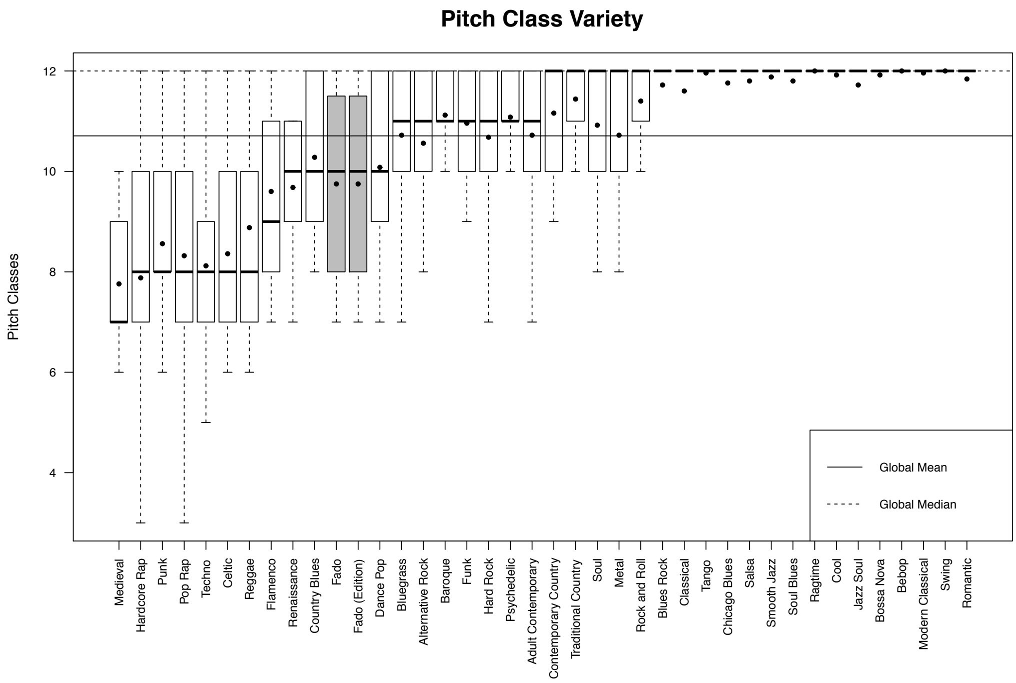

FIGURE 5.51: Pitch Class Variety.

5.14.10 Most Common Pitch Class

The most common pitch class is defined as the "bin label of the most common pitch class" (McKay, 2004, p. 74).

The visualization of this feature as presented in the other figures makes no sense in this case. While it is certainly important to notice what the most common pitch class is, in a given practice, global median and mean seem to have a meaningless value in this context, not being known exactly what they represent. On the other hand, the mode within any given taxonomy and their overall distribution makes sense.

Most genres have as the most common pitches the 4 (E) and the 7 (G). The most common pitch class in Fado is 9 (A), which is also fairly common among other genres, namely baroque, hardcore rap, reggae, psychedelic and punk. A few number also privilege pitches 0 (C) and 5 (F), and a lesser number 2 (D) and 11 (B). No genres have as the preferred pitch any of the "black keys" of the piano. Instrumentation is probably the main factor behind these facts.

TABLE 5.14: Most Common Pitch Class

Taxonomy	Mode	Taxonomy	Mode	Taxonomy	Mode
Medieval	2	Dance Pop	7	Contemporary Country	4
Renaissance	5	Psychedelic	9	Cool	0
Baroque	9	Jazz Soul	5	Bebop	0
Hardcore Rap	9	Smooth Jazz	7	Soul	4
Classical	7	Chicago Blues	4	Romantic	4
Swing	0	Soul Blues	11	Modern Classical	5
Celtic	4	Traditional Country	7	Salsa	7
Blues Rock	4	Hard Rock	7	Tango	2
Funk	2	Bossa Nova	4	Ragtime	7
Pop Rap	11	Metal	4	Alternative Rock	4
Reggae	9	Bluegrass	7	Rock and Roll	0
Techno	5	Adult Contemporary	7	Punk	9
Fado	9	Flamenco	4	Country Blues	7

TABLE 5.15: Distribution of the most common pitch class

Pitch Class	#
0	4
1	0
2	3
3	0
4	10
5	4
6	0
7	10
8	0
9	6
10	0
11	2

5.15 Melody

Most fado melodies are either characteristically arch shaped or undulating. The shape of the melodies are the result of unfolding the narrative, contriving each line into a pair of 2/4 measures, respecting both the emotional prosody and the underlying harmonic progression. The melodic form varies greatly within the repertoire. The oldest fados in the sources are very simple and strophic, with little to no variation. These sources, however, present only the musical scores. Since there were no recordings back then, one cannot be sure that the melodies were effectively sung that way, rather than improvised and more varied. The textual descriptions of the practice and the very idea that styling and improvisation are values highly regarded and praised in fado, in the beginning of the twentieth century, lead us to believe that the melodies would vary more than what is presented in the musical scores, depending also on the skill of the performer. During the twentieth century, and with the evolution of the practice, the form also evolved and complex strophic fados with great variation appeared and even some through-composed fados resembling art songs emerged in the repertoire. All these possibilities co-exist nowadays, with very complex forms and simple strophic fados circulating side by side.

In fado practice, the combined ability to manipulate, not only the rhythm of a melody, but also the pitch is called *estilar* (styling). Very much like other improvisatory practices (namely Jazz), styling is a kind of improvisation. It "is overwhelmingly spoken about by *fadistas* as essentially unlearnable, as the defining characteristic of fado as genre as practice and of a *fadista* as an individual voice. Instrumentalists style too." (Gray, 2013, p. 144) If one considers again the idea of an ideal version of each fado, an *urtext*, it is clear that there is a whole continuum of possible variations on the melody, in which one can go further and further away. Some fados are more suitable to be highly manipulated while others are not. It is also a skill that depends on the creativity, musicality and risk taking of the *fadista* and the instrumentalists (Gray, 2013, p. 146). This ideal version of a fado is generally attributed to the first person to fix it in a given medium. In the nineteenth century this would be the musical score, but in the twentieth century this was mainly the phonogram. The *fadista* was then entitled the "creator", as one can see in the music scores covers and records. There was the composer (when the fado was authored), the author (the lyricist) and this new figure – the creator. Because, and following the reasoning of Manuela de Freitas, already discussed, it is the *fadista* the one who embodies the fado, and brings it to life, in fact, the one creating it. Without the *fadista*, the music is not fado, it is just music on a score. A second creator may become a composer, when styling in such a way that the result departs so much from the original version, and consistently within the creator's style or grammar, that the new version is then fixed. And it is believed that this dynamic, dialogic and emergent process gave birth to a whole series of fados, the ones all derived from others, during the second half of the nineteenth century and beginning of the twentieth century.

> "When performers style melodies, they draw on shared musical

> grammars and conventions (...). Highly inventive *fadistas*, working within these shared conventions and performance histories, may, through repeat performances, develop their own melodic figures for specific fados in their repertoire, melodic formulas than can then be creatively refigured in their future improvisations of the same fado" (Gray, 2013, pp. 154-155).

Melodies are contrived both by the underlying harmonic progression and the text, as described earlier. Most lines begin with unstressed syllables, thus becoming pick-up notes. Hence, the archetypical situation is that most fado melodies begin with an ascending leap of a fourth, as a consequence of those pick-up notes being in the dominant, leading to the tonic, in the downbeat of the first bar. The sequential melodic contours follow logically these constraints and the final tone rests inevitably in the tonic. Sometimes, however, in very dramatic renditions of a fado by rather skilled performers, and for emotional and climactic effect, the peak note is chosen to be also the last. In those situations, the melody is varied in the last strophe so that the tonic standing in a low register is transposed one or even two octaves higher and reached via an upward movement. The archetypical situation is shown in notation (figure 5.52) and most fados in the transcriptions can be seen as more or less inventive variations of this archetype, depending on the initial constraints.

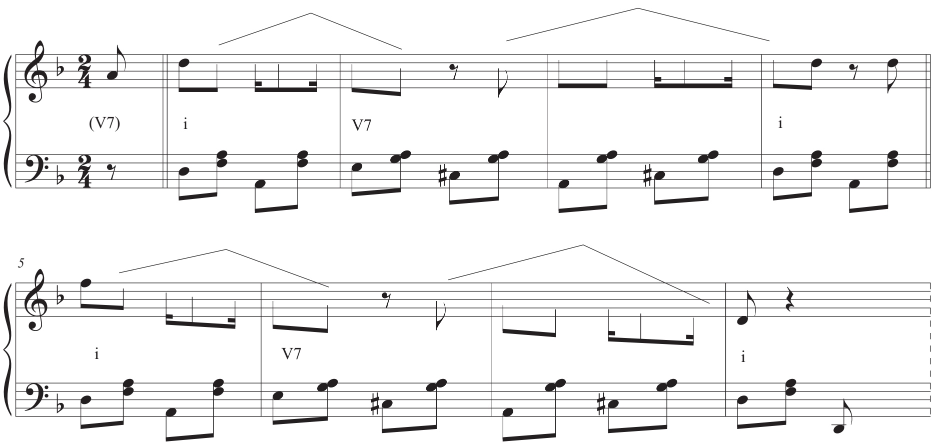

Figure 5.52: A fado archetype.

5.15.0.1 Pitch Variety in melodies

The number of common pitches (table 5.16) are defined as the number of pitches that account individually for at least 9% of all notes (McKay, 2004, p. 73) and complement the information obtained in pitch prevalence. While it is already know that fados are highly skewed towards tonal centres, looking at the minimum and maximum values of this parameter one can also see fados with no common pitches, meaning a total fragmentation of the distribution, and possibly more variety, up to fados with five common pitches, possibly the ones where more modulations occur. On average, though, only two pitches seem to have prevalence, and we predict them to be the tonic and the dominant in most cases. Among the Melodies-only, since the range is smaller (and thus there are less possibilities) the concentration around certain pitches increases and so it can be said that on average melodies are based around five pitches. We predict them to be the tonic, dominant, subdominant, the second degree (dominant of dominant) and the leading tone.

The pitch variety, meaning the number of pitches that show up at least once (McKay, 2004, p. 73), is a value presenting an enormous variance, hinting that there are very monotonous fados based around a few number of pitches (as small as fourteen), to more complex ones with fifty different pitches. The average is thirty. If one translates these values into pitch classes, it can be indeed confirmed that, although relying on strong tonal centres, most fados, mainly due to modulations, present on average almost all of the chromatic scale averaging on ten pitch classes. We predict the ones missing most should be the tritone and the augmented fifth. When focusing on Melodies-only, this number is slightly less, averaging on nine pitch classes per melody, and thirteen pitches overall.

Table 5.16: Statistics of Pitch Variety

Corpus	Avg	Med	St Dev	Var	Min	Max	Range	Skew	Kurt
Number of Common Pitches	1.94	2.00	1.07	1.15	0.00	5.00	5.00	0.57	0.20
Pitch Variety	29.57	28.50	9.23	85.18	14.00	50.00	36.00	0.36	-0.72
Pitch Class Variety	9.75	10.00	1.77	3.12	7.00	12.00	5.00	-0.10	-1.35
Melodies-only	Avg	Med	St Dev	Var	Min	Max	Range	Skew	Kurt
Number of Common Pitches	4.47	5.00	1.11	1.22	1.00	7.00	6.00	-0.52	0.69
Pitch Variety	12.96	13.00	3.92	15.33	7.00	25.00	18.00	0.91	0.57
Pitch Class Variety	9.02	9.00	1.61	2.61	6.00	12.00	6.00	0.20	-1.03

5.15.1 Pitch-Class distribution

Concerning pitch-class distribution, specifically among the melodies, it is possible to confirm (figure 5.53) that the tonic is the prevalent one by far, averaging at 24%, followed by the second, fourth, fifth and minor seventh degrees all with similar prevalences, above the average on a theoretical perfect evenly distribution. This is somewhat expected since these are the pitch-classes present in most functional chords, but with the surprise of the low percentage of the leading tone, compared with, for instance, the minor seventh. As a third tier we have the major third and sixth degrees and then all the others well below average, with the tritone being almost inexistent.

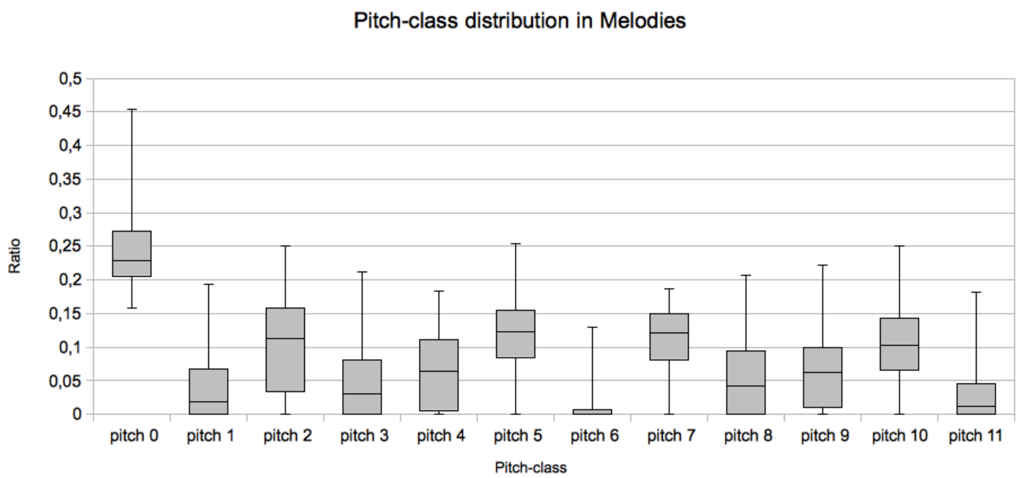

FIGURE 5.53: Pitch-Class distribution in melodies.

5.16 Melodic Intervals

In order to better understand the melodies, not only pitches are relevant but also the transitions between them. Therefore, we have performed a series of calculations on the Melodies-only (table 5.17). The average melodic interval has a rather large span among fados and by itself does not seem such a useful value to draw conclusions from, so further calculations will be required. On the other hand, the most common melodic interval gives us more precious information, confirming that indeed smaller values (like stepwise motion) are highly preferred, which is expected among melodies. The distance between the most common melodic intervals reinforces this idea, since typically the second most common interval is just half tone away, hinting at the possibility that the most common intervals on melodies are unisons, seconds and thirds. The most common melodic interval prevalence shows us how on average it recurs from one fifth up to half of the times in each melody, averaging at one third, while the second most common interval averages at 70% of this rate. Usually there are four melodic intervals in each melody that at least account for 9% of all melodic intervals.

Table 5.17: Statistics of Melodic Intervals

Melodies-only	Avg	Med	St Dev	Var	Min	Max	Range	Skew	Kurt
Average Melodic Interval	2.48	2.42	0.84	0.71	0.90	8.42	7.52	3.73	24.76
Most Common Melodic Interval	1.72	2.00	1.38	1.90	0.00	12.00	12.00	4.06	30.75
Distance between Most Common Melodic Intervals	1.52	1.00	0.72	0.51	1.00	6.00	5.00	2.86	15.01
Most Common Melodic Interval Prevalence	0.33	0.32	0.07	0.01	0.20	0.53	0.33	0.60	0.15
Relative Strength of Most Common Melodic Intervals	0.70	0.71	0.17	0.03	0.29	1.00	0.71	-0.26	-0.71
Number of Common Melodic Intervals	3.96	4.00	0.90	0.81	2.00	6.00	4.00	0.08	-0.19

Since the average interval was an incomplete statistic, we have gone further and explored more the type of intervals one can found on melodies (table 5.18). In the transcriptions, the fraction of horizontal intervals that are repeated notes, minor thirds, major thirds, perfect fifths, minor sevenths, major sevenths, octaves, minor tenths or major tenths, on average represent 42% of all melodic material, which indicates how chordal derivatives are important and expected in highly tonal tunes. Stepwise motion is the most prominent interval accounting for half of the total, on average, up to a maximum of 80% in some fados. Repeated notes (or unisons) are highly relevant as they average on 17% of all intervals to a maximum of 52% on certain fados. Chromatic motion is equally relevant with similar values, as well as melodic thirds which also account for a fifth of the possible intervals. The amount of bigger leaps with relevant percentages seems almost irrelevant within the context. According to Huron, singing is usually stepwise, with larger leaps immediately compensated by a step in contrary motion (Huron, 2008), and these statistics seem to confirm this general trend. Fado singers seem to have a lower maximum phonational frequency range (MPFR, an acoustic measurement representative of the physiologic limits of the larynx) than Western Classical singers, and this could be related with life habits, less or lack of singing training, or it could be just a fado voice characteristic (Mendes *et al.*, 2013).

TABLE 5.18: Statistics of Melodic Motion

Melodies-only	Avg	Med	St Dev	Var	Min	Max	Range	Skew	Kurt
Amount of Arpeggiation	0.42	0.42	0.11	0.01	0.17	0.68	0.51	-0.09	-0.06
Repeated Notes	0.17	0.16	0.10	0.01	0.00	0.52	0.52	0.63	0.36
Chromatic Motion	0.19	0.18	0.09	0.01	0.03	0.49	0.46	0.92	1.91
Stepwise Motion	0.47	0.49	0.13	0.02	0.13	0.80	0.67	0.09	0.08
Melodic Thirds	0.20	0.17	0.09	0.01	0.06	0.56	0.49	1.34	2.43
Melodic Fifths	0.03	0.02	0.04	0.00	0.00	0.24	0.24	2.94	12.48
Melodic Tritones	0.02	0.01	0.02	0.00	0.00	0.11	0.11	2.14	5.84
Melodic Octaves	0.01	0.00	0.05	0.00	0.00	0.42	0.42	7.67	64.97

5.17 Comparative features based on Melody

This set of features tries to reflect meaningful data on pitches taking into account the order in which they are played. Unfortunately it is not easy to purely discriminate the main melodies in any given MIDI file. What *Bodhidharma* does is to collect statistics regarding melodic motion, however, all notes occurring in any given channel are treated as a melody, which might create a distortion. Since we already had prepared a third edited corpus with just the main melodies filtered and trimmed, according to Ernesto Vieira's model, what we have done was to replace the "Edition corpus" values with those from the "Melodies-only" corpus for this particular set of features only. Therefore in all figures one will be able to see the relative positions of raw fado corpus within the scope of the raw database, but the main fado Melodies-only as well. Unfortunately it was not possible to have a version of the entire database with the main Melodies-only, which would have been ideal to test these features.

5.17.1 Average Melodic Interval

As one can see (figure 5.54), in relative terms, fado has huge melodic intervals if one considers all voices as a whole. This can be explained considering the accompaniment, as there are huge leaps between adjacent pitches in the lower voices. Those leaps correspond to the alternation of the notes played by the thumb and the other fingers in the guitar, or the bass and chord notes on the left hand of a piano player. Country blues, flamenco and ragtime also display huge average melodic intervals because these files were encoded using the same principle.

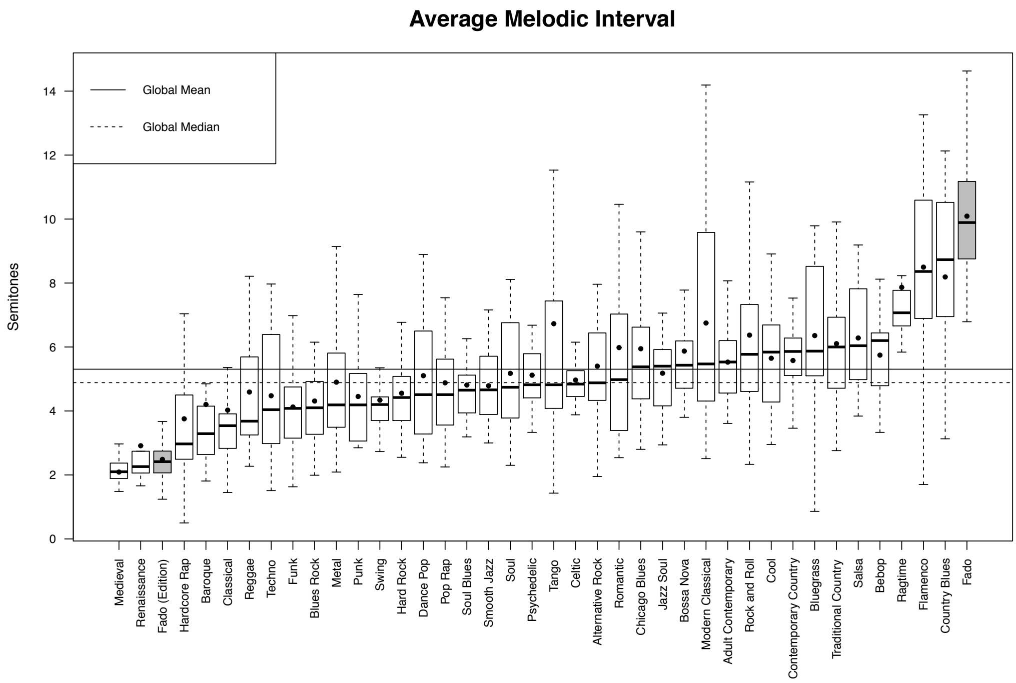

Figure 5.54: Average Melodic Interval.

Looking at the fado Melodies-only, then the scenario drastically changes: the interval is now a little less than two semitones, along with medieval and renaissance. This reveals a tendency to mostly conservative stepwise, undulating melodies.

5.17.2 Most Common Melodic Interval

The most common melodic interval is defined as the “melodic interval with the highest magnitude” (McKay, 2004, p. 75).

This figure (figure 5.55) is consistent with the last interpretation. Indeed the most common melodic interval in fado is the largest one among the entire database, having the perfect fourth as its median point. This reflects the huge leaps in the accompaniments, them being usually fourths, fifths and octaves. On the other hand when looking at the Melodies-only, then fado behaves as expected and the most common melodic interval is the whole tone. This seems to be the most common melodic interval among most taxonomies. A generous number of genres also privilege the unison.

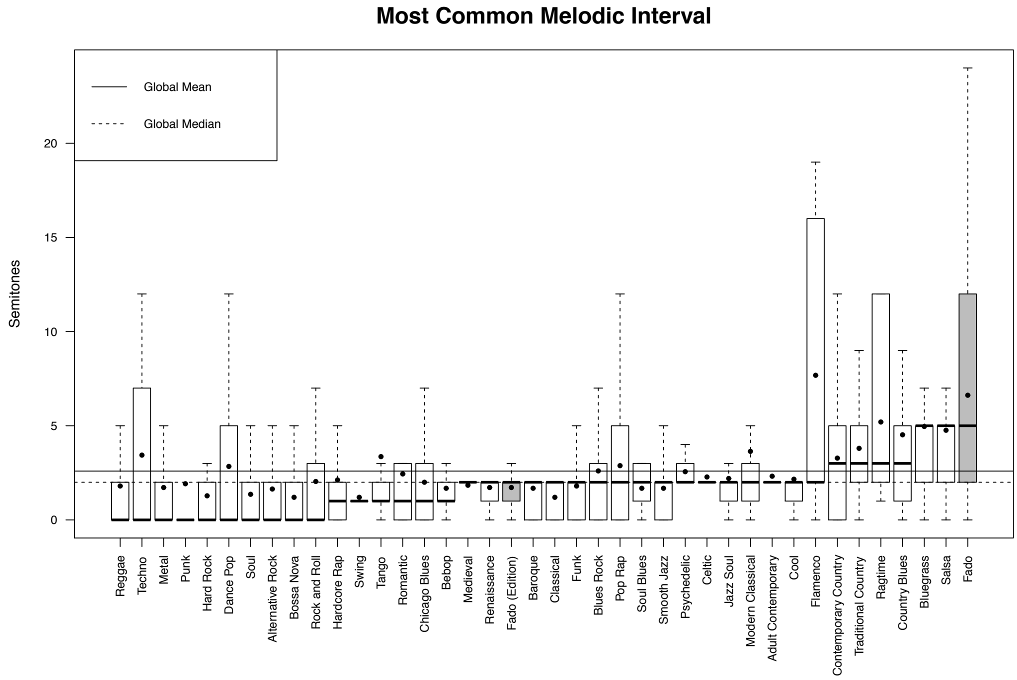

FIGURE 5.55: Most Common Melodic Interval.

5.17.3 Distance Between Most Common Melodic Intervals

The distance between most common melodic intervals is defined as the "absolute value of the difference between the most common melodic interval and the second most common melodic interval" (McKay, 2004, p. 75).

As expected, in most genres the distance between their most common melodic intervals is just a half or a whole step (figure 5.56). This reflects diatonic melodies moving stepwise up or down, and the fado melodies respect that trait. When considered as a whole, then due to the accompaniment, the leaps are bigger.

5.17.4 Most Common Melodic Interval Prevalence

The most common melodic interval prevalence is defined as the "fraction of melodic intervals that belong to the most common interval" (McKay, 2004, p. 75).

This feature (figure 5.57) is highly interesting because it allows us to hint, regardless of the how the file was encoded, the diversity of intervals used. If the most

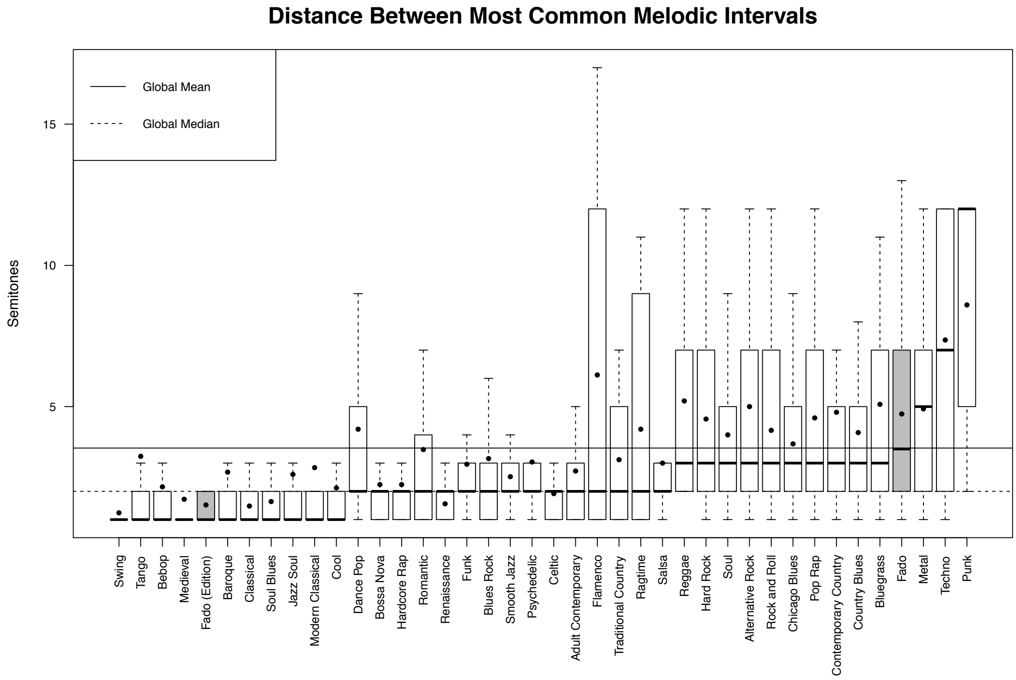

FIGURE 5.56: Distance Between Most Common Melodic Intervals.

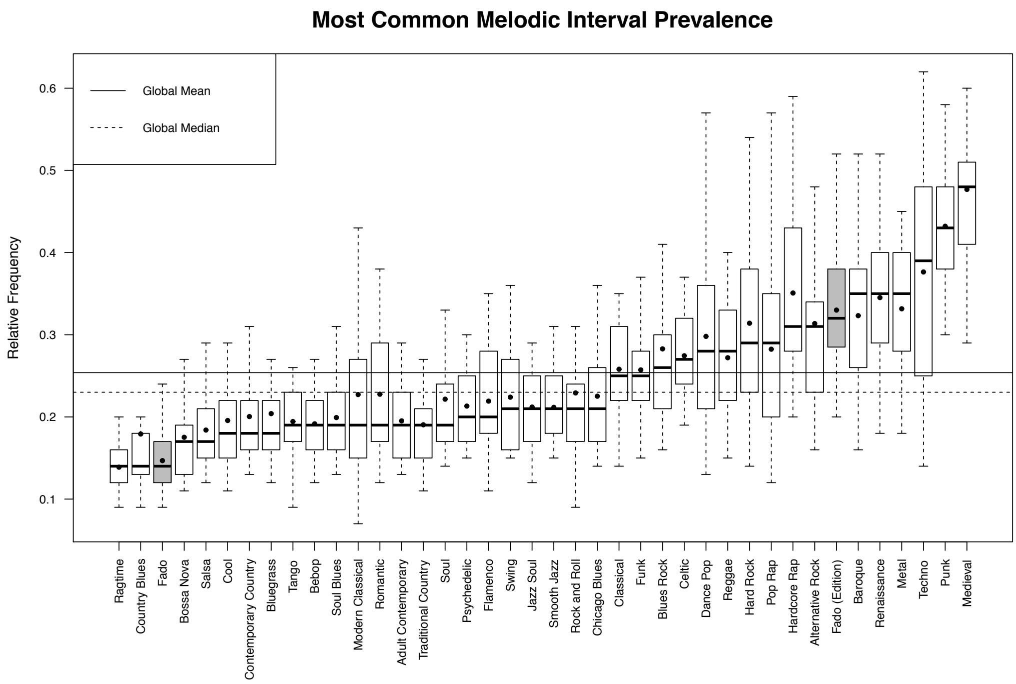

FIGURE 5.57: Most Common Melodic Interval Prevalence.

prevalent melodic interval has a low percentage this means all possible intervals are scattered and distributed, thus no one being highly prevalent. While if one takes fado as a whole one sees a relatively high prevalence of one interval above all others, the complete opposite happens when looking at the main Melodies-only. This points out to how the accompaniments have highly repetitive structures relying on the same interval over and over, while the melodies seem to be much more diverse. Fado melodies when compared to all other taxonomies also show signs of being highly inventive along with bossa nova, country blues and ragtime. On the other hand, medieval, punk and techno seem to rely too much on a given melodic interval, although in these later cases we suspect it is because of accompaniment figurations.

5.17.5 Relative Strength of Most Common Intervals

The relative strength of most common intervals is defined as the "fraction of melodic intervals that belong to the second most common interval divided by the fraction of melodic intervals belonging to the most common interval" (McKay, 2004, p. 75).

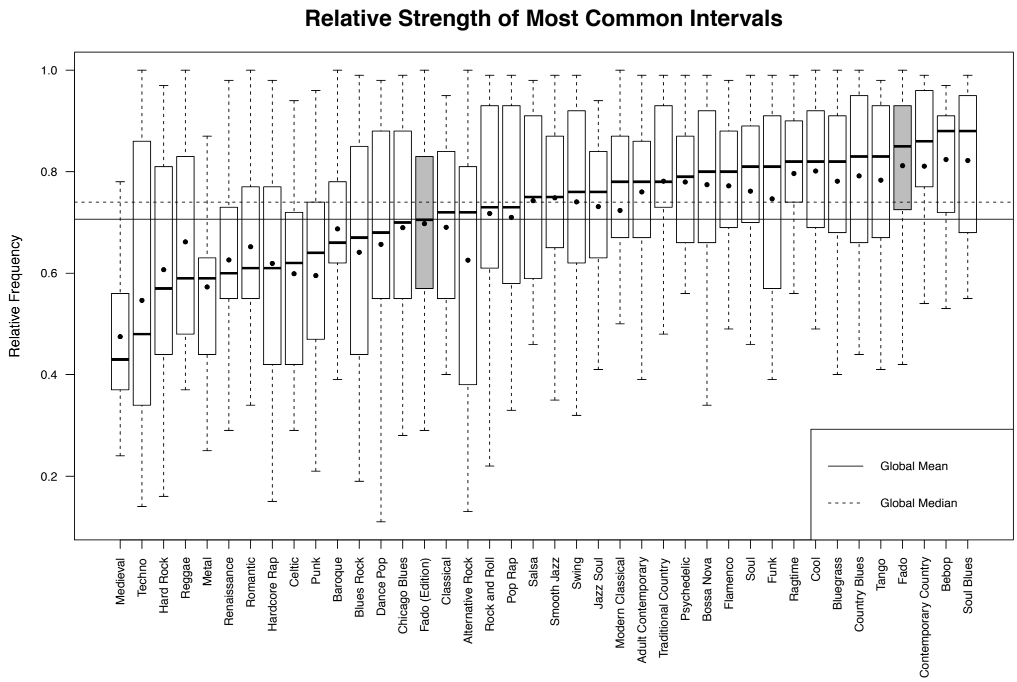

Figure 5.58: Relative Strength of Most Common Intervals.

This feature (figure 5.58) complements the last one as it allows to better understand the melodic motion distribution. In practical terms, looking at fado, it can be seen that the accompaniment figuration not only possesses one relevant melodic interval, but also at least two of almost equal importance in relative terms. On the other hand, looking at melodies, it seems that the second most relevant interval has some relative distant weight from the most common interval. It was previously shown that the most common melodic interval on fado melodies is the whole tone, and that the distance to the second most common melodic interval is the half tone. Therefore it can be inferred that in the fado melodies the whole tone is relatively more prevalent than half tones and minor thirds. Looking at the entire spectrum of taxonomies it seems that the second most common interval in soul blues, bebop and contemporary country is as important as the first one, while on medieval and techno one can see that a single melodic interval clearly outperforms all others.

5.17.6 Number of Common Melodic Intervals

The number of common melodic intervals is the "number of melodic intervals that represent at least 9% of all melodic intervals" (McKay, 2004, p. 76).

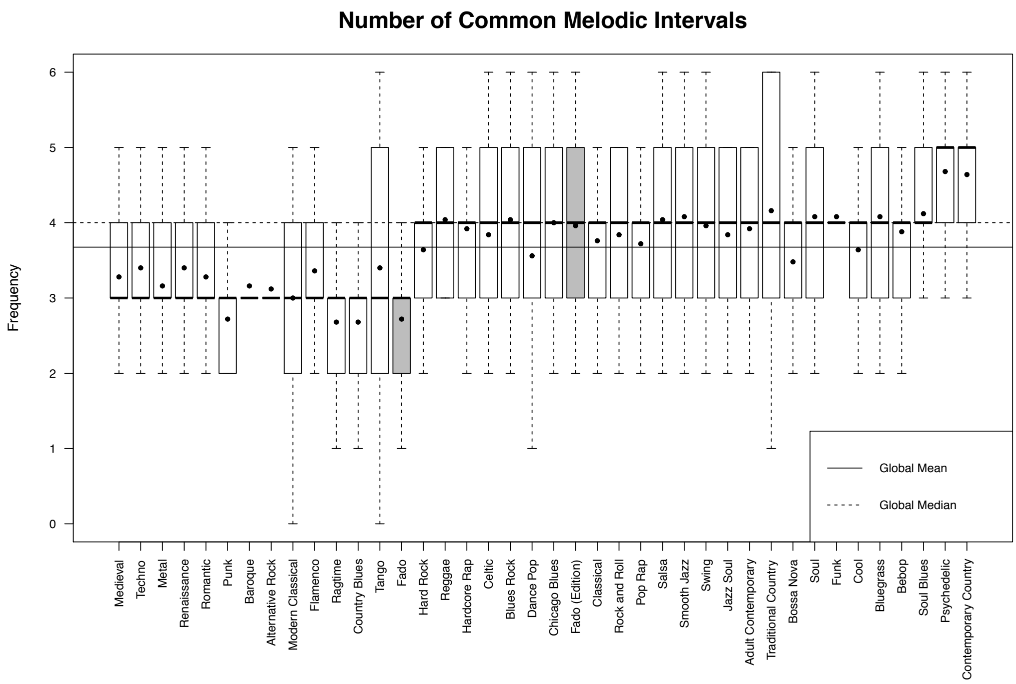

Figure 5.59: Number of Common Melodic Intervals.

This feature (figure 5.59) is useful to confirm the complexity and variety within the melodic contours. As one can see most genres present a median of four common melodic intervals, fado melodies included. The exceptions are psychedelic and contemporary country with their median being five, while a relatively large sample of taxonomies have medians as three, this including fado as a whole.

5.17.7 Amount of Arpeggiation

The amount of arpeggiation is defined as the "fraction of horizontal intervals that are repeated notes, minor thirds, major thirds, perfect fifths, minor sevenths, major sevenths, octaves, minor tenths or major tenths" (McKay, 2004, p. 76).

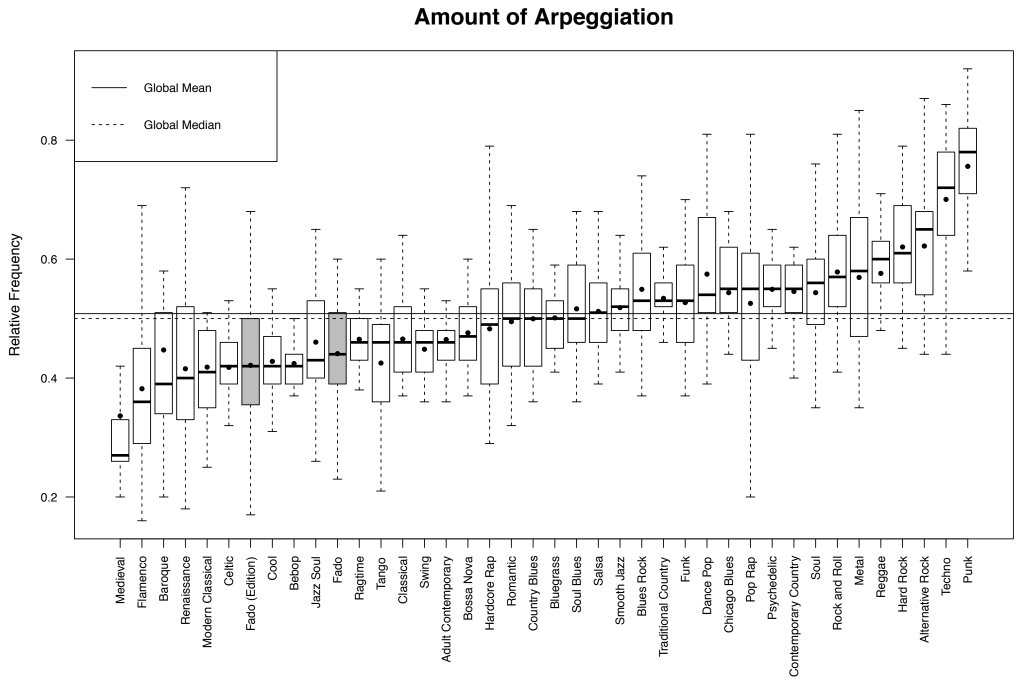

FIGURE 5.60: Amount of Arpeggiation.

It is somewhat surprising that both fado as a whole and fado melodies have a relatively low level of arpeggiation (figure 5.60). This can only be explained by fado on the horizontal level being organized on diatonic steps, and fourths, the accompaniments included. While it might seem counterintuitive at first, one can picture an *alberti* bass based on the dominant, as being a frequent trait, for instance. That is often written in the sequence fifth leading up to the tonic, lowering to the seventh and going back up to the tonic, which would correspond to a "melody" consisting only on perfect fourths and half tones. Medieval, flamenco, baroque, modern classical and Celtic are the other genres with low levels of arpeggiation, while punk, techno, alternative rock and hard rock seem to rely on these intervals.

5.17.8 Repeated Notes

The repeated notes represent the "fraction of notes that are repeated melodically" (McKay, 2004, p. 76), in other words, unisons.

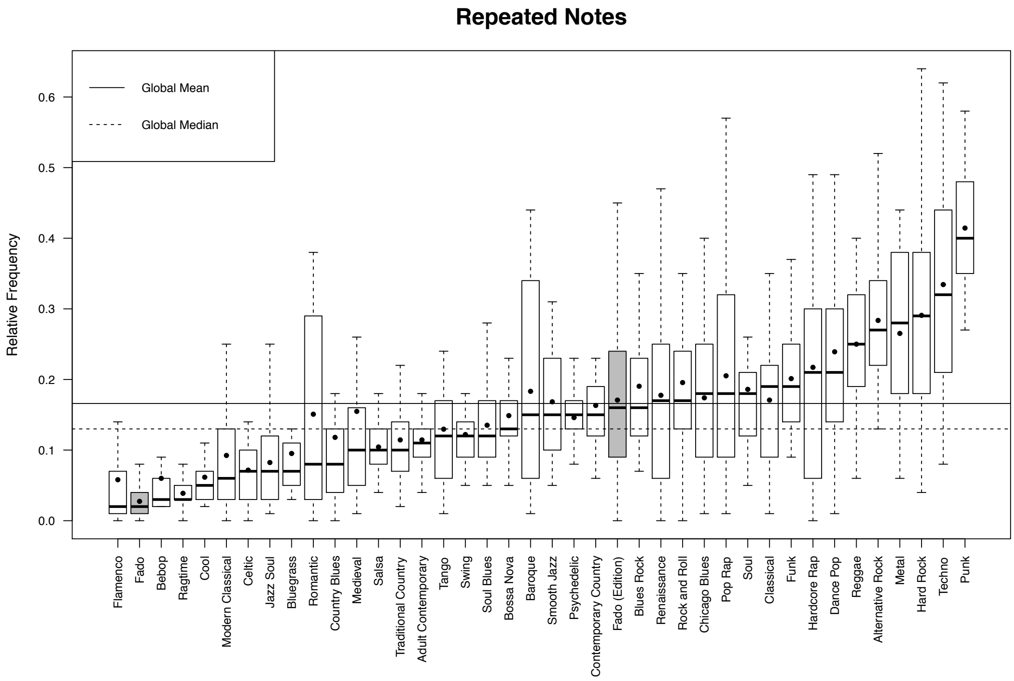

FIGURE 5.61: Repeated Notes.

Fado as a whole stands out in this feature (figure 5.61), having the second lowest frequency of unisons of all taxonomies along with flamenco, bebop and ragtime. This is mainly due to the accompaniments, because when analyzing only the melodies then fado is within the average. Metal, hard rock, techno and punk are the practices who can be defined by over emphasizing this trait.

5.17.9 Chromatic Motion

Chromatic Motion is the "fraction of melodic intervals corresponding to a semitone" (McKay, 2004, p. 76).

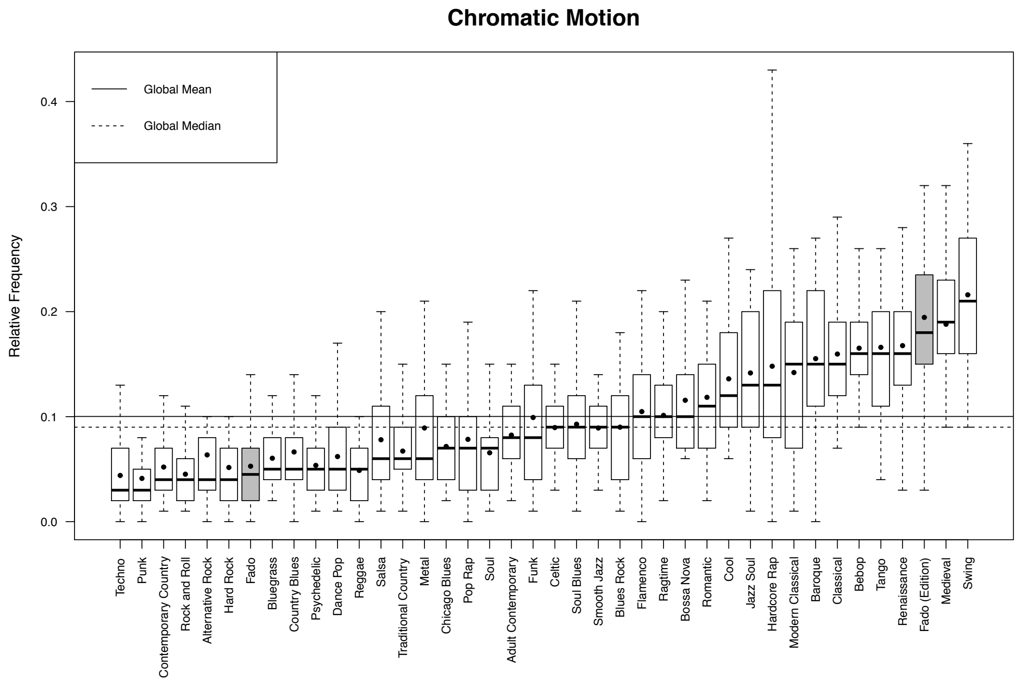

FIGURE 5.62: Chromatic Motion.

While fado as a whole is at the lower part of the spectrum (figure 5.62), regarding this feature, when looking only at the melodies fado can be found at the highest part of it, ranked third, among swing, medieval, renaissance and tango. This clearly represents the importance of half tones in fado melodies, which, while not being the most common interval, in relative terms, it represents a huge distinction in comparative terms. Since fado is a tonal style, and not a chromatic one, this can only be explained as being the result of a relatively high use of leading tones and minor seconds. This could be a defining trait.

5.17.10 Stepwise Motion

Stepwise Motion is the fraction of melodic intervals that corresponded to either a minor or a major second.

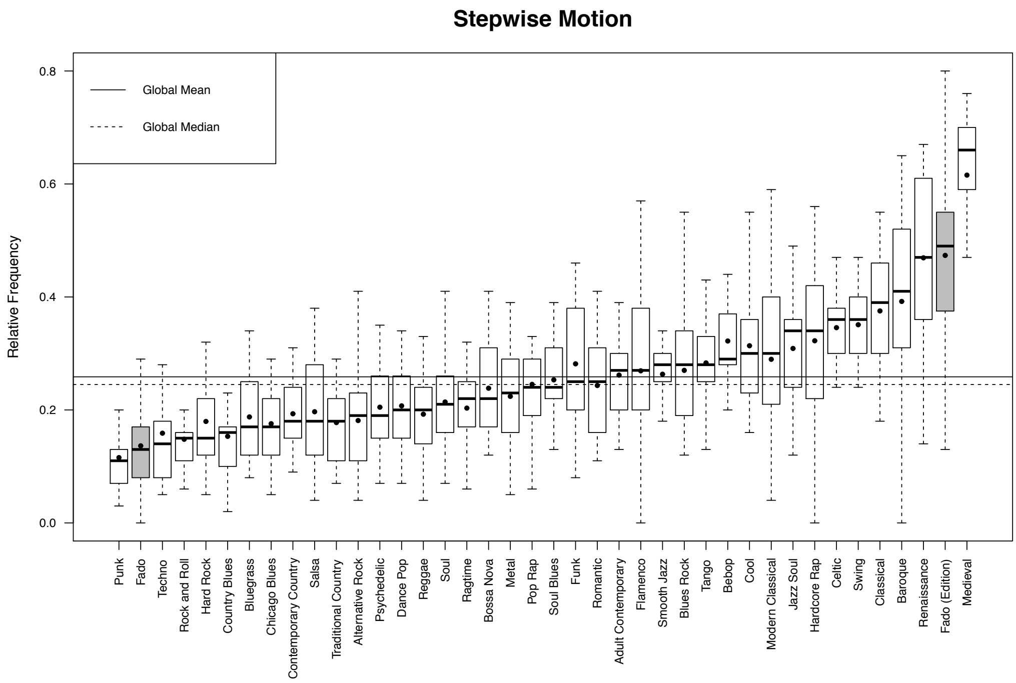

FIGURE 5.63: Stepwise Motion.

This feature (figure 5.63) seems to be a highly useful one to define fado. While fado as a whole is among the two lowest taxonomies (along with punk), the fado melodies are among the two highest ones, only surpassed by medieval. In comparative and relative terms these values just show how important stepwise motion and minor seconds are in melodic terms to define this style, and, on the other side, how of little importance they seem to be to the accompaniment. The importance of stepwise motion, combined with the also high importance of chromatic motion clearly seems to point out to a character of either undulating or perfectly arch-shaped melodies, which could be modeled with Brownian noise.

5.17.11 Melodic Thirds

Melodic thirds refers to the “fraction of melodic intervals that are major or minor thirds” (McKay, 2004, p. 76).

Melodic thirds do not seem to be a particular trait useful to define fado (figure 5.64). The main corpus lies slightly below the average, while the melodies are a bit above the center of the spectrum, not standing out. Punk, metal and techno

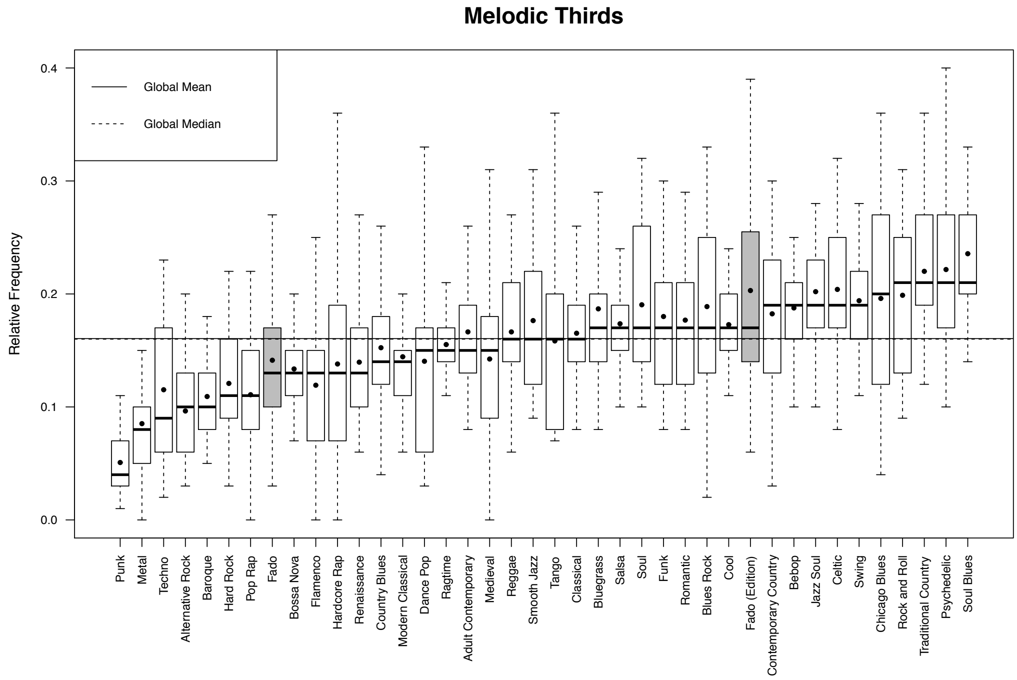

FIGURE 5.64: Melodic Thirds.

are the genres which least depend on this interval, while soul blues, psychedelic, traditional country and rock and roll seem to be highly dependent on it.

5.17.12 Melodic Fifths

Melodic Fifths corresponds to the "fraction of melodic intervals that are perfect fifths" (McKay, 2004, p,76).

Looking at fado as a whole, it stands in line with the average of other taxonomies (figure 5.65). Minding the Melodies-only, then fado can be defined as having a clear lack of melodic fifths, being the second lowest taxonomy along with medieval, flamenco and punk. On the other extreme reggae, psychedelic and rock and roll present a high prevalence on this kind of leap.

5.17.13 Melodic Tritones

Melodic Tritones is the "fraction of melodic intervals that are tritones" (McKay, 2004, p. 76).

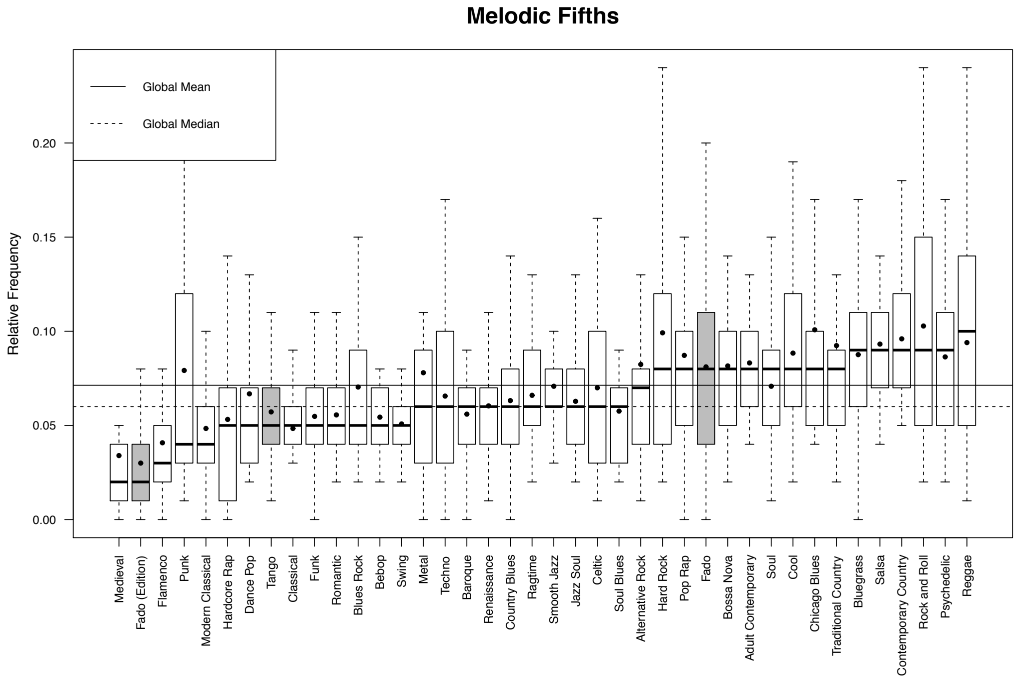

FIGURE 5.65: Melodic Fifths.

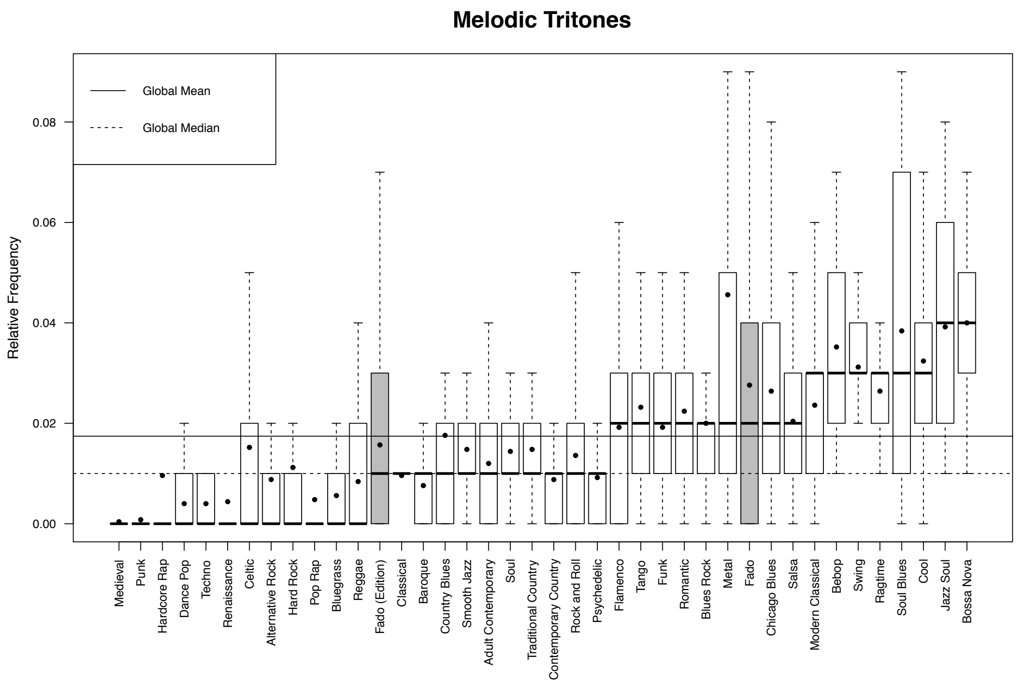

FIGURE 5.66: Melodic Tritones.

Overall the prevalence of melodic tritones is very low among all taxonomies presented (figure 5.66), when compared to other melodic intervals, due to the fact that most of these genres rely on tonal tradition. Still, within this low range, one can notice how fado, overall, belongs slightly above the center of the spectrum while the melodies appear on the bottom part of the spectrum emphasizing the lack of prevalence of this leap in the voice. Still, other taxonomies like medieval, punk and hardcore rap are much more extreme, with values bordering zero, while bossa nova, cool, jazz soul and soul blues seem to tolerate this interval more.

5.17.14 Melodic Octaves

Melodic Octaves represents the "fraction of melodic intervals that are octaves" (McKay, 2004, p. 76).

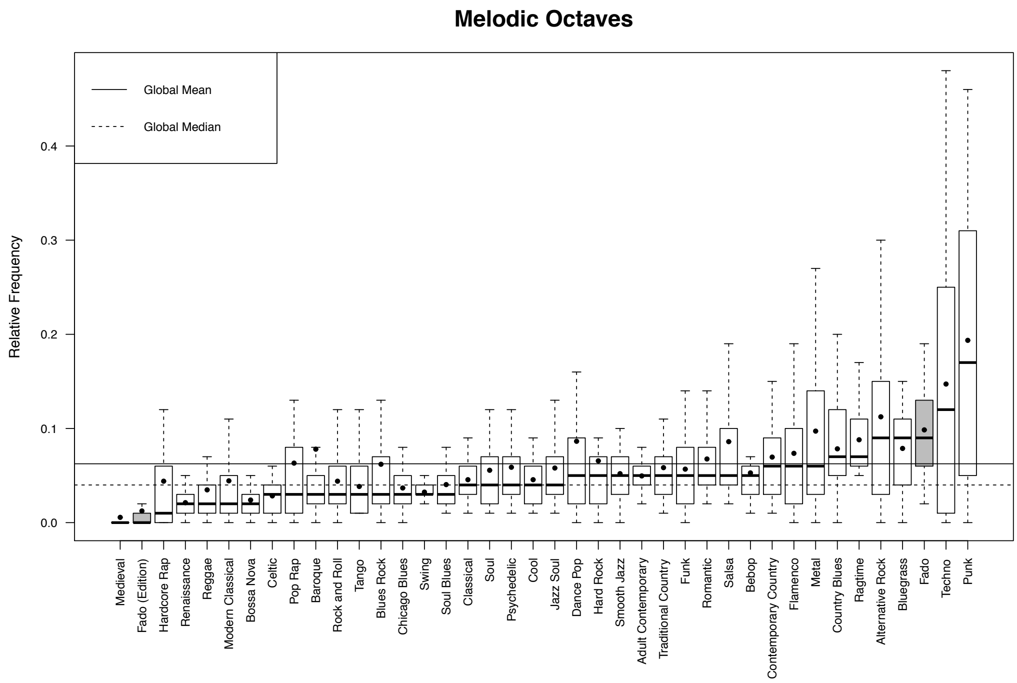

FIGURE 5.67: Melodic Octaves.

This seems to be another feature useful to define fado (figure 5.67). With the accompaniments included, fado is one of the genres with highest prevalence, along with techno and punk. On the other hand, analyzing just the vocal melodies, fado is the second lowest close to medieval and hardcore rap. So it seems that melodic octaves only make sense in the accompaniment, being a vital part of it, while they are absent in the vocals.

5.18 Melodic Contour

We had the intuition that fados' melodies were mainly arch shaped in a very smooth way. Our work with the database has shown that in terms of seeing each melody as a whole that is true – the average pitches in the middle are higher than the extremes, and the ending ones are below than the first ones. We have retrieved the melodic contour of the melodies in the corpus, using Huron's classification system[10] and compared them with the ones provided by himself, relative to the Essen Folksong Database (Huron, 1996). This database comprises 6251 folksongs from mostly European sources, so it is a good comparative source.

Table 5.19: Prevalence of Melodic Contours

Huron Contour	Essen Folksong Database (%)	Fados' Melodies (%)
Ascending	27.3	16
Descending	16.3	25
Concave	12.9	6
Convex	41.9	53
Horizontal-Ascending	0.3	0
Horizontal-Descending	0.2	0
Ascending-Horizontal	0.4	0
Descending-Horizontal	0.3	0
Horizontal	0.4	0
Total	100	100

More than half of fados' melodies are convex, which is a higher percentage than the folksongs in the Essen database. Furthermore a quarter of fados' melodies are descending, which is also a prevalence much higher than those in the Essen database. These two contours alone represent a total of 78% of fados' melodies clearly defining the archetype. On the other hand, while a quarter of the folksongs in the Essen database are ascending, only a sixth of fados' melodies do so. Furthermore, the concave contour represents an eight of the folksongs in the Essen

[10] one of the additional features available in *MeloSpyGUI* (`http://jazzomat.hfm-weimar.de/`, accessed June, 6, 2015).

database, while in fado this prevalence is halved. All other contours have negligible expression in the folksongs in the Essen database and null expression in fados' melodies.

While the overall statistics might present a general, however distorted idea, other statistics retrieved can complement it better. Overall the ratio of melodic intervals that rise rather than fall is very close to half, but slightly less, which gives a tendency for fados' melodies to slowly go down over the time. The duration of melodic arcs, which is the average number of notes separating peaks and troughs is incredibly small, ranging from one to three and averaging at two. The size of those melodic arcs, which is the interval that separates each peak from each trough is also rather small, averaging at less than a tritone. This seems to indicate rather zigzagging melodies falling down in the long run, instead of smooth arcs.

Table 5.20: Statistics of Melodic arcs

Melodies-only	Avg	Med	St Dev	Var	Min	Max	Range	Skew	Kurt
Direction of Motion	0.46	0.46	0.06	0.00	0.27	0.68	0.41	0.01	1.22
Duration of Melodic Arcs	1.99	1.91	0.39	0.15	1.12	3.09	1.97	0.87	0.64
Size of Melodic Arcs	5.68	5.58	1.20	1.44	3.20	9.62	6.42	0.72	0.84

5.18.1 Direction of Motion

Direction of Motion is defined as the "fraction of melodic intervals that are rising rather than falling" (McKay, 2004, p. 76).

This is another feature useful to define fado (figure 5.68): when seen as a whole, fado is the taxonomy that most rises, and in a prevalence significantly higher than all other taxonomies. Country blues, funk, traditional country and ragtime are other styles which rise overall. This pattern could be explained by a series of pitches consecutively rising and then a few huge leaps downward to compensate. Paying attention to just the melodies the pattern changes: fado aligns with the styles presenting downward motion, along with punk, dance pop, flamenco, metal, pop rap and alternative rock. This, again, shows us a contrasting tendency between the melodies and the accompaniment.

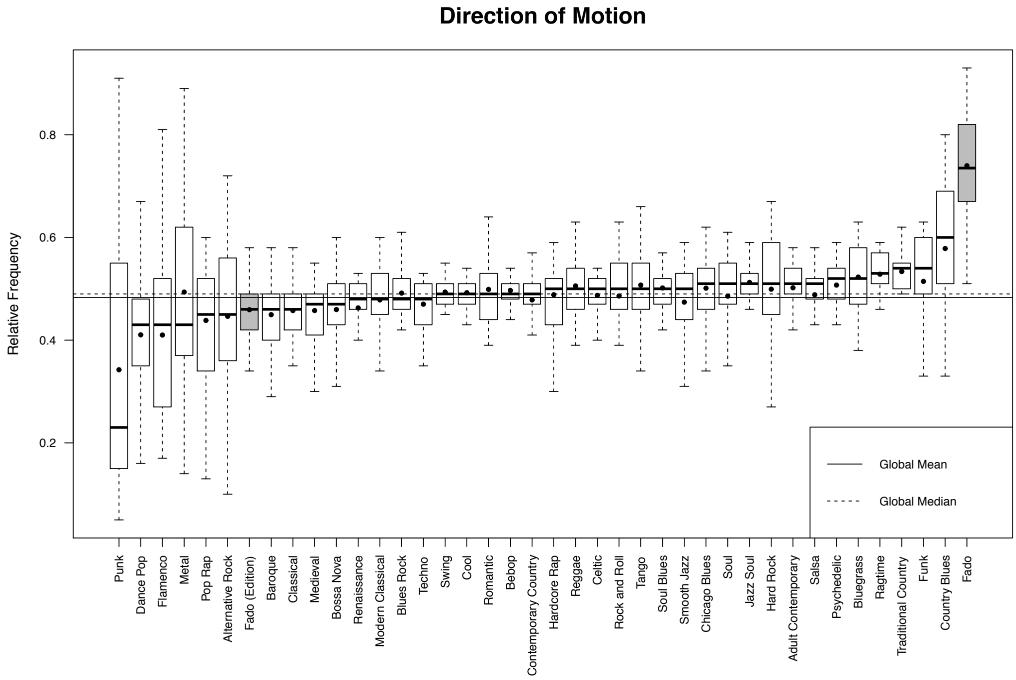

FIGURE 5.68: Direction of Motion.

5.18.2 Duration of Melodic Arcs

The duration of melodic arcs is defined as the "average number of notes that separate melodic peaks and troughs in any channel" (McKay, 2004, p. 76).

Overall it can be seen how fado melodies presents relatively long melodic arcs (figure 5.69). This tendency is emphasized when fado is seen as a whole, having the third highest median, only surpassed by punk and flamenco. On the other side of the spectrum Celtic, bossa nova and Chicago blues present the briefest melodic arcs.

5.18.3 Size of Melodic Arcs

The size of melodic arcs is defined as the "average melodic interval separating the top note of melodic peaks and the bottom note of melodic troughs" (McKay, 2004, p. 76).

This seems to be another relevant feature to define fado (figure 5.70). On the whole, fado is the taxonomy presenting the tallest melodic arcs, followed by

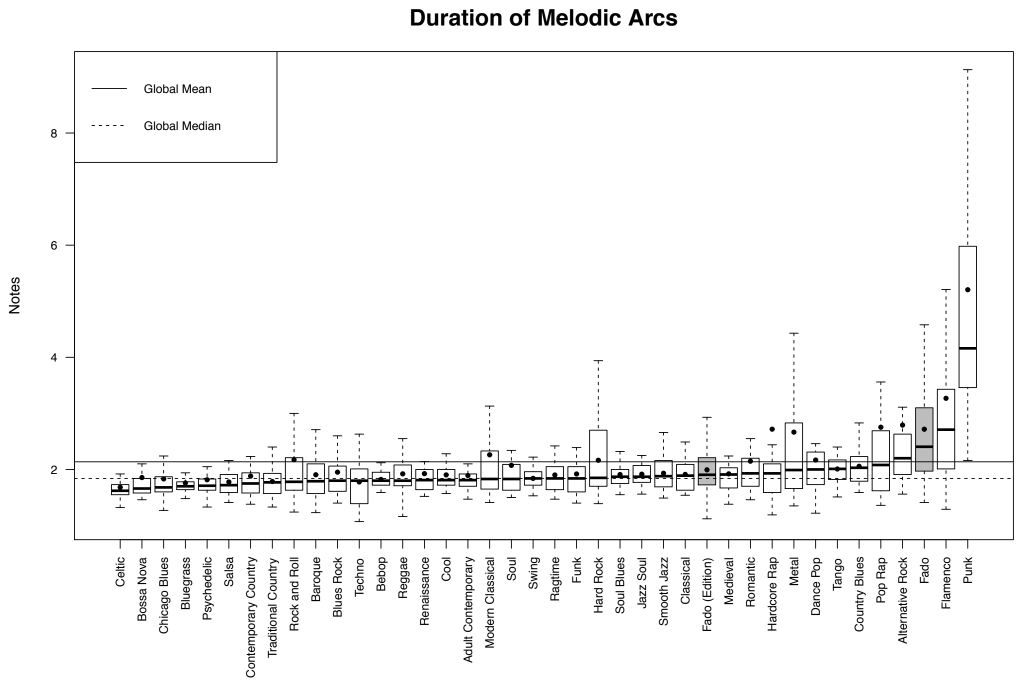

Figure 5.69: Duration of Melodic Arcs.

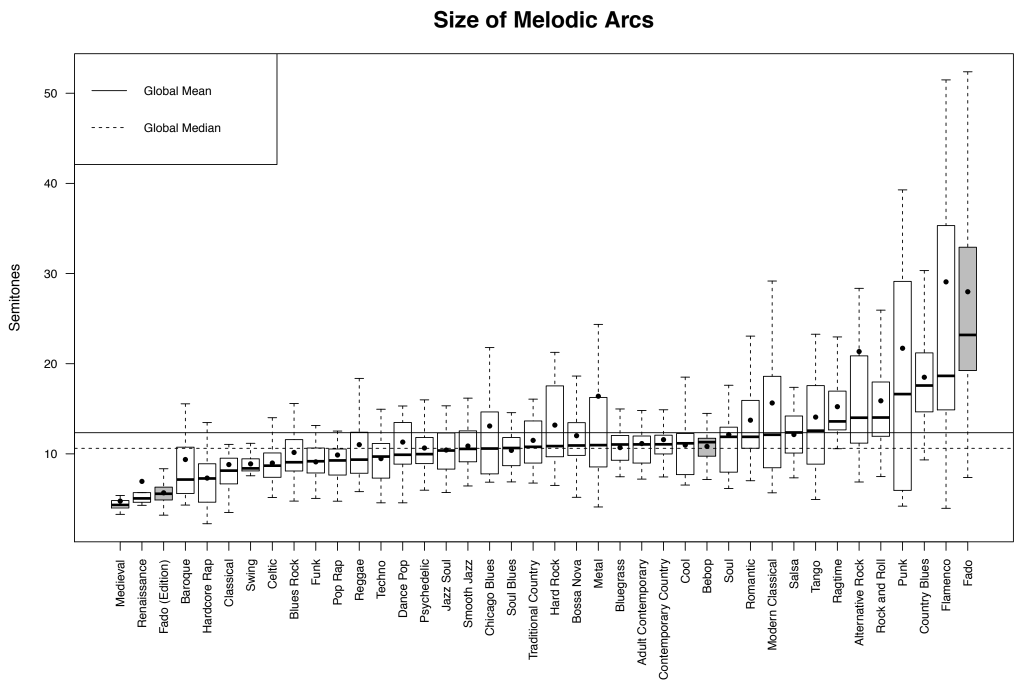

Figure 5.70: Size of Melodic Arcs.

flamenco, country blues and punk. This is due to the accompaniment figurations because analyzing only the melodies, fado presents one of the shortest melodic arcs, along with medieval and renaissance. This is another clue on how fado melodies seem to privilege stepwise motion, having fewer leaps than other taxonomies, overall. The values obtained also seem to indicate either undulating melodies or, in case of arch shapes, a long arch with a short peak, within the interval of an octave.

5.19 Position of the final tone

According to the data observation, the first note of a fado is usually either the dominant or the tonic, then followed by an arch shaped or undulating form that invariably comes to rest on the tonic. In simple terms, this is usually the lowest note of the song, in abstract notation. Sometimes, however, in undulating fados, the tonic is achieved one octave higher, which breaks the previous rule. In very dramatic performances and for emotional and climactic effects, sometimes the peak note is chosen to be also the last. Therefore, in those situations, the melody is varied in the last strophe in a way that the tonic standing in a low register is transposed one or even two octaves higher and reached via an upward movement. This can be the highest note of that particular performance of that fado. These situations are more exceptions than rules, and usually occur only when the performer is rather skilled and intends to show off (a diva, for instance), and also in more complex fados that resemble the format of art songs.

5.20 Dynamics

The volume of a fado also depends greatly on the skill of the performer, the context, performative space, and the narrative involved. In the context of street or amateur venues, fados are sung louder and sometimes with resource to yelling and shouting. In the context of professional venues, with a silent audience and a mournful narrative, the performance can be extremely soft and delicate. Sometimes a fado alternates the two moments, having very soft dynamics in some phrases and then growing and growing until it reaches a climax in very high notes with powerful dynamics and voice projection, to immediately being finished almost in a counter-climatic whisper. “In a performance of traditional fado, strophes often accrue amplified emotional significance and more marked improvisation as the singer progresses through the poetic narrative of the fado – that is, they accrue *mais fado* (more fado)” (Gray, 2013, p. 40). In empirical study, shimmer mean values among fado singers were lower than in all other music styles (pop, country, soul, musical theater, western classical), except Jazz (Mendes *et al.*, 2013).

The calculation of dynamics took into account a relative loudness unit defined as the note velocity times the channel volume divided by the overall possible range, which will result in a value between 0 and 127 (McKay, 2004, p. 72). The main issue is that many of the transcriptions lacked dynamics information, other times such information was presented in a subjective way by the means of signs or words. Even the typical indications found in conventional literature like “*pp*”, “*mf*” or “*f*” lack an objective relation to a typical MIDI scale with a resolution of 127, being complemented by the volume or expression CC. At first these issues could be a problem if one thinks on how to get meaningful data having these highly fluctuating constraints. However, since the encoding of all transcriptions was done using the same software, having the same interpreting algorithms and conventions, then, in a relative way all dynamics are comparable. Although we are not aware what the exact value for “*pp*” is or the algorithm for a crescendo, we know they are consistent among all the data encoded and therefore they can be compared.

Having this in mind, we have calculated the overall dynamic range for each fado. This range is simply the difference between the maximum and minimum loudness found. We have also calculated the variation of Dynamics, which is the standard deviation of loudness level of all notes, and the average change of loudness from one note to the next note in the same channel (McKay, 2004, p. 72). All these parameters were calculated for both the edition corpus and for the Melodies-only.

As expected, there is an enormous variance among the overall dynamic range, reflecting both the fados totally lacking dynamic information (hence, the software assuming default values causing very narrow and steady ranges, for the entire performance), and the ones presenting detailed, contrasting loudnesses going from “*pp*” to “*ff*”. It is not linear to assume that the lack of dynamic range in some fados is merely due to lack of information from the transcriber neglecting that parameter – one has to consider that the devaluation of that parameter might indeed hint at a practice where the range was somewhat flat and therefore not noteworthy enough to actually notate its fluctuation. Some of the early recordings point to cases like these. Still, the overall dynamic range is much higher in the fado corpus in general and much narrower considering the Melodies-only, suggesting more and more contrasting dynamic indications within the accompaniments. That is corroborated by the variation of dynamic also being higher within the edition corpus than in the melodies. However, when analyzing the note to note transitions within the same channel one notices they are very similar – in fact, slightly higher considering the Melodies-only. This clearly suggests that the contrast in the overall dynamic range is mainly a result of vertical discrepancies, and not horizontal. Horizontally it seems that the voice actually fluctuates more and presents more contrasting dynamics, while the accompaniment keep their horizontal voices more consistent but clearly delineated among themselves.

Table 5.21: Statistics of Dynamics

Dynamics	Avg	Med	St Dev	Var	Min	Max	Range	Skew	Kurt
Overall Dynamic Range	44.10	41.50	23.02	530.03	13.00	102.00	89.00	0.50	-0.83
Variation of Dynamics	9.67	7.48	4.66	21.68	4.40	26.50	22.10	1.29	1.18
Avg Note to Note	6.36	6.65	1.68	2.82	3.19	11.24	8.05	0.14	0.22
Melodies-only	Avg	Med	St Dev	Var	Min	Max	Range	Skew	Kurt
Overall Dynamic Range	26.13	18.00	15.59	242.98	8.00	72.00	64.00	1.47	1.22
Variation of Dynamics	7.52	6.04	3.71	13.80	2.07	19.18	17.11	1.81	2.44
Avg Note to Note	6.51	6.78	1.93	3.71	1.83	9.97	8.14	-0.55	-0.29

5.21 Comparative features based on Dynamics

For the purpose of comparing dynamics a unity of “loudness” was defined as the “velocity values scaled by volume channel messages:

$$\text{note loudness} = \text{note velocity} \times (\text{channel volume}/127)$$

All features based on dynamics use relative measures rather than absolute measures (such as average volume) because the default volume and velocity values set by sequencers can vary, and many MIDI authors simply encode their files without varying these values” (McKay, 2004, p. 72).

5.21.1 Overall Dynamic Range

The overall dynamic range is defined as “the maximum loudness minus the minimum loudness value” (McKay, 2004, p. 72).

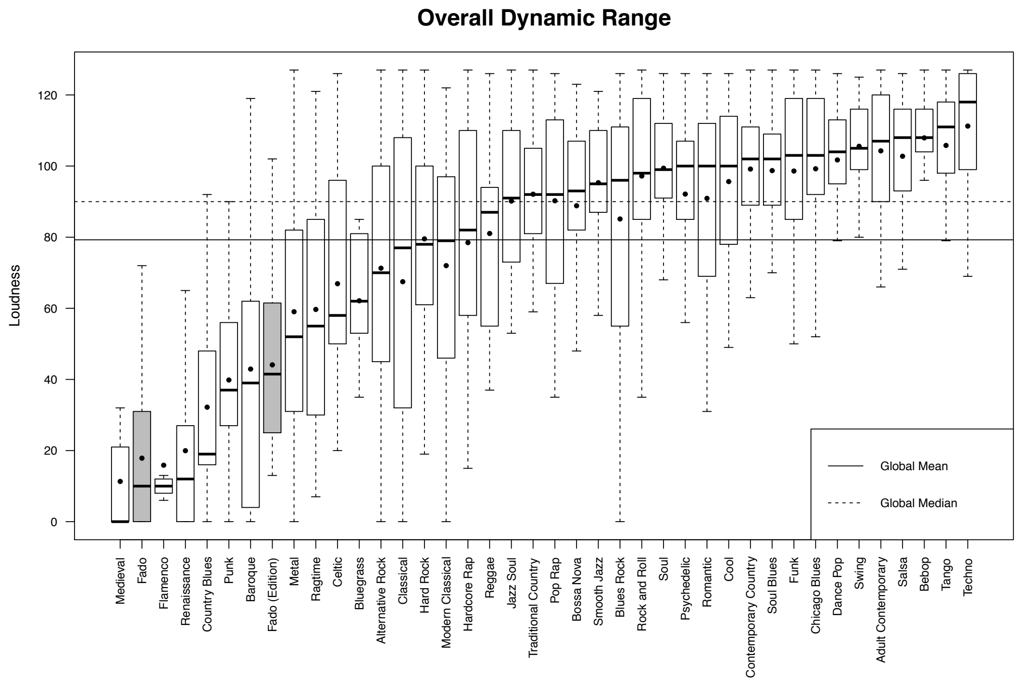

Figure 5.71: Overall Dynamic Range.

Fado is one of the genres with lowest overall dynamic range (figure 5.71, even in the edited version of the corpus) among the likes of early music, flamenco, country blues and punk. At the opposite side techno, tango, bebop and salsa show very high dynamic ranges. It is noteworthy, however, the presence of a considerable number of genres with very large spans, occupying the entire loudness spectrum (like metal, alternative rock, classical and blues rock), which indicates the presence of recordings both with maximum and minimum dynamic ranges. It seems that the density of instrumentation is a key factor influencing this feature – the more voices present, and the presence of percussion, seems to increase the range overall, which is also expected.

5.21.2 Variation of Dynamics

The variation of dynamics is defined as the "standard deviation of loudness levels of all notes" (McKay, 2004, p. 72).

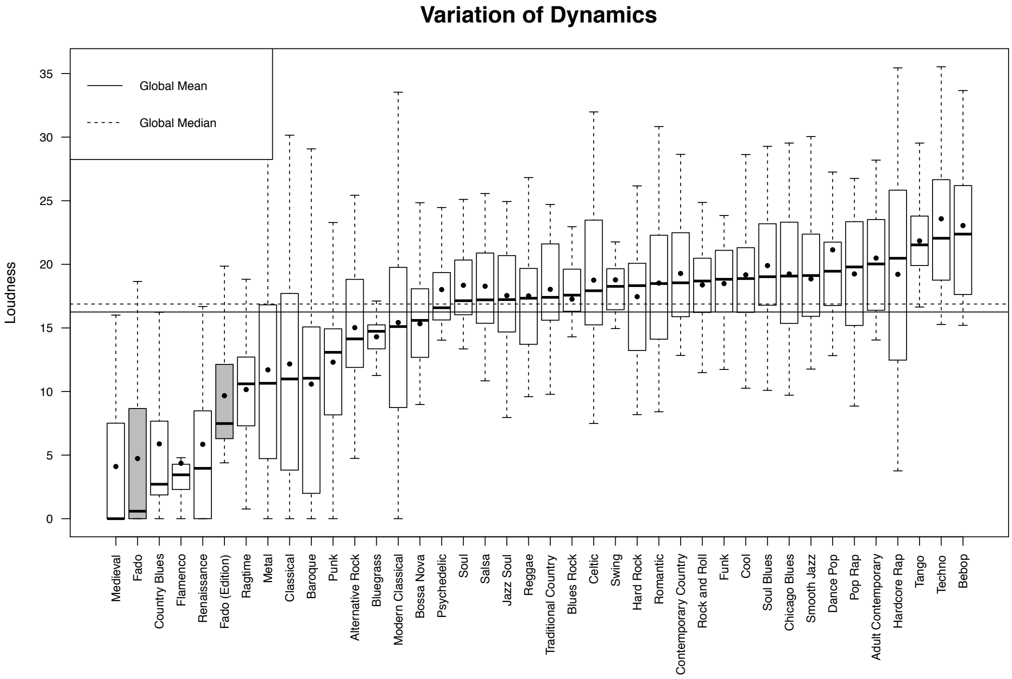

FIGURE 5.72: Variation of Dynamics.

Following the trend of a smaller relative range, fado is also among the genres with less dynamic variation (figure 5.72), along with medieval, country blues, flamenco, renaissance and ragtime. We highlight the fact that baroque has slightly climbed up the scale, being a style that varies within its narrow range. At the opposite side, bebop, techno, tango and hardcore rap are the genres with highest variety. Also of note is the fact that salsa left the top part of this chart. Hence, while there seems to be a strong correlation between the overall dynamic range and the dynamic variability, in some cases that is not true.

5.21.3 Variation of Dynamics In Each Voice

The variation of dynamics in each voice is defined as "the average of the standard deviations of loudness levels within each channel that contains at least one note" (McKay, 2004, p. 72).

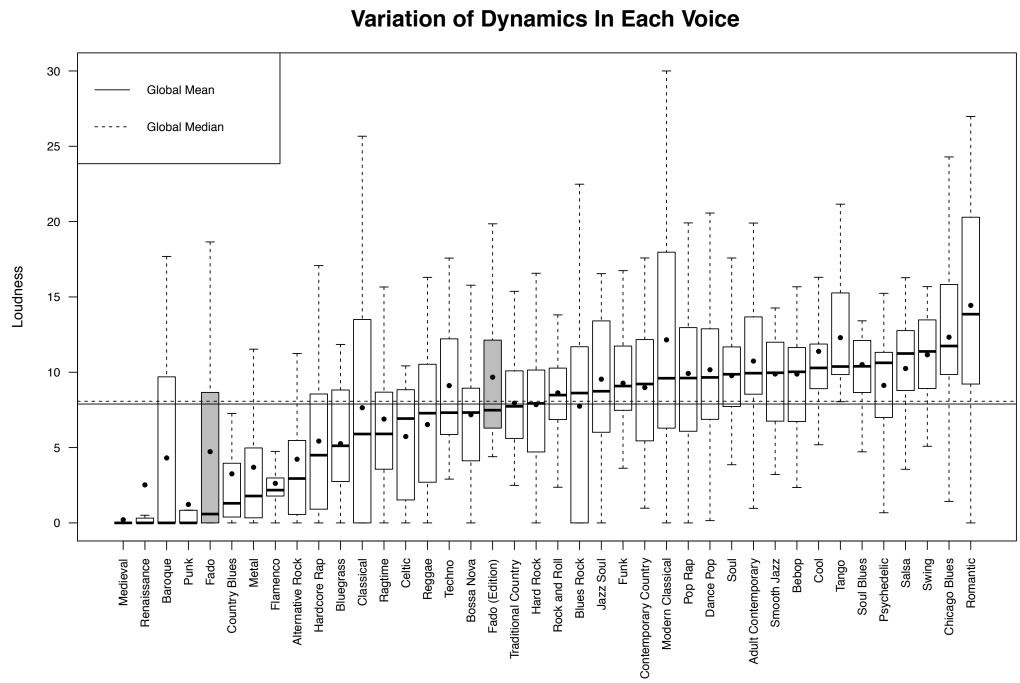

FIGURE 5.73: Variation of Dynamics In Each Voice.

Analyzing the dynamic variation in each voice (figure 5.73), it can be seen that more distortions occur, meaning that, overall, some styles are highly influenced by just one or few of its instruments. It is very likely that in some styles one or few instruments use a very large dynamic range while the majority varies much less. In the case of fado, the general corpus is still among the less variable cases, along with medieval, renaissance, baroque, punk and country blues; however, the edited version of the corpus clearly approaches the global median and mean. On the other side of the spectrum one can find romantic, Chicago blues, swing and salsa. This fact corroborates the idea that in genres like techno and bebop one or few instruments create contrast and influence the overall perception of their dynamic range.

5.21.4 Average Note To Note Dynamics Change

The average note to note dynamics change is defined as the "average change of loudness from one note to the next note in the same channel" (McKay, 2004, p. 72).

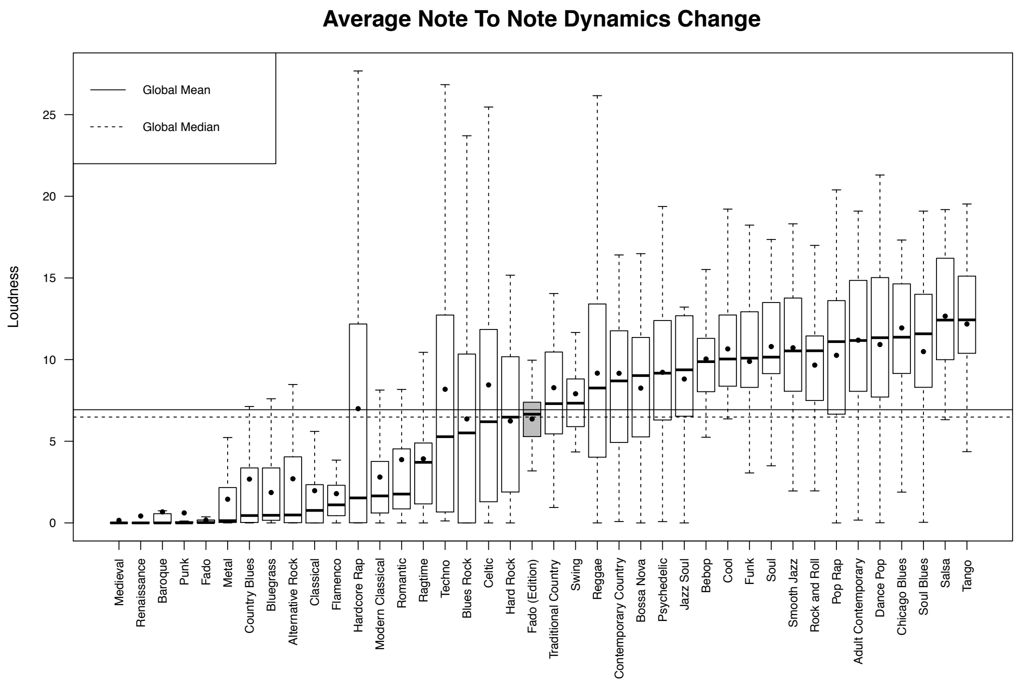

Figure 5.74: Average Note To Note Dynamics Change.

Fado, along with the early music genres, punk, metal and country blues has virtually no change of dynamics from one note to the next (figure 5.74). This might be because it relies on smoothly gradual continuous dynamics, with no ruptures or abrupt changes, or can also be because there are actually no changes in many of its voices. This can indicate instruments incapable of producing dynamic changes (like the harpsichord), or can simply indicate that the recordings were made without this parameter taken into consideration. In the case of fado that was already discussed as a pertinent issue, and when one tries to compensate that fact, in the edited corpus, one realizes how fado approaches the global mean and median. At the other side of the spectrum, tango, salsa, soul blues and Chicago blues are genres which rely on relatively abrupt dynamic changes.

5.22 Pitch Bend Messages

The next three features rely on the measuring of pitch bend messages. However, this is an extremely problematic issue. While, if uniformly encoded, they would give many interesting clues, the problem lies in the encoding: it is a parameter that is seldom notated in written notation, hence, most times totally absent from the musical scores and MIDI transcriptions derived from notation programs. Even when MIDI files are generated by live playing with controllers, many do not have ways to encode these messages due to the lack of knobs. Other times, they are simply neglected during performance (for instance, playing a melodic line in a keyboard and not using the pitch bend wheel). Therefore, historically, many musical practices in real life performances might present these features (namely in vocal lines or continuum instruments like trombones or violins) and they are completely missing in the MIDI files.

The fado corpus formed completely neglects this aspect, since pitch bend messages, glissandi or vibrato are not transcribed in notated music, while we often find them in the phonograms and real life performances. We speculate that this might happen with many other recordings in the database, and most practices in general. Therefore, for historical and technical reasons, we do not think the data we have is reliable enough regarding these particular features. They are presented here just for demonstrative purposes of their potential.

5.22.1 Glissando Prevalence

The glissando prevalence is defined as the "number of Note Ons that have at least one MIDI Pitch Bend associated with them divided by total number of pitched Note Ons" (McKay, 2004, p. 74).

If one relies on the data we have (figure 5.75), then one has to say that fado is among the taxonomies that do not present glissando, which are the major part of them. At the opposite side of the spectrum, four blues-related taxonomies (country blues, soul blues, blues rock, Chicago blues) have a significant prevalence. For the reasons already explained we do not believe these results represent reality.

5.22.2 Average Range of Glissandos

The average range of glissandos is defined as the "average range of Pitch Bends, where range is defined as the greatest value of the absolute difference between 64 and the second data byte of all MIDI Pitch Bend messages falling between the Note On and Note Off messages of any note" (McKay, 2004, p. 74).

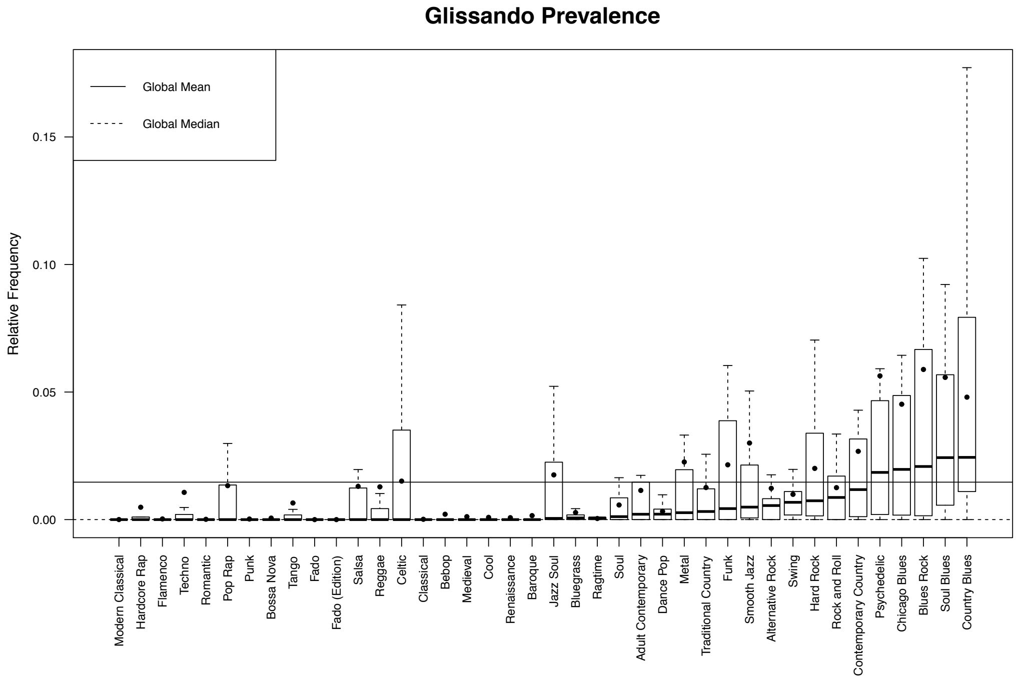

FIGURE 5.75: Glissando Prevalence.

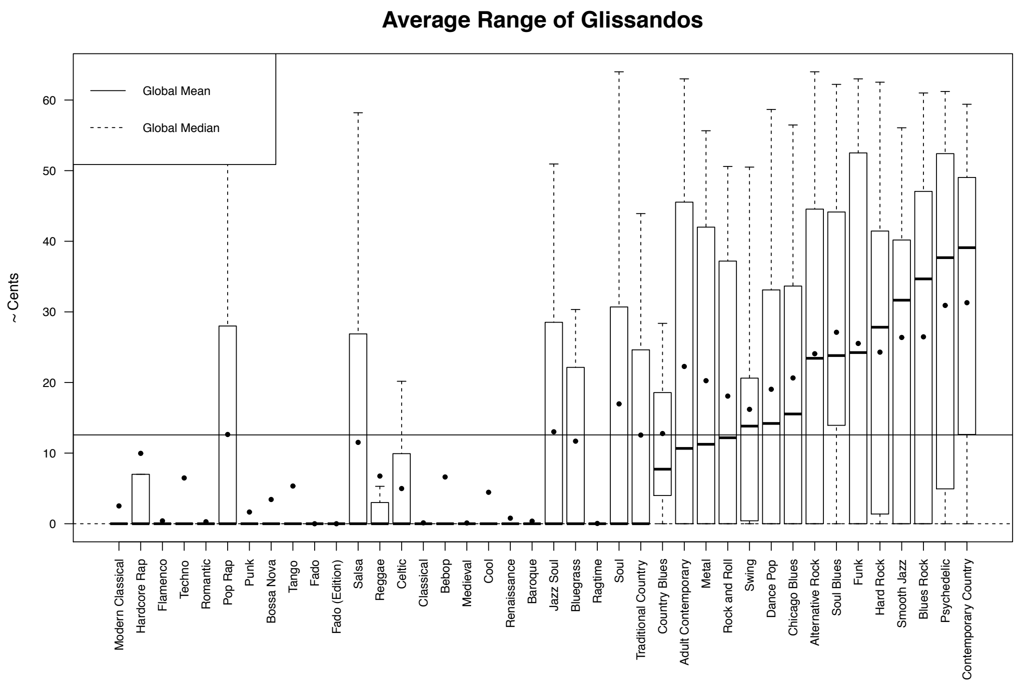

FIGURE 5.76: Average Range of Glissandos.

Since we do not believe the raw data is reliable (figure 5.76) we do not find the results credible. Since most taxonomies do not present glissandos, then their range is next to zero, fado included in this set. It is noteworthy however to find that among the taxonomies that present this feature encoded, contemporary country and psychedelic are the two most prominent, even though they were not among the ones having the highest glissando prevalence. This means that in these genres, the few glissandos they possess are accentuated, while the set of blues-related taxonomies seem to have more glissandos but which are weaker, overall.

5.22.3 Vibrato Prevalence

The Vibrato Prevalence is defined as the "number of notes for which Pitch Bend messages change direction at least twice divided by total number of notes that have Pitch Bend messages associated with them" (McKay, 2004, p. 74).

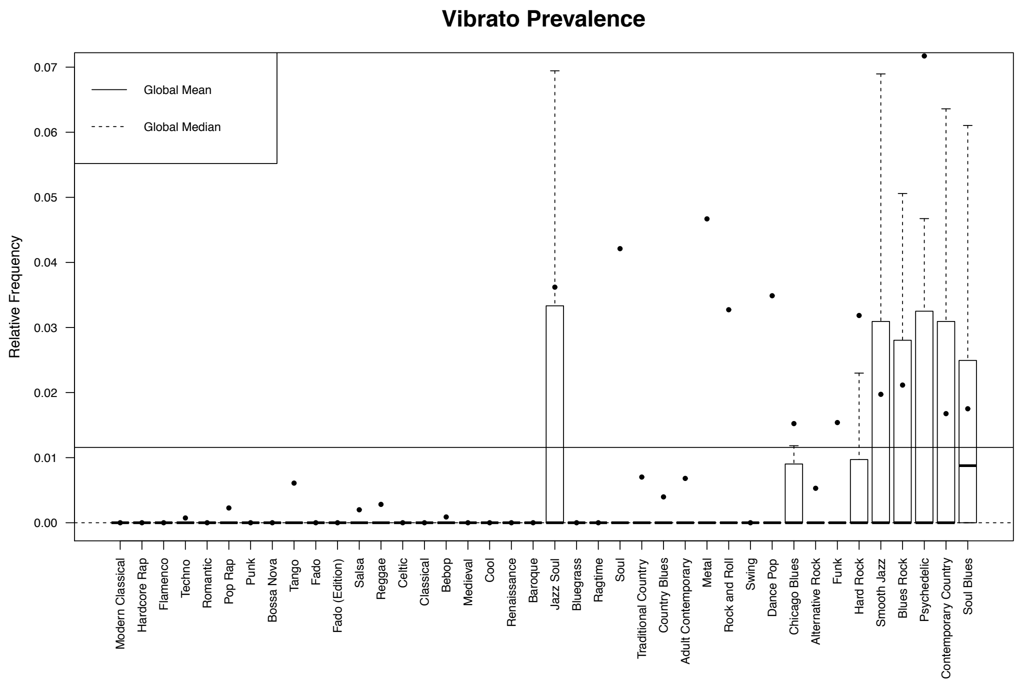

Figure 5.77: Vibrato Prevalence.

The same encoding issues remain (figure 5.77): most taxonomies do not present vibrato at all, or just some outliers, meaning most files were not encoded taking into account pitch bend messages, therefore the initial data is unreliable to describe the actual practices. Among the ones that have this feature encoded soul blues and contemporary country seem the most relevant.

5.23 Embellishment, ornamentation and vocal effects

In the oldest written sources it is possible to detect only a minimal degree of embellishment expressed through some grace notes and ornamentation on the melody. It is not known exactly how they would reflect the actual practice. In the early recordings, the singing is mainly flat, with minimum embellishment. Styling is shaped employing numerous specific techniques grounded on timbral variations. However, throughout the twentieth century some particular performers used and abused this and other similar resources discussed further ahead, namely Amália Rodrigues. Often *mordentes* and similar figurations were applied in certain notes or passages, and this peculiar way of singing was described as *voltinhas* [twirls].

Tremolo and glottal shake is sometimes also used, especially on longer and dramatic notes, depending much on the performers and the way they embody the narrative. The use (sometimes overuse) of embellishment by Amália Rodrigues was emulated in the following years, and spread through phonographic recordings. Many new performers would follow the vocals traits found there and would try to impersonate them. Eventually those gestures became trademarks of the genre, and at present embellishment is standard in fado.

There are numerous specific techniques and descriptors that shape the way in which the styling is done. Not only rhythm and pitch are slightly varied in a random way, although within certain constraints to respect the overall structure, but also a whole plethora of *timbral variations*.

This series of parameters, gestures and shapes associated with timbre and how the voice is managed are not notated and are completely missing from the written scores, especially the ones from the nineteenth century, hence the empirical data obtained is not reliable regarding these features. They are, however, mentioned in the literary descriptions and in the ethnographic studies, and can be deducted and inferred from the discourses of the practitioners. They are absolutely crucial to define the practice, because their presence or absence might lead a song to be considered fado or not.

Many fado performers after Amália Rodrigues use her typical style, or close to it, which is defined as "a slight portamento connecting the lower and the upper note of the ascending intervals, and this same upper note attacked with a small *mordente* leading the fall into the next lower note. The outcome is an all-time legato singing reinforcing the meaning of each verse" (Nery, 2010c, p. 105).

The glissando (in this specific vocal context the term is used interchangeably with portamento or slide), occurs when one goes from one tone to another in a continuous way, passing through all intermediate levels. This effect happens often in fado, and is notorious especially in ascending leaps, and most notably in pickup notes or from a weak to a strong beat. Melisma is also frequent, due to the legato. Often the same syllable is sung and prolonged through various notes, some of them micro-tonal and out of the scale in a kind of mix between embellishment and glissando/portamento. Inflexions are also frequent, as well as sobs, wails and shouts. This specific way of articulating the melody is nowadays a trademark gesture of fado, and some people dare to say that fado itself can be inferred solely by its presence: the famous Portuguese maestro António Vitorino d'Almeida, author of a few fados himself, on the TV show *Autores*, stated that "fado is a way to launch your voice, to launch the musical phrase" or "to articulate the melody"[11], and demonstrates his assumptions by giving an example on the piano, based on this kind of articulation. This peculiar way of singing, so many times repeated and made famous through time, established a model, a canon on how to properly sing fado – also confirmed, by (Gray, 2013, pp. 210-225). Moreover, it created the possibility of making virtually any music to be recognized as fado. This should not be seen as a strange phenomenon, after all "the gestural energy of a melody is phenomenologically more fundamental than the sequence of pitches of which a melody is comprised" (Hatten, 2004, p. 114). Amália was able to assimilate all kinds of genres, from whichever countries, and lend them her own personal style. Therefore, she was able to produce constantly a "fado beyond fado", a typical unifying sound that affected all of her repertoire regardless of its origin (Nery, 2010c, pp. 193-194). Amália was well aware of that phenomenon: "She stresses that her fame as *fadista* reached such a high degree that today people consider as fado everything she sings: 'I may sing a malhão or a vira, or even a

[11]`https://www.youtube.com/watch?v=40M432Bihg0`, accessed June, 6, 2015

simple song; everybody will consider it as a fado' " (Côrte-Real, 1991, p. 67). In the same interview, quoted by Côrte-Real, she emphasizes and demonstrates how her vocal gesture makes the style and defines the genre through a musical example: she sings a melodic line "flat" and then she sings the same melodic line using her typical ornaments, portamento and mannerisms, and states how the first version would be considered one style and the second version a fado, in spite of being the same melody with the same exact lyrics. According to Hatten,

> "musical gesture is biologically and culturally grounded in communicative human movement. Gesture draws upon the close interaction (and intermodality) of a range of human perceptual and motor systems to synthesize the energetic shaping of motion through time into significant events with unique expressive force. The biological and cultural motivations of musical gesture are further negotiated within the conventions of a musical style, whose elements include both the discrete (pitch, rhythm, meter) and the analog (dynamics, articulation, temporal pacing). Musical gestures are emergent gestalts that convey affective motion, emotion, and agency by fusing otherwise separate elements into continuities of shape and force"[12](Bandt *et al.*, 2007, p. 355).

Furthermore,

> "Perhaps the most important function of gesture, however, comes from its thematization as motivic idea. (...) Thematic gestures, like motives, are further marked as significant parts of the discourse of a movement, and they play a structural as well as expressive role in the unfolding form and expressive genre of a movement or work" (Hatten, 2006, p. 8).

Tremolo as a stylistic conscious device is only used in held notes, especially the higher ones. Other than that it is mainly a recurrent condition in some *fadistas*, like Frei Hermano da Câmara, for instance, who have a tremulous timbre by default. Because fado is mainly sung by uneducated voices, with no formal training, the position and projection is often made in the throat. Therefore glottal shake,

[12]`http://www.music.indiana.edu/html/department/theory/courses/t561-f03_hatten.shtml`, accessed June, 6, 2015

vibratos, shouts and speech mixed with singing is frequent. Since the melody in fado is mainly improvised, and can be shaped to the will of the performer, linked to the prosody, the register of fado is therefore mainly low, sometimes chest voice, and close to the spoken register. Only very virtuosic singers risk the head register and *falsetto* is rather uncommon, only happening when someone is trying to imitate another performance and sticking to a range or key that is not tailored to his or herself. In empirical study,

> "jitter mean values were lower than Pop and Western Classical singers and higher than those of Country, Soul, and Musical Theater singers", also, "for the vibrato analysis, 11/15 subjects (eight males and three females) produced vowels with a vibrato frequency and extent within the range described in the literature" (Mendes *et al.*, 2013).

For Amélia Muge (singer, composer) fado is related to suffering, in the sense of *life experience*, of embodying the narrative and being able to express and convey it to the audience[13]. Manuela de Freitas (lyricist) and José Luís Gordo (*guitarra* player) shared the same thought[14]. Emotion in fado is exaggerated. It is like comparing Paulo de Carvalho and Carlos do Carmo, comparing a singer to a *fadista*. Fado is more than just singing.

Amélia Muge, composer, has shown two versions of the same song, with different arrangements, one sung by herself and another by Camané (famous *fadista*). In her version she stated how she had a very light and fluid voice, and in Camané's version, how his voice was carrying much more "weight" and how the words acquired a much more emotional deepness compared to her original version. According to Amélia Muge this was the main factor to inscribe fado in the second version, that Camané had put the fado in that song. Fado was, then, a way of living, and consequently expressed in the voice and through the body. When asked directly about her values and if the articulation of the melody, the way to launch one's voice, was enough to define fado, she reinforced that it is indeed the most important characteristic, but she had doubts about that being enough just by itself. She believed it was more than that, and that it is an entanglement of

[13] Debate "fado(s): Escritas e Autoria", moderated by Soraia Simões, promoted by Mural Sonoro in 15/12/2013.

[14] Debate "Nova literatura para fado", moderated by Soraia Simões, promoted by Mural Sonoro in 26/01/2014.

several expressive factors that defines fado. Vital de Assunção (viola player, composer) added that the metric and rhythm structure were crucial to define fado. That fado had "rules". Perhaps because Amélia Muge is a singer and Vital de Assunção is a viola player, each of their own musical values reflect the importance of their own roles in the practice. Therefore, for Vital de Assunção, the swing, the groove and the balance of the harmonic figurations (most of the time binary, but sometimes quaternary, never ternary), needed to be there for fado to exist. He stated that if you do not have that layer and, even when you do, if when you play the typical bass line and chords you do not have the urge to almost dance, or move along, then it is not fado. In spite of these differences, the notion of movement and the existence of an expressive layer communicated through the embodiment of emotions in performance seems to be an important value to define the genre among the community, in general.

One of the key characteristics of amateur fado performances, especially among male performers, is the very narrow and tense vocal width. Often, performers escaping from the spoken register, instead of projecting the voice and using singing techniques, do the opposite and embed the words in extreme emotion by narrowing the vocal cavity, raising the glottis, raising the tongue and pulling it back and tensing the muscles in the throat, while slightly tilting the head back and sometimes closing their eyes. Cumulatively, it is frequent to display a high degree of rasp (hoarseness, harshness, grating or buzzing) when performing. It was observed empirically that fado singers produced vibrato, but a singer's formant was rarely produced.

> "The result of the lowering of larynx and enlargement of the pharynx can be physiologically incompatible with the lateral positioning of the head these singers adopt during the performance. The head lateralization has a 45 angle with the shoulder and is slightly tilted back. With this head-neck posture, it is difficult to expand the laryngeal tube" (Mendes *et al.*, 2013).

The idea of a strained throat is an important value, also pointed out by Ruben de Carvalho (Carvalho, 1994, p. 95) and Ellen Gray (Gray, 2013, p. 40), because it not only reinforces the idea that it is an unlearned skill (as opposed to lyrical singing, for instance), but it also emphasizes the suffering, the unhappy fate, as a husky, gritty, voice is commonly associated with drunk men in taverns and with prostitutes, people who led difficult lives, smoked and drank a lot. It is a timbre that embodies pain and suffering. A great model for this singing style is the legendary Alfredo Marceneiro, who probably had great impact in coining this style for men, and was largely imitated afterwards. This style of singing is metaphorically linked with suffering, a very hard life, bad habits and tremendous life experience, and thus, *defines what it means to be a fadista*. Also, "one is not taught, nor does one learn to be a *fadista*; one is born a *fadista*" (Gray, 2013, p. 28). In the case of women *fadistas*, the vocal width is usually not as narrow as in men, and sometimes it is even absent and the voices are relaxed. However, even in this case, rasp might be present with the precise metaphorical intention of conveying the image of suffering and bad fate. This is widely known as "voz de bagaço" [brandy's voice], a timbre typical of people who drank a lot of alcohol and never cared about the quality of their voices.

Gray also mentions how a voice marked by a "pronounced nasality, a texture that might occasionally break into roughness, and sometimes a vocal placement that falls between speaking and singing" might be deemed as carrying "more fado" (Gray, 2013, p. 65), although we do not find nasalization to be that common and relevant to define the practice. Portuguese language, by itself, has more nasal sounds than most Indo-European languages, and this fact might have created a perceptual bias on Gray, leading her to attribute to fado a characteristic that is in fact from the language[15].

These differences in tempo, air pressure and placement are not easily measurable or quantifiable. However, they correspond to articulatory functions like off-beat accents (emphasizing syncopation), *tenutos*, slight *ritardos*, portamentos, glissandi, *mordentes* and general ornamentations and *arpeggio*s. There are correlations between these occurrences and the shape of the melody; the strategic places where they happen. One can imagine dynamics being correlated directly with rhythm and pitch – the open vowels being the longest notes, thus the highest pitches and the loudest dynamics. Therefore, if one thinks about the "statistically ideal" heptasyllabic European Portuguese line, with pick up notes derived from the absence of stresses in the first syllable, and one applies all the principles discussed, a pattern will emerge – melodic contours that will contrast short rhythms, lower registers and lower dynamics for the unstressed syllables, contrasting with larger notes, higher pitches and louder dynamics in the stressed ones, which will need

[15] As kindly pointed out by Jorge Martins Rosa.

to be further compensated. According to the universal rules of entropy and inertia, every step statistically privileges the least energy and movement, so singing is usually not made in leaps but by steps. Therefore the melodies will tend to have undulating or arch-shaped contours. The upward movements are favorable to portamentos and glissandi (to approach and sustain the long, highest notes; similar traits can be found in other improvisatory traditions, like scooping, in jazz) and downward movement to *mordentes*, and melisma to compensate (like in flamenco or Arabic songs). The long, high, open vowels are suitable for *tenutos*, suspensions and vibratos, while also prone to fading. The intensification of these traits is consistently observed over time in live performances and phonograms throughout the twentieth century.

5.24 Accent and enunciation of consonants

In fado performance the accent is mostly linked to prosody. Therefore, the stronger attacks are mainly linked with the stressed syllables containing open vowels. Often there is a deliberate effort to place those syllables in the strong beats. However sometimes this does not happen, hence the frequency of syncopation. One can say that this is a very personal decision, open to the will or skill of the *fadista*. Sometimes, for very dramatic effects, an accent might happen in an unexpected place, thus breaking the prosody. A very famous case is Amália Rodrigues' interpretation of "Gaivota" [Seagull]. When she sings the line "Se uma gaivota viesse" [If a seagull would come], instead of the logical stress in "vo", she prolongs and embellishes that syllable, in a melismatic way, but with a vanishing dynamic. She then hits hard on the following unstressed, almost mute, syllable "ta" and links it with the following "vie", resulting in a cacophonous "gaivooooo.... TAVIEsse". This particular choice was highly criticized by some peers, namely Daniel Gouveia (Gouveia, 2010, p. 203), who points out this case (among many others) as an example of how to not sing correctly. Diction is a value highly praised in fado, and therefore the enunciation of consonants is usually very precise, so that the narrative and the words are communicated in an efficient manner to the audience.

Due to a combination of other factors, namely the timbre provoked by the narrow width and the raspiness associated with alcohol consumption, as well as the typical legato singing, some old *fadistas* often present an abnormal, yet very characteristic, degree of slurriness in their singing. Although this condition greatly affects the intelligibility of the narrative, in these situations it is tolerated, since it is the perfect metaphor for a long life being a *fadista* and the inevitable consequence of all their extreme suffering. Therefore, paradoxically, one can say that although diction and the precise enunciation of consonants are a goal in defining what good fado is, the practice shows that slur is characteristic of the genre, and it is usually associated with masters and veterans (even Amália presented a very slurred, rasp singing in her later years). When fado is mocked down and portrayed in caricatures[16], often this exaggerated, slurred, unintelligible version is shown. Ellen Gray points out how "the listeners perception of 'soulfulness' and feeling in fado are intimately linked to the performer's level of mastery of multiple sonic communicative codes", including "word placement, Lisbon-inflected pronunciation, phrasing, breathing and use of rubato and vocal ornamentation" (Gray, 2013, p. 40-41).

Hence, we believe that the *combination of all these timbral and articulatory variations* in styling, much more than pitch and rhythm, corresponds to a key value expressed by most of the *fadistas* and practitioners, in such a way that they often cannot describe or express in precise, technical terms, but that can be deduced from their discourses. This is what Amélia Muge, for instance, meant when she said that Camané sung her words with more "weight" and turned her song into a fado; this is what Tozé Brito or José Luís Gordo mean when they say that they write songs, but then *fadistas* make them fados. The embodiment of a song into a fado – by *fadistas*, when expressed by their voices (and neglecting the rest of the embodiment for now), corresponds to the set of timbral and articulatory parameters described above, which are not present in an explicit technical and detailed way in the discourses or narratives, are inconsistent with the musical scores, but are implicitly present in the recordings, and are intuitively perceived by any listener. They are a key to define, understand, and model the practice.

[16]Caricatures are often very useful to understand a stereotype, since they portray and exaggerate the most relevant traces. For notable fado caricatures, see Dulce Pontes videoclip "Júlia Galdéria" (`https://www.youtube.com/watch?v=XYT4iQ8ukWE`, accessed June, 6, 2015) and Joaquim Monchique's impersonation of Amália Rodrigues (`https://www.youtube.com/watch?v=iC_yL8gArGw`, accessed June, 6, 2015).

Chapter 6

Embodiment

Fado, being a total art form, relies heavily on body performance and on cues that are beyond regular vocal and instrumental cues. The whole performance is perceived and evaluated by the audience through the means of codes and conventions that rely on visual communication, not only aural. This is the main reason why Manuela de Freitas insists that recordings cannot replicate a live experience (sensorial information is missing). Also, a recent study by Tsay pointed out that in piano competitions "people consistently report that sound is the most important source of information in evaluating performance in music. However, the findings demonstrate that people actually depend primarily on visual information when making judgments about music performance" (Tsay, 2013), which emphasizes the importance of embodiment in establishing empathy with the audience for the narrative to be successfully communicated, and thus for "fado to happen".

According to Marc Leman, this empathy is possible because the physical constraints of human bodies are universal, therefore the sensorimotor basis of gestural communication is common to most cultures. So, even within very different cultures, the same gestures may have the same meaning. Furthermore,

> "nonlinguistic descriptions, such as body movements in response to music, rely on the transfer of sonic moving forms to motor moving forms. The motor modality is then the expression of the original auditory experience and, as such, it can be considered a description of the original auditory experience and, as such, it can be considered a description of the original music with the body" (Leman, 2008, p. 21).

So, in the same way that we all have a common sense of what a fast or slow tempo is (because we all measure it up relative to the heart beat, that is a universal trait within human species (Deutsch, 2012)), there are plenty more other gestures and conventions we share simply because we are all humans. This can perfectly account for why a Portuguese native can empathize with a flamenco or American blues performance, the same way someone who does not understand Portuguese still can be moved by fado.

> "The connection between subjective experience and matter has to do with the human brain", however, we cannot forget the role of the body as a mediator. "Scientific methodology has been expanding from purely physical issues (music as sound) to more subjective issues (music as experience). The connection between the two draws on fundamental relationships between mind, body and matter" (Leman, 2008, p. 48).

Leman points out how a number of researchers during the twentieth century, namely Lipps and Turlit, already saw the perception of emotions in music as a phenomenon of physical empathy. The sonic forms are perceived in reference to bodily movement expressions, and so we can actually perceive a music as sad, without experiencing sadness ourselves (Leman, 2008, p. 44). This perspective may be the solution for the subjective experience within the brain. Since much research around music has its core on the cultural relativism and the plethora of possible parameters through which music can be valued, without a definition of perceived universals, the conception of the human body as mediator and its own constraints constitute the universal by itself. Therefore, if one aims to be objective regarding perception, emotion and value of music, one should search for the part of the experience that is universal within every one of us – how our body is interacting each time we experience music in context.

> "Knowledge does not emerge from passive perception, but from the need to act in an environment. In that sense, ecology is not merely about the relationship between a subject and its environment, but also about the knowledge which is needed to act in that environment" (Leman, 2008, p. 43).

In this sense, then, there is something universal in fado that is recurrent and transmitted by and through the body, and perceived by any audience. On the other hand, there are also gestural and bodily conventions that only apply contextually, because they are cultural constructions that emerge from the "ecology" of the place. In that sense, the judgment of a fado performance by a foreigner will always rely on different values and cues than the judgement by a native – language and accent being the primary difference in recordings and phonograms, since the body expression is mainly absent in that media.

Peter Kivy, one of the most reputable philosophers of music, fails to see how emotion can be perceived in music precisely because he forgets the universality of the mediator (the human body). His discourse is based on the experience of music through cognition and he reaches the conclusion that the emotion must be in the music like the redness is in the apple. He does not even conceive the relativist assumptions of Nettl (Nettl, 2005) (and ethnomusicology in general), because based on his own experience

> "there is substantial agreement at least within broad boundaries as to what garden-variety emotions various passages of expressive music are expressive of, as anyone can demonstrate to himself by playing well-chosen passages to competent listeners and asking for their responses. So obvious is this fact that I will say no more about it" (Kivy, 2001, p. 96).

Kivy argues that if he is emotionally moved by music, then music itself must be the intentional object of his emotion. Also, he denies to acknowledge his emotions as the garden-variety common names because he claims to actually feel none of them. He also claims that music is "a thing of the mind", and that "the musical emotion that the music I take to beautiful or excellent in some other musical way arouses in me is an enthusiasm, an intense musical excitement *about* what I am hearing" (Kivy, 2001, p. 105). Kivy then reviews the positions of Davies and Levinson, and how all of them agree on the point that music "is expressive of the garden-variety emotions in virtue of the emotive qualities we recognize in it" (Kivy, 2001, p. 106), but pointing out how for Levison, "the listener identifies with a musical persona (. . .) and then reacting to that, empathetically, sympathetically, or antipathetically" (Kivy, 2001, p. 107). Kivy quickly dismisses this position by arguing that "the analyst who tries to tease a persona and her misfortunes out of a symphony or a string quartet is between Scylla and Charybdis. If she stays within the bounds of sanity, she gets an abstraction that nobody can identify or emphasize with. And if she tries to get Anna Karenina or Hamlet out of Opus 131, she stretches our credulity well beyond the breaking point" (Kivy, 2001, pp. 110-111). He stresses out how "the behavioral manifestations of the garden-variety emotions are absent" (Kivy, 2001, p. 111).

What Peter Kivy seems to forget is that not only there is a whole realm of possibilities for facing even absolute music as programatic music, with an imaginary program, based on a myriad of contexts, life situations, associations (and that in fact, we can relate to a fictional "persona" triggered by our own subjective mind), but also we do not necessarily need to feel those emotions, but just recognize them. So, when we say that some piece of music is sad we are not saying that we are sad, or feel sad, because of the music, neither that the sadness is *in* the music, but instead that we recognize the physical and embodied properties of sadness in the sonic movement we are perceiving as reference to our own bodies[1]. And that is the only reasonable explanation for any emotional universality (if one aims at one). Our conclusion is that, then, music in itself does not carry any emotional or expressive property in itself, but not everything is subjective/cultural experience of the mind. Every musical experience is, then, the outcome of both the subjective mind and the universal body, and so in every interpretation and description there are some things that will always be very personal and unique and others that will be common to most people, even when they do not share the same conventions and culture. And that degree of communality is brought to us by our common mediator, the body.

Those codes and conventions have been described extensively in the sources, and have been changing greatly through time: in the beginning of the nineteenth century, in Brazil, the descriptions mention a fado that was mainly a dance with many traces in common with flamenco performances. In Lisbon the dance was no longer the main feature, but still existed and it was an important part of the practice. Throughout the twentieth century the dance lost importance and nowadays fado, in professional venues, uses mainly the bodily posture conventions of other popular ballad genres, in which the musicians sit and the singer stands still, only allowing small steps, foot stomps, slight hip or upper body swells, and arm and hand movement to metaphorically express and aid the narrative.

[1] On this particular problem also see the distinction Noël Carroll portrays from "natural horror" and "art-horror" (Carroll, 1990, pp. 12-42).

> "The *fadista* often sings the more melancholic songs with eyes closed, with her head thrown back, her hands at times interlocked in front of her and at others gesturing expressively, the torso in a stillness rapt with a focus that directs all attention to the sound and expression of her voice" (Gray, 2013, p. 29).

In amateur venues and informal contexts, in very cheerful fados, especially the ones in march tempo, singers get looser and dance a little, clap and may request the audience to participate. Much of the posture conventions, dress codes, lighting, decoration of the place, that are nowadays regarded as traditional values, were fixed and stylized during the dictatorship and are in fact, a "sanitized and proper nationalist tradition", an idealization of *Portugalidade* [Portugality], created mainly as a commodity for the upper classes, tourists and foreigners.

6.1 Fado as dance

Fado appears referenced as a dance in Brazil in the beginning of the nineteenth century. We will discuss those sources and the possible links of this practice to the ones that reference fado in Portugal during the nineteenth century. It seems that during a certain period of time and in some contexts the bodily expression was heavily associated to what people perceived as fado. The original dance seemed associated with instrumental music, however there are no clear references to voice or lyrics in this ancient practice. Meanwhile, in nineteenth-century Lisbon, clear documentation shows that music, voice, lyrics and dance were connected. Fado was no longer a "dance", but more of a performance practice where dance was included as an important part of it. Eventually that part would gradually lose its importance and nowadays almost nobody associates fado with dancing.

The earliest known references of fado as an artistic performance date from the early nineteenth century. Rui Vieira Nery describes with great detail early sources to point out how fado was seen and described as a dance in Brazil at that time. He quotes the Italian geographer Balbi (Balbi, 1822), as well as some European travelers like Captain Louis-Charles Desaules de Freycinet (Freycinet *et al.*, 1826), or the Germans Carl Schlichthorst (Schlichthorst, 1829) and Johann-Friedrich von Weech (Weech, 1831) as they describe fado being a fascinating yet voluptuous, immoral dance, similar to the ones performed by the black people

(Nery, 2004, pp. 18-22). He also uses the insights provided by local authors as the Brazilian poet Falmeno (Cordeiro, 1827) or the novelist Manuel António de Almeida (Almeida, 1893) to characterize the dance. These early sources provide us with vivid observations and descriptions about the reality and daily life of Brazil, at that time, and so we can infer valuable details about what was a current practice.

Almeida originally published his book *Memórias de um sargento de Milícias* [Memories of a militia sergeant] in 1852, as a part of a periodical series. Later it was revised and published as a whole book in 1854. In Chapter VI we can read a very detailed narrative:

> "Everyone knows what fado is, that dance so varied, so voluptuous, it seems to be the daughter of the most refined study of art. A simple viola fits the purpose better than any other instrument. Fado has many variants, each one more original than the other. One single person, man or woman, dances for a while in the middle of the room, executing the most difficult steps, adopting the most graceful positions, accompanying everything with finger snaps, and then, slowly, approaches whoever pleases him or her the most. Then the dancer performs some twists and twirls and finally claps his or her hands, this meaning a new dancer has been chosen. This procedure goes roundabout until everyone has danced.
>
> Other times a man and a woman dance together; precisely following the tempo, either with slow or faster steps, either repelling or approaching one another; sometimes the man approaches the woman with light steps, while her, performing a slight movement with her body and arms, slowly retreats; other times she is the one looking for the man, who then steps back until, finally, they come together again. There is also the circle in which many people dance; certain measures being interrupted with clapping and loud and lasting, other times milder and briefer, step-dancing, although always with a steady unitary time signature. Besides these, there are also other forms not discussed here. The music is different for each one of them, but always played by a viola. Often the player, in certain measures, sings a song, sometimes carrying a truly poetic meaning. Once fado begins it is difficult to end,

always lasting until dawn, sometimes going on for days and nights in a row.[2]"

6.1.1 The hypothetical links with flamenco

Some scholars and historians of fado were too quick to dismiss the influences of other musical practices in the shaping of fado. Clearly, in a world that is a melting pot and where several cultures and practices cross and overlap each other, it is impossible not to notice some characteristics of early practices making part of rituals that would later develop on their own. Looking back at the descriptions of fado as a dance, in Brazil, one clearly identifies many of the choreographic characteristics of flamenco in that description. However, there are not many clues regarding the instrumental accompaniment that the viola would have been doing back then. Still, the clues are enough for us to believe that by then fado and flamenco, despite having different names (or not even being recognized as such, as autonomous musical categories), were practices co-existing in the same time period and nearby geographical regions, and therefore could share a fair number of common characteristics and traits and be influenced by each other. Moreover, they probably could have common origins.

Following that reasoning, when one reads more about early flamenco, one realizes that there are two distinct aspects concerning the practice: concerning the

[2] "Todos sabem o que é fado, essa dança tão voluptuosa, tão variada, que parece filha do mais apurado estudo da arte. Uma simples viola serve melhor do que instrumento algum para o efeito. O fado tem diversas formas, cada qual mais original. Ora, uma só pessoa, homem ou mulher, dança no meio da casa por algum tempo, fazendo passos os mais dificultosos, tomando as mais airosas posições, acompanhando tudo isso com estalos que dá com os dedos, e vai depois pouco e pouco aproximando-se de qualquer que lhe agrada; faz-lhe diante algumas negaças e viravoltas, e finalmente bate palmas, o que quer dizer que a escolheu para substituir o seu lugar. Assim corre a roda toda até que todos tenham dançado.

Outras vezes um homem e uma mulher dançam juntos; seguindo com a maior certeza o compasso da música, ora acompanham-se a passos lentos, ora apressados, depois repelem-se, depois juntam-se; o homem às vezes busca a mulher com passos ligeiros, enquanto ela, fazendo um pequeno movimento com o corpo e com os braços, recua vagarosamente, outras vezes é ela quem procura o homem, que recua por seu turno, até que enfim acompanham-se de novo. Há também a roda em que dançam muitas pessoas, interrompendo certos compassos com palmas e com um sapateado às vezes estrondoso e prolongado, às vezes mais brando e mais breve, porém sempre igual e a um só tempo. Além destas há ainda outras formas de que não falamos. A música é diferente para cada uma, porém sempre tocada em viola. Muitas vezes o tocador canta em certos compassos uma cantiga às vezes de pensamento verdadeiramente poético. Quando o fado começa custa a acabar; termina sempre pela madrugada, quando não leva de enfiada dias e noites seguidas e inteiras."

vocal and choreographic tradition, one that is attributed to the Gypsies, in its earlier forms, it

> "consisted of the song or cante without any musical instruments for accompaniment, with the exception of a long, dry stick that was held upright and rhythmically tapped on the ground. This is known as á palo seco, a term literally translating to 'by means of a dry stick.' This terms also applies to flamenco that is accompanied solely by rhythmic hand clapping and/or finger snapping. Some of the most primitive flamenco songs relate tragic stories of lost love, struggle, desperation, hardship, imprisonment, and death" (Ruiz, 2007, p. 75).

The other, concerning the music: flamenco music was influenced by Hindu and Arabic music from the beginning, and

> "the melodic song forms known as *Arabesques* and *Melismas* are fine examples of Arabic influence upon flamenco. Reminiscent of liturgical chants, Melismas, or extended vocalizations of several notes to a single syllable, are a strong component of flamenco song. Important characteristics include the extension of vowels, expression of profound feelings, and priority of emotions over lyrics." Numerous ornamentations such as *ay*, *layli*, *layla*, *lolailo*, *lereli*, and *lerele* were fairly common among traditional flamenco songs, which may have originated from the Arabic *Layali*, a term for improvisation, or from the similar-sounding Arabic expression *la illaha illa'llah*, translating as 'There is no God but Allah' " (Ruiz, 2007, p. 75).

These descriptions are extremely interesting because many of the characteristics associated with fado can be recognized, and we can think of at least two different moments of its chronology where they could have been implemented and reinforced. The melodic Arabic and Hindu characteristics were probably implemented into the viola, and we can easily extrapolate that this kind of accompaniment made sense both in the fado and flamenco of the early nineteenth century, as described by the sources. Also, this mood and affect linked with the way the narratives are expressed and sung (exacerbation of emotion over the lyrics) could probably be a very good reason why one should call fado (destiny, fate) to fado and also justify its themes and furthermore the way it is articulated and how the stressed syllables are constantly emphasized: they would come directly from this tradition of very emotional, tragic songs. This thesis would be consistent with the description of the character of the songs that would happen sometimes in the fado ritual, as described in the sources from the early nineteenth century. Although there are evidences that this way of singing (this almost caricatural gesture) was somewhat lost during the nineteenth and early twentieth century, based on the descriptions and early recordings, it is also known that this gesture still existed in performative practices of the Iberian Peninsula, namely in Andalusia and in folk and traditional songs. This same way of singing was then "recovered" and reinforced in fado as a personal mark by Amália Rodrigues, who, borrowing it from the way her mother sung local songs, unintentionally spread it as a gesture of notable recognition associated with the practice. It seems fairly easy now to recognize how these gestures and characteristics from the Eastern Europe and Middle-Eastern Asia are present in fado nowadays and how we can trace them back to their origins in a logical way. What we find notable, however, is how a kind of singing already associated with performative practices in early flamenco, and probably in the early forms of fado, is weakened and then reinforced later on, on a new context and geographical space. Perhaps this just show us that Amália felt the gesture made sense and it was "always there", and that it was a more than adequate way to express the moods and affects linked to those kinds of narratives. Even in a more simplistic way, the mere embodiment of the emotions, affects and moods, contained in these narratives and expressed through the means of the prosody of the European Portuguese language naturally are more effectively conveyed through the means of this specific kind of gesture.

What seems to be a crucial point is the categorization of fado as a dance, something unique along its history. If it is true that fado was danced or "batido" [hit] during several decades, it is also true that the core of the practice moved from the choreographic value to the sung value – it has become "less of a dance" and "more of a song". The primordial value that defined its characterization changed, and this is the core of Tinhorão's thesis (Tinhorão, 1994).

It is not clear to us that the danced fado from Brazil is the same practice as the sung fado in Lisbon. In a certain way, one could claim they are two distinct practices sharing the same name but with different origins and distinct influences that overlapped in the same place. In Lisbon several sources point to several musical and social practices. In the brothels and taverns, mainly in the poor neighborhoods of Lisbon, physical fights or games where a person tries to knock out the other person in a kind of a challenge or dance is often called "fado". It is not known how independent these practices might be from the lascivious Brazilian dance. It is a certainty that challenges and social games already existed in Lisbon before the court returned from Brazil in 1821. However, the Industrial Revolution, inner migrations, constant commerce and the interchange with sailors and slaves had notorious impact in the social geography and for sure changed those same practices. The main issue is to know when and how these practices started being called "fado" and recognized as such. The thesis of the importation of the name and some practices makes sense only for one thing: there is no performative practice called "fado" in the sources, namely in Portuguese literature, until the nineteenth century, the Brazilian designation having precedence. However, Pimentel, based on Ramalho Ortigão's *As Farpas*, tries to explain an origin for the label based on the character of the *fadista*. Being the *fadista*, the man of the bad fortune, the one with a "bad fado", and being the brothels by extension "the fado houses", then "fado" would be whatever one would be doing in there (Pimentel, 1904). And this is a totally different explanation for the origin of the name, completely independent from whatever was happening in Brazil.

It is noteworthy that what was practiced in the brothels and taverns was already more than mere dance or physical challenges, because Pimentel already describes *fadistas* singing mournful songs and telling their own sad stories, using a viola or a *guitarra* to accompany themselves. This also shows how, in Lisbon, the component "dance" is not seen as the core identity of the practice. However, this does not necessarily exclude the possibility of the Brazilian practice occurring simultaneously in Lisbon, and also being called fado. We find it possible and even probable that one could hit the fado, sing mournfully the fado and dance lasciviously the fado, all practices coexisting in the same time and place and using the same denomination. The period lithography clearly shows all those practices taking place in Lisbon during the nineteenth century[3]. Also, one should not exclude the possibility of some elements from a given community being aware of the several practices and performing some of them, contextually, and opting afterwards for the ones that made more sense. All these different descriptions and hypotheses suggest the possibility of independent origins for the use of the label.

[3]See for instance the numerous reproductions in (Nery, 2004)

Both Sardinha and Gouveia contest the idea of a lascivious dance being the origin of a mournful singing and challenge the ideas of Tinhorão, who was seconded by Rui Vieira Nery. Sardinha criticizes the notion that fado was born in Brazil and deconstructs the Brazilian dance using extensive choreographic analysis based on the descriptions and written testimonials, concluding that even in Brazil the dance called fado was not an isolated practice, but in fact a myriad of distinct choreographies. Hence, their origin and evolution had to be prior to the written sources. He also tries to establish a non-relation between those practices and the Portuguese ones, namely invoking their character. He does not understand how a bright, pulsating, lascivious dance might originate sad, plangent, mournful melodies. Moreover, he accuses Nery of not explaining the transition, or how the word "fado" applied to that dance. He accuses Ramos Tinhorão of the same flaw. Sardinha acknowledges the contact point between the Brazilian dances and the "fado bailado" [danced fado], but they are so general that they are also to be found in many other national choreographic practices. Therefore, if one were to employ the same reasoning, virtually all national dances would descend from Brazilian dances, something that makes no sense. Finally, he claims that the Brazilian sources of that period reveal little concrete information about the music that would accompany those dances. While Rui Vieira Nery claims that the danced fado from Brazil already had melodic and harmonic traces that we will then find in the first musical transcriptions from 1852, and that will remain, in many cases, until nowadays, Sardinha claims that is not possible to establish any relation with the music from the fado-dance from Brazil, the *lundum* or even the music that would support the Portuguese fado, and any opinion in that direction is mere speculation or fantasy (Sardinha, 2010a, p. 450). This opinion echoes Renato de Almeida's, who claimed the absence of any physical document or musical transcription about the music of the Brazilian fado that would support the connection with *lundum* or the Portuguese fado (Almeida, 1926, p. 78).

The divergences between Sardinha and Nery are well documented in a newspaper article in *Jornal de Letras*, in which Nery highly criticizes Sardinha's work by pointing out numerous methodological errors (Nery, 2010b), as well as a rebuttal where Sardinha answers maintaining his arguments and stating that Nery obviously missed the point and failed to interpret his work (Sardinha, 2010b).

Gouveia, in a certain way, supports Sardinha in his hypothesis. He starts by quoting Luísa Guerra on how "*Lundum* was danced in Africa. Fado is not sung. (...) *Lundum*s were sung in Brazil. Fado is not sung. (...) the so-called Brazilian danced fado lasted only about forty years. *Lundum* continued. *Lundum* was danced and sung in Portugal. Fado is sung. It is sung because it exists a proper context" (Guerra, 2003, pp. 96-97) (Gouveia, 2010, p. 18). The existence of several simultaneous musical practices and influences are recognized, but not a transference between them. Gouveia follows by analyzing Caldas de Barbosa's lyrics, a Brazilian native that moved to Portugal, and according to Nery and Tinhorão one of the fado precursors. Gouveia concludes that nothing in Barbosa's poetry is similar to fado narratives and

> "what one could listen in the salons was... salon music. There were musical scores, evidence that schooled people wrote them for presumably schooled people to enjoy. The several renditions of those genres, performed nowadays by the meritorious efforts of Segréis de Lisboa, Pedro Caldeira Cabral or Silvestre Fonseca, show that it was erudite music, sung by tenors or lyrical sopranos, with trained voices, accompanied on the piano or the harpsichord, all following (or even dependent on) a musical score. The lyrics reinforce perfectly the idea already portrayed by the music, with elaborated metrics and poetic palatial ornaments. "*Cadê*" – one might wonder, assuming a fado Afro-Brazilian origin – the descriptive quatrain, the simplicity of the musical accompaniment, the melodic improvisation spontaneity?" (Gouveia, 2010, p. 21).

The situation reaches the point of comedy when in the documentary Trovas Antigas, Saudade Louca (Ávila, 2010), broadcast by Portuguese National Television (RTP) in September 24th, 2010, about the origins of fado, a scene where a *modinha* accompanied on a harpsichord and sung with an educated voice, in a palatial setting, is presented as a representation of a fado precursor. The disparity between the described practices and the ones shown is so vast that one cannot find any relation, neither lyrical, neither performative, causing perplexity.

At this point we might add that it seems that both Sardinha and Gouveia failed to understand not only the differences, but also the relations between what would be the practice of fado in its spontaneous context (and the contexts where they learned what fado is) and the sanitized versions played by the upper classes following the musical transcriptions. The existence of these two kinds of repertoire as reflections of the same reality is, in our opinion, a major cause for some of these misunderstandings.

Sardinha explains that the satirical, humoristic, and non-mournful fados, derive their musical basis from the *passacalhe*, an extremely popular genre in Europe and especially in Andalusia. Obviously it would be a variant of the popular version, before it reached the complexity of the erudite one. Several authors, namely César das Neves, corroborate this idea: "the large number of fados, almost all variations from each other, improvised daily, are a kind of slow passa-calle, having characteristically Portuguese music" (Neves, 1893, p. 31). Sardinha also quotes Pinto de Carvalho saying that fado was corrupted until "it became a slow passacalhe" (Sardinha, 2010a, p. 250). Grounded on these affirmations and knowing that "Corrido" was the term by which the Spanish *passacalles* (which were the basis of their traditional ballads) were known (following an idea from Mário de Andrade), Sardinha sustains the thesis that this was the genesis for the term "Fado Corrido" and its vulgarization as a major subclass of canonical fados. Gouveia, on the other hand, claims that one called "those fados 'corridos' because their function is to tell a run-on sentence story [*corrida*] that unfolds itself through a series of quatrains (...)" (Gouveia, 2010, p. 33), being unable to properly sustain this idea beyond the obvious etymological play, which seems nothing more than speculation to us.

Sardinha then extrapolates that

> "humoristic fados, played by the blind musicians, having the *passacalhe* lively and marked rhythm, and given the natural tendency for people to dance to everything, started being danced by the audiences and tavern costumers, alongside with other dance practices that were already being performed there for recreation of those same costumers" (Sardinha, 2010a, p. 267).

Based on Teófilo Braga and Ramón Menéndez Pidal, Sardinha tries to show that the period fado practices, and others derived from the traditional ballads, needed no external influence, and they were by themselves suitable for dancing. "Calling fado to these other dance practices was just another step" and using, again, a synecdoche reasoning, "this was how the label fado engulfed other practices different from its original matrix" (Sardinha, 2010a, p. 268). Sardinha culminates his thesis, supported on a reasoning by Carolina Michaelis de Vasconcelos, that fado had an ancient, national, origin, based on the traditional ballads, sung across the entire country.

Our own opinion is that none of these authors considered the hypothesis that all these different theses (even if Sardinha's one is highly speculative) have something true in them. One cannot fully prove or dismiss any of them. Obviously the practices derived from the traditional ballads had their evolution and continuity alongside other contemporary practices coming from abroad. We cannot assume that someone has ever called "fado" to the result of those practices as Sardinha assumes, nor even assure that that fact would be decisive for the creation of an independent musical category. However, we consider plausible that those practices might have had influence on what constitutes the body of repertoire of the future fado. A myriad of performative and contextual practices coexisted in the same time and space and some of them were known as "fado" in a given period of its history. It is likely that the same practices that were not fado started being called by that name by the incorporation of certain elements or its inclusion in a new context and posterior legitimation. On the other hand, some other practices could just cease to be called fado. It seems clear, though, that the sources tell us about several choreographic practices that were known as fado or integrated as such in a symbolic category. However, it also seems clear that, although the dance has been always associated with fado until very recently in its history, soon enough that aspect was no longer the fundamental trait for its recognition as such.

6.2 Fado feeling

The body posture and the way the *fadistas* embody their performance is a key feature to influence the overall sound of fado, not only because of the spatial placement regarding the audience and the musicians and how they will interact with each other, but also because of the recurrent tendency to place the neck in a way that will invariably affect the breathing and the timbre of the voice. Hence, the embodied performance will have a major influence, even in the phonograms, when communicating emotions, moods and affects towards an audience eager to create empathy with the singer.

In the particular case of fado, the embodiment of the narrative, mapping each line into a pair of binary measures, is done in conjunction with a gestural device:

the tempo of the second beat of the odd measures is slightly slowed down, while its dynamics are increased, raising tension and creating a waddling effect that makes one want to lift their feet. While this effect has been described in literature as a syncopation, the data shows us that many different rhythmic figurations actually occur, and instead, it is the gestural and articulatory characteristics of the beat that are consistently reiterated, as shown in figure 6.1.

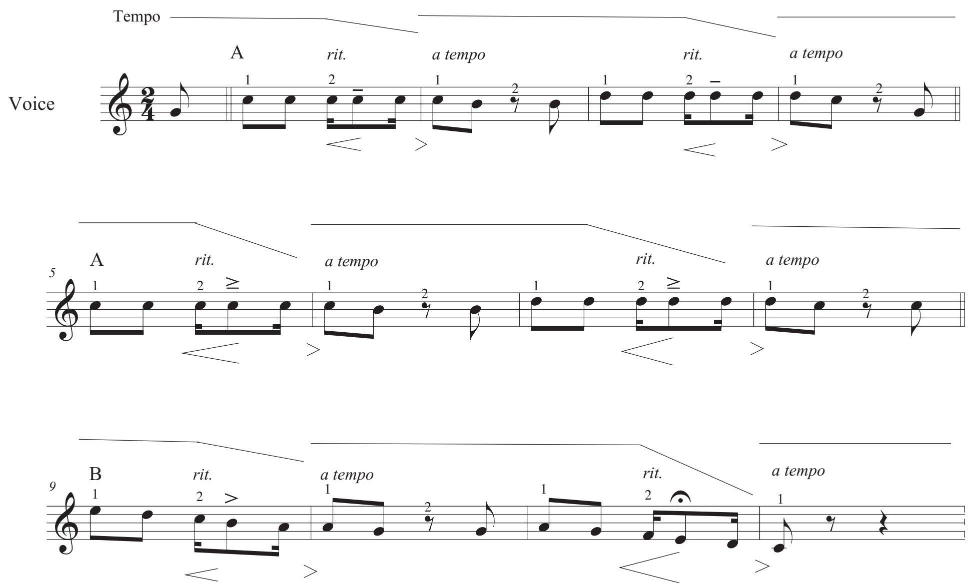

Figure 6.1: Fado feeling.

This gestural shape is one of the trademarks of the genre and can be described as *fado feeling*. When a given line of text is repeated for emphatic purposes, often the already emphasized open vowels tend to be over-emphasized, slightly changing the pitch, further slowing down the tempo, and increasing even more the dynamics. Sometimes, even enlarging the rhythmic value, shortening the following ones, which would correspond roughly to something between a *tenuto* and a *sforzando*.

In fado practice rubato is often used for dramatic effects and for emphasizing certain words from the text. Therefore, the instruments try to keep a steady tempo (namely the viola). It is the singer who decides when to diverge, and at that point the other instruments have to react and adapt themselves to the singer. Often in very dramatic and long suspensions the instruments completely cease to play and wait for the singer to finish the cadenza and let the silence resonate. "Particularly in the last strophe during the finale on a key utterance, when the instruments might pause, and in this space of silence, the voice might hover on the break of a cry; it might become almost impossibly soft (or, for a man, impossibly high); the voice might tremble and turn upon itself in ornamentation" (Gray, 2013, p. 39). This silence is powerful and has a tremendous emotional effect:

> "There are shifts in pitch and rhythm; suspensions of time in a vowel drawn out or a silence prolonged; micro-timbral nuances in the voice that inflect the feeling of a word or a phrase. There are moments that hover on a continuum between speech and song – now a word declaimed, then a phrase sung. There are the variations of force behind the air as it moves out of the lungs and the throat into the air: the wail, the whisper, the falsetto, the sometimes widely oscillating vibrato. Then there is stillness, the strategic use of silence" (Gray, 2013, p. 139).

After that, the viola resumes the play with a steady beat, and the performance follows. Even in the older musical scores from the nineteenth century it is possible to infer these moments, often near the end and in a high, long note or above a key word, marked with a *fermata*.

Chapter 7

Fado as Memory

By the end of the twentieth century, fado exists in the mind of listeners and performers as a concept referring to certain contexts, conventions, musical gestures and practices. It is impossible to define exactly what fado means to everybody since, as has been shown, fado can be equated to a series of many different things, and our definition of fado might be slightly different from others or even have a narrower or wider scope. The meaning of fado each one brings inside themselves can vary according to a series of factors like education, living context, information access, local practice, etc. Even reducing fado to a particular set of musical gestures that seem to be common to most of its occurrences nowadays might not be enough. Another step beyond was already taken when dealing with covers and homages. A concrete example: the Portuguese musical singer Sónia Tavares, from the band The Gift, made a new arrangement of Amália Rodrigues' "Gaivota" [Seagull]. "Gaivota" in itself was already a bold innovation in the 60s, and was not considered a fado by many of its contemporaries. However, in the 90s, everyone would consider "Gaivota" a fado, even a canonical and respected one. It was a very good example of a song that was assimilated into the canonical repertoire. The new arrangement presented by Sónia Tavares was another bold innovation derived from Amália's one – the new song was sung completely flat with a synthesized accompaniment. None of the musical gestures or references typically associated with fado are present. Any common listener, outside the context, hearing this performance would say it was a normal contemporary Portuguese pop song.

The "Gaivota" from the 60s was already very different from a typical fado – a different structure, a complex harmonic progression, a poem with an irregular form. It just did not fit the known and accepted model of its time. However, because it was performed by Amália, sung with her peculiar vocal style, with the guitar and viola accompaniment, and with the dressing code and bodily posture used at the time, there were enough cues leading one to think that it was fado, and as such it was assimilated as one. "Gaivota" was, eventually, considered a fado, just like many other new songs throughout the 70s, 80s, 90s and even nowadays are, by offering enough cues, namely the musical gestures, present and related to traditional models of fado.

Sónia Tavares' "Gaivota" cover, however, completely misses those same cues. It lacks vocal and guitar gestures, it lacks the dressing codes and the bodily posture. It lacks the performative context and space. Nothing in that performance has any resemblance or connection to a traditional fado from the beginning of the twentieth century. There are only second generation cues, one ought to say. The lyrics, and more or less the same melody (even without the ornaments) and harmony are preserved between the original "Gaivota" and the new one. People say the new "Gaivota" is a fado, because it is a recreation of the original "Gaivota", which is already considered a fado nowadays, even if it was not back then. So, there is a kind of chain of events, and it is this chain that is preserving the sensation of fado along the way, even if there are not common traits shared between the first and the last element of this chain.

Fado is then recognized through memory and association. This is a fado because of memory and reference: because by listening to this performance one immediately equates it with a former performance that was already considered as being a fado, even if that same performance was not considered as one in the time of its original creation. In the twenty-first century fado can then be identified as vaguely and imprecisely as the memory and reference of some gestures and cues present in previous occurrences of another fado.

7.1 *Desfado*

The most recent album by Ana Moura, *Desfado* (Moura, 2012), is an interesting case study that allows us to test several of our assumptions. First, the work is called *Desfado* (literally *un-fado*) and the deconstruction of the fado starts by paradoxically leading us into thinking that one is in the presence of the real thing by the use of strong cues. It then challenges them by incorporating a myriad of other elements, usually not present in traditional fado (piano, several percussions, strange metrics and poems, etc.), leading one to think in the opposite direction, that one is in fact in the presence of a more folk or pop album, an album of songs. The album was recorded and produced in Los Angeles and a web-series based on the recording can be found in Ana Moura's YouTube channel[1]. Along with Ana Moura, two musicians, the *guitarra* and the viola players, traveled with her, which shows the importance of the local instrumentation in the definition of crucial sonic cues. Those instruments are present throughout the entire record, the viola always as a base support – mostly doing a rhythmic pattern of bass and chords, and the *guitarra* as a counter melodic instrument when the voice is present or as a melodic and soloist one on some instrumental sections. This use has been the most common during the entire twentieth century in all records and live performances and so it acts as a strong reference of an already existing tradition. Tozé Brito, a Portuguese composer, on episode seven of the web-series, states and reinforces the idea that he composes regular songs but then the way Ana Moura sings them (*estilando*), and the arrangements "turns them into fados". This statement reinforces the idea that contemporary fado can be seen and recognized through some specific cues and gestures and that its identity is linked to those. In this case, Tozé Brito seems to identify them as being the articulation of the voice and the instrumentation. The cherry on top of the cake is a song composed by Joni Mitchell, entitled "A case of you". Hearing this song we certainly hear the *guitarra* in its habitual role, however the viola makes a slight smoother and fluid pattern, usually more close to pop ballads and not fados. The strongest cue, Ana Moura's vocal style, is totally missing: she sings in English, and that totally deprives us of a crucial element in the understanding of fado's identity. Because, and on top of that, the prosody and gesture are not present because she sings with a very discrete articulation without legatos, portamentos and almost absent *mordentes*. The outcome is that it does not sound like fado at all, it just sounds like a regular pop song. One of the most important characteristics of fado is its relationship with language. Although some of its themes are universal, in the sense that they are part of the daily life and emotions of most human beings, it is the fact that they are sung in European Portuguese language that gives them a special aura.

[1] `http://www.youtube.com/user/anamourafado`, accessed June, 6, 2015

Chapter 8

The Creative Processes

It can be argued that there are as many different creative processes as there are composers in the world. The craft of a song can seem elusive and, sometimes, arbitrary and not possible to be modeled or reduced to a correct "way of doing it". While we have been defending that fado emerges in a kind of linear fashion where the melody is constrained by the text, at this point some might argue otherwise. Often, and this is true of other song making traditions as well, composers just whistle a textless monophonic melody, that descends on them via "divine inspiration". They talk about how they dreamt of it, or how some God might have dictated it to them. Other times, they just fiddle around with a guitar and start mumbling random melodies, derived from the chords they are playing. Other times, they just improvise on a piano and the fingers lead their way up into crafting beautiful melodic lines, in a largely arbitrary process, not at all related to a text, or involving any sort of prosodic concern.

All these operative models, and a thousand more, exist, more or less related. Yet, they all translate into one of two things: either they are generative or transformative processes. They are generative when new material is being born for the first time, out of nowhere. They are transformative when previous material is being changed, recombined or further developed.

When composers depart from a text and derive the melody from it, for us, that poses no issues. It is the "ideal" situation we have been defending all along, and it is clear how one is facing a generative process in which the text constraints the melodic creation, in the sense of the rhythms, pitches, articulations, and many other relevant parameters involved.

However, sometimes, composers come up with textless melodies first. In this case, this is the generative process: the creation of new melodic material, and in these terms, this seems to violate the "correct ideal process" we have been defending. We still think it is not the case. Because even when composers generate textless melodies first, they have to deal with the text at a later moment. Either being written by them, or provided by someone else, they have to come up with a text whose characteristics exactly match the characteristics of their generated melodic material. This often implies that they have to *transform* their initial melody to conform to the new text. Sometimes this process is a back and forth one, in which the text is also slightly changed and transformed to conform to some melodic detail that composers do not wish to change. Either way, one is in the presence of transformative processes, through which the text will indeed ending up prevailing over and shaping the melody, and leading up to a final result that is similar to the initial model proposed. In the cases when this does not happen, that means, the text ends up not shaping the melody, according to its prosodic and semantic conventions, then the final result is incongruent.

The mismatch of text and melodic material is often detected both by the audiences and by the composer peers, and it is invariably seen in a very negative light and deemed as a bad practice. This leads to a subjective positioning of what good and bad practices are, and that is something that varies according to the different song making traditions and their communities. In the case of fado, it is something often pointed out, and already presented in this dissertation. Due to this fact, sometimes subsequent transformative processes occur. *Fadistas*, for instance, may receive mismatched texts and melodies and then they "correct" them in performance, transforming the melodies so that they conform to the text in ways they see fit. The reverse might also happen, unexperienced *fadistas* might ruin what were congruent texts and melodies. In either case, these processes generally do not overlap with the initial creative process, unless both the text and melody are being created on the spot, which, at present, is very rare.

Our goal is to avoid any model (be it explanatory or predictive) that is modeling what is considered a bad practice or a final result that is not adequate to the communities involved in the practice. Hence, and having acknowledged the fact that there are indeed a myriad of ways of composing and achieving similar or even undesired results, we claim that, in the end, in a "good" song making process, the final text used is indeed a crucial, foundational element in constraining the melodies. Be it directly as a generative device (the melody deriving from it), or as a transformative one (a precomposed melody being changed to conform to it), or as a back and forth transformative one (both the melody and the initial text are shaping one another until they conform to each other). Therefore, while a more faithful model would encompass these three variations, we consider that their end result sounds very similar. Both the second and third processes ending up providing the illusion that the melody conforms to the text just as if it were derived from it all along. Hence, one can model them like the first one in order to avoid redundancy.

Chapter 9

Conclusions

Fado is a sorrowful tale, a narrative emerging from the life experience of the people, using the vocabulary and lexical field appropriate to be shared by the people. The text shapes the form of the music. The strophic nature of the narrative translates into strophic musical forms repeated over and over, while more complex texts originate more complex forms. The available musical instruments determine the musical arrangement. Since most people have limited musical knowledge, the most common practice is to play very simple patterns (often just *arpeggio*s, other times simple stock figurations and repetitive *ostinati*), maximizing the number of open strings and the easiest fingering positions, using the simplest time signature. Therefore, a binary pulse and a chord progression alternating tonic and dominant is vastly preferred over any other more complex variation. If skilled performers are available, then the degree of complexity and inventiveness of a fado tends to increase accordingly. These conditions constrain the way the melody is shaped. The rhythm of the melody is dependent both on the prosody of the text and the time signature chosen, while the pitches of the melody are constrained by the underlying chord progression being done by the instruments.

The tempo, dynamics and articulations of the same melody are constrained by the emotional (semantic) content of the lyrics and by the physical characteristics of the *fadistas*. Their body shape, the way they position themselves, their health condition, will determine most of the timbral characteristics of the melody and how they will be perceived by the audience, in a complex network of relationships and interdependencies. The rhythms and pitches selected will also affect the dynamics and the timbre, since they are all correlated (ascending lines will tend to increase in dynamics; high-pitched longer notes will also tend to have increased dynamics and vibrato while being slowed down; shorter and faster rhythms will tend to have lower dynamics, while being accelerated etc.).

There are a myriad of conventions built along the nineteenth and twentieth century that were supposed to reflect "Portugality" and convey a number of emotions, affects or moods that would make us experience empathy towards them. Portuguese natives would see themselves as individuals belonging to a community, a culture, mirrored on those traits. Therefore, as Moore points out, "A musically inclined Portuguese (and most Portuguese are musically inclined) can instantly tell whether a song is a 'fado' or not; though he cannot successfully explain it to any one who is not a born Portuguese." (Moore, 1902, p. 165). Fado would, then, be the empathic recognition or embodied experience of certain emotions, affects or moods, learned by association to certain conventions as symbols of Portugal (*saudade*, nostalgia, melancholy), in a performance practice.

However, even with such a cautious but strong definition, a very important conclusion that we have reached is that it seems impossible to devise a definitive definition that includes everything that we call fado, but excludes everything that we do not call fado. This is a problem similar to the one portrayed by Wittgenstein in his *Philosophical Investigations*, where he studied the problem posed by the definition of "game" (Wittgenstein, 2010). His solution, based on the strategy of "family resemblances", is somewhat what we propose for the issue of fado. We believe that fado is a name we give to a myriad of different things that share some characteristics in common, but not all of them have to be present for us to identify something as a fado. On the other hand, there are also a number of extraneous traits that might be incorporated into something recognized as fado that are not relevant characteristics to the phenomena at all. We have detailed a series of cues and signs that may help us define it but, as stated previously, there are no clear boundaries as to what extent those cues have to be present, neither how many, neither in which contexts.

It seems that the stronger characteristics are the ones related to unique timbral traits, not shared by other practices. Thus the conjunction of two gestures: the vocal styling within a theatrical embodiment and the typical "Armandinho" *guitarra* formulaic countermelodies, allow that virtually any musical work containing them will be identified by most of the contemporary listeners as a fado regardless of other factors. The use of these gestures may not be exactly in their original form – one needs neither the voice of Amália, nor even any voice at all to recall her vocal shape. One successful attempt at demonstrating this assumption are Rão Kyao's instrumental fado albums[1] in which he recorded the melodic lines with wind instruments (mostly saxophones and flutes) (Côrte-Real, 1991, p. 74). By articulating the melody as the originally *Amalian* vocal gesture described above, he was able to convey the feeling of fado to his listeners. Neither a voice nor lyrics were present, however, by employing a gesture that at the time was already canonical and present in everyone's minds, the genre was conveyed by memory and association with past events and contexts. A mere allusion sometimes is enough to convey the style.

Empirically, the relatively low note density seems to be a useful feature to define fado in relative terms. The usually sparse instrumentation and the lack of percussion tells it apart from other musical styles.

The strength of strongest rhythmic pulse also seems very distinctive, since fado stands out regarding this feature. Fado also presents relatively high average note durations, with low variability (confirmed by low maximum and high minimum note durations), and negligible very short notes, indicating mostly rhythms centered around the eight note, with absence of extreme note values. The very low average variability of time between attacks for each voice also points out how written fados share clusters of similar rhythms well aligned with each other.

Range is a useful feature to define fado, since fado has a relatively short range, located mainly around the A below central C. In terms of pitches, the magnitude of the second most common pitch in fados, divided by the most common one, is relatively very low, which indicates a strong tonicization of the style. Its distance is usually the perfect fifth or the perfect fourth reinforcing the idea of a tonal tradition. The relatively low pitch class variety implies the simplicity of the style, being A the most common pitch class overall.

Fado melodies have a high number of half and whole tones in relative terms, contrasting with the accompaniment figurations, presenting a low level of them. In comparative terms, fado melodies also lack perfect fifths, tritones and octaves when compared with other styles. In terms of direction of motion, fado accompaniments melodically rises while melodies go down. Fado melodies also present long (in

[1] *Fado Bailado* (1983); *Viva o fado* (1996); *Fado virado a Nascente* (2001).

terms of duration) and short (in terms of range) arcs in relative terms, indicating undulating melodies.

Another strong cue is a visual and social one: the presence of a *fadista*. The simple presence of someone who is known or present themselves as a *fadista* leads us to recognize or categorize as fado whatever songs they perform. This is a vicious cycle: usually a *fadista* is someone who earns their identity because they are professional fado singers, because they sing fados. On the other hand, after being recognized for doing that, and one assuming their identity as being that, then whatever they do is entitled to be part of the "*fadista* repertoire", and is therefore identified as a "fado". This is precisely what happened with Amália Rodrigues and many others following her, namely Carlos do Carmo.

Some musical archetypes, namely the ones based on the primary Ernesto Vieira definition, seem also to be a strong cue, since statistically, most of the fados conform to that model. Although there are a large number or variations and exceptions, especially in more recent times (and much due to the inclusion of extraneous repertoire by the appropriation of some popular songs by famous *fadistas*), the truth is that when someone tries to compose a fado from scratch, usually they end up following something somewhat along those lines. So it would be very unlikely for someone to not think of a fado in binary form, without at least four melodic arcs, each one being two bars long, in the antecedent-consequent format, usually with a pickup note and a syncopated rhythm, and a harmonic *ostinato* based around tonic and dominant. Many variations can be made, but the skeletal model is this one.

A final and very important cue is the lyrical content and the ideological association with Portugal. This is a very tricky and subjective cue, leading to many mistakes and curious phenomena. Whenever one sees a performance in which the lyrics talk about feelings and facts associated with Portugal, and cumulatively, one can pick up some other cues, namely the use of a *guitarra* or viola, for instance, and also cues from the popular and ideological imaginary built during the dictatorship (the famous "Tom's dolls"), some people tend to make an association and recognize this as part of the fado repertoire. Recent examples of this are famous groups like Madredeus or Deolinda, or the popular singer Dulce Pontes. Although these Portuguese artists perform some very original Portuguese music, we would not consider them fado. They actually have some fados in their repertoire, but in essence they do not present themselves as *fadistas*, in the whole, neither do they display most of the strong characteristics already mentioned. Still, somehow, some of their songs are confused and categorized as “fado” by their listeners. This is most visible looking at commentaries to videos of their music on YouTube (both by Portuguese and foreigners). We can only conceive and explain this based on those ideas of “Portugality” and lyrical content associated with their music.

The lack of a proper vocabulary and of a way to systematize this set of values has been a recurrent problem until the present time. Also, our standard musical notation is poor and lacks the resources to take full account of these traits. Ellen Gray presents transcriptions with a remarkable degree of detail compared to the Portuguese sources, which lack many of these parameters. Based on her notation and our own findings we can provide one example (figure 9.1) of how one can improve conventional notation to better convey a “fado feeling” when scoring a MIDI file, for instance, for computer rendition.

Figure 9.1: Alternative notation to better convey “fado feeling”.

Many more characteristics could be mentioned, essentially weaker and less relevant than the ones mentioned above. Throughout the different sub-sections of this part we have explained most of them in detail, and we think we were able to portray an essential and global idea of what fado is, and also, what fado was and can be in different times and contexts. We believe we have achieved a holistic description of the phenomenon and presented solutions for its understanding, modeling, and also possibilities for further research. Fado has been considered to be many different things in recent history. Although one can clearly see the concept evolve in time and widen, like a tree spreading into many branches, the truth is that fado's evolution cannot be considered as closed. All fado manifestations exist and persist at the same time, varying their relevance or preponderance in a completely subjective way. Fado is a dynamic and ever changing concept; hence one might always find some new manifestation that will not be contained in the definition one might provide. However, one can more or less agree that we recognize fado when we see it, and most of the time we can present a justification for why that is so. Therefore, we are certainly able to model some objects, based on chosen rules and statistical data from the past to create new fados. However, we are not creating nor exhausting the entire array of possibilities. Perhaps we might not even be creating a representative set of what the concept means at present. But we can for sure say that "if this object complies with the characteristics x, y, z... then it is for sure a fado, in this context".

Chapter 10

Future Work

Empirical Musicology is a field in current expansion and development. While the study of fado might be considered more of a historical, anthropological or social problem, we believe an empirical musicological approach was missing. We also believe most approaches have merit and a syncretism of all of them might give us the best answers to understand a phenomenon that we, now, see as a complex and holistic one. Given the amount of data gathered and all the possibilities that remain to gather some more, using the same or different methods, it is expected that we have built the grounds for a fruitful study. The database and the several corpus versions are available and there is plenty of room for more experimentation using other parameters and statistical operations that we have not considered given our own subjective view and limited amount of time. There are plenty more occurrences of fado in literature waiting to be unearthed and converted and added to the database, as well as increasing its time span, if deemed as necessary. The comparative database should also be enlarged. Ideally, a huge set of recordings – including not only symbolic sources but also audio recordings – sampling the entire world musics, with much more detail and uniform encoding conditions could prove to be worthwhile. Therefore, we consider that much future work can still be done and built upon this data to refine and improve its effectiveness.

Part II

Automating the Composition Process

Chapter 11

Introduction

The main objective of this dissertation is to model musics and vocal sounds typically associated with fado practice, in a way that a computer can generate new sound-alike instrumental music and reproduce it. There are several ways to approach this problem. However, soon enough we have realized that the most flexible and generic models are the strongest ones, as they can be easily manipulated and adapted to represent other musical practices. In a certain way, and following the steps of our inspiration, David Cope, a reference in the imitation of musical styles using artificial intelligences, we see fado as just a case study and a proof of concept of a larger problem: the modeling of the cognitive process behind the way humans, in general, compose songs. This second problem seems a more interesting and vast one, however, impossible to solve in the scope of a mere PhD dissertation, so we struggled back and forth between these two axes in order to focus on our case study without losing sight of the bigger picture.

The song composition process seems to be a series of constrained problems. There is a task to be solved step by step, involving a series of decisions. Some of those decisions are not consciously taken by the composer; rather, they are the natural result of the limitations of some initial conditions. In the chain of events, some decisions and limitations influence others. For instance, the musical instruments available will determine the arrangement, the overall timbre, range, even the rhythms and dynamics of the final outcome. The skill of the performers and their health conditions will also affect them. The structure of the text will affect the musical structure, and so on. Therefore, our model is built in a sequential way, taking into account what we think best reflects the actual practice, based on the observations presented in the first part of this dissertation.

It would be tempting to say that modeling the process of composition of a song is a daunting task and a virtually impossible one, given the large number of possibilities and different approaches the actual practitioners use in their daily lives and performative contexts. Again, this being true, we also believe the best models are the most elegant and general ones. Therefore, instead of focusing on the differences and the myriads of individual approaches (plurality) we decided to concentrate on what they could all have in common, their tendencies, their recurrent patterns (universality). A model like this, aiming at universality, is obviously a flawed reduction of reality. It is also far from giving any scientific or objective explanation about the whys and hows of that same reality. Instead, it represents an archetype, an ideal, or even a stereotype. Perhaps, a projected vision of what an "average" of all possible ways of doing it might be, if it makes any sense to conceive that. One might say that, if David Cope in his project tried to teach the computer to compose like he, himself, would do (Cope, 2005), we did virtually the same. We tried to learn how some people compose music and vocal sounds associated with fado, how those musics and sounds were made throughout history, how they evolved and changed, how they actually sound. Then we tried to do it ourselves. We spent a long period learning and perfecting the craft of composing and producing music using computers and virtual instruments. We had to physically understand the process and be a part of it so we could be aware of the challenges and obstacles one usually faces. We had to understand not only more analogical tasks, such as how to create melodies from lyrics having just a viola or a *guitarra* in our hands, but also the process of creating a score using a music notation program. Moreover, we felt the need to understand how a musical score might end up in a DAW (Digital Audio Workstation) to be recorded, mixed and mastered, up to the point of obtaining a convincing sound result. While this is usually a time consuming task, that in the real world might evolve several people doing it, in several different ways, we felt we needed to understand and learn most of them. Derived from all that experience, we have now a conception of how to do that process from scratch. If someone asks us to compose music for a fado, we have a way of doing it. And now we are teaching the computer the most effective way to replicate the way we do it.

To think about an academic or scientific goal is to be less concerned with results in the short-run. The pursuit of knowledge, in itself, is the main goal. However, looking from a commercial angle, there also are a myriad of possibilities that can be taken into account: the production of software emulating or imitating a style, generating infinite music, is an invaluable resource from an economical point of view. Once it is done, it consumes very few resources and can generate massive amounts of content. Neither does one need to pay musicians or composers, nor does one need to pay royalties. The outcome could be sold to society and the industry. At present there are numerous software applications based in algorithmic composition for people to try on and generate music at their will, like PG Music *Band-in-a-Box*[1] or Dunn's *Artwonk*[2], as well as leisure and relaxing environments that generate music real-time with interactive components, not only in computers, but also in smartphones, for instance, Brian Eno's *Bloom* or *Trope*[3] or the more academic *ANTracks* (Schulz *et al.*, 2009). In a way, by trying to imitate a style and creating an endless repertoire of songs, several goals are being met: not only a scientific and philosophic problem is being addressed, but also an attempt is being made at creating something to fulfill a cultural and social need: the endless desire for music – "Music is not a language that describes the way society seems to be, but a metaphorical expression of feelings associated with the way society really is" (Blacking, 1973, p. 104).

[1] `http://www.bandinabox.com/`, accessed June, 6, 2015
[2] `http://algoart.com/`, accessed June, 6, 2015
[3] `http://www.generativemusic.com/index.html`, accessed June, 6, 2015

Chapter 12

State of the art

In the creative process of composing music one is dealing with the most intricate processes that happen inside our brain. Composing, in a romantic view, could be something that deals with emotions, moods, affects, senses, soul – with one's true being, with the self. One of the crucial aspects of composing resides in the moment when the composer has several options on how to combine their basic musical cells. Whether they are sounds, clusters, musical pitches, structures or other sonic objects, human beings have two main options in hand: either they leave the decision to chance, thus throwing dice, picking up cards, following tables, I-Ching or several other methods human beings usually use to generate random results, or they just deliberately pick a road at their will. When thinking about this second option, the most common by far, one really does not know what is going on, and one would step into an endless discussion about subjectivity, determinism versus free-will, auto-determinacy or consciousness. In fact, the debate is wide open and one really does not know yet the rules that govern our choices. In many ethnographic interviews composers many times answer things like "I just felt like it", or "It sounded right" or "I have tried several combinations and it was the one that sounded better", and so on. Often, even highly specialized musicians are unable to justify their choices, methods or decisions in a rational way. However, it is often believed that it is a human phenomenon different from pure chaos or chance. One tends to think that when a human makes a choice, something personal, something belonging only to that individual is present, and that if somebody else was put in the same situation probably the outcome would be different. In a certain way, choices made when composing define the composers, define their style. Bourgeois (Bourgeois *et al.*, 2001) stated that "Wasn't it Buffon who said, 'the style makes the man'? It means that the way you do something is more important than what you do. The way you do something signals you as an identity. You are the only one who does it that way.", corroborating this idea. Also, Wittgenstein (Wittgenstein *et al.*, 1984) follows the same path when he states about the same sentence that the style of a man is his own image[1]. The style, the way composers make their choices, is present in every one of their art works, it is a kind of a signature, a personal mark, something that leads us to assign a given work to a specific individual and not another.

When thinking about computers making choices, none of this happens. Computers deliberate only on what they are told to do, only in predetermined instructions given by the programmer/composer. And every time a computer is called to make a choice, by itself, out of two or more different possibilities, either a pure algorithmic procedure or randomness (which is also based in an algorithm) are involved. In fact, reading specifically the story of random procedures in informatics (Hayes, 2001), it can be seen that in the beginning most of those procedures were only pseudo-random, as they were based in chaotic mathematical functions such as, for instance, $f(x) = x.(1-x).k$. This and similar derivative functions are extremely effective to solve everyday problems, since they generate apparently random numbers. However, this is an illusion because, in fact, these functions, to a certain extent, are predictable. Therefore, in the following years, scientists tried to improve random generators to be more and more chaotic and less predictable, to approach universal systems. The solutions were found using external parameters like the computer's clock, the cooler speed (which is dependent on weather conditions and the amount of work the processor is submitted to), the movements of the mouse pointer, the frequency of the keyboard strokes, and many other alternatives using physical processes on a microscopic level. When dealing with this kind of variables one understands that the computer choices are governed by what could be called cosmic chance, and there is no way someone could find any reliable pattern to confine it to any recognizable style or identity. It would be extremely hard to find any coherence and we really doubt that one day someone could claim "This set of choices is really the style of Computer 04 in Room 302". Unless, of course, one limits the way computer makes choices according to some constraints

[1] "Le style c'est l'homme", "Le style c'est l'homme meme". Der erste Ausdruck hat eine bilige epigrammatische Kürze. Der zweite, richtige, eröffnet eine ganz andere Perspektive. Er sagt, daß der Stil das *Bild* des Menschen sei.

and desires of the programmers themselves. But in that case, one is really assigning a kind of identity given by them and not one the computer would create by itself. We have already written about this subject in more detail elsewhere (Videira, 2007). This being said, a point has been reached in which we feel this romantic vision of the composer being gifted and having an opaque soul might be transcended. We have come to believe that computers might be programmed to automate reasonably well problems that lie in the music composition process. Algorithms can be employed, just like when a cook writes a recipe, to emulate those processes. Several techniques were and have been developed through the course of history and are surveyed ahead.

Systems of algorithmic composition can be found a long time before the computer era. In 1026 the monk Guido D'Arezzo applied a method to derive his compositions right from the lyrical content, assigning specific musical pitches to vowels (Roads, 1996, p. 822), (Järveläinen, 2000, Silva, 2003). Later, during the eighteenth century, several musical dice games were made famous: a preset of composed measures was being recombined between each other according to chance dictated by dice throwing (Roads, 1996, p. 823), (Alpern, 1995, Silva, 2003). However, it is with the advent of computers that these methods became increasingly popular and efficient. A computer is able to perform calculations much faster and more accurately than any human would do, so adopting them as an aid tool was something quite desirable for composers seeking effectiveness. The necessity and motivation to explore these new resources was born. There are numerous examples of pioneers in algorithmic composition since the 50s up to today. The first, and most relevant, was Lejaren Hiller, in 1955, when computers were still rare and extremely big. He was one of the first to apply computers to algorithmic composition, musical impression and physical modeling synthesis. He was also one of the first cybernetic music historiographers contributing with his *Experimental Music* (1959) and *Music Composed with Computers* in 1970 (Roads, 1996, p. 830). Several composers followed his example namely Brün, Myhill, Tenney, Barbaud, Philipot, Koenig and even Xenakis. The latter had been composing for a while using formal processes (his previous piece *Metastasis*, from 1955, was written based in stochastic calculations made by hand), and quickly understood that a computer would make his work a lot easier. The first processes being implemented were *deterministic procedures*, these being a set of predetermined instructions that a computer would follow and, by the end, one would obtain a certain result, similar to following a kitchen recipe. The procedure by itself is straightforward and classical composers frequently used them. Computer programs following contrapuntal rules are a good example of this. The advantage is efficiency and speed – the machine produces in seconds what for a conservatory student might take hours to compose.

12.1 A survey on algorithmic composition

Since this project began many things changed. The references accumulated and discussion around the core problems of the field grew exponentially. Thus, this particular chapter has been revised substantially since its first version in 2010, because it quickly became outdated, with several papers and surveys being published recently during the development of our own research. What were ill-defined and vague problems suddenly became well-formalized or solved issues, while many theoretical approaches were implemented by vast teams of researchers and new applications were tested and put in the market. So, in a way, we felt vastly overwhelmed with a constant flux of new information while, often, also surpassed when some of our own "original" ideas and concepts suddenly became obsolete or flimsy when compared to recent work by other researchers around the world.

Our references for what is the field of algorithmic composition and its main achievements also became outdated and redundant. Curtis Road' (Roads, 1996), Eduardo Reck Miranda's (Miranda, 2001) and David Cope's (Cope, 1996, 2000, 2004, 2005, 2008) books will always be historically important and full of relevant information, taking into account their context, but Nierhaus' (Nierhaus, 2008) book on algorithmic composition does a major update and quickly became a reference as a state of the art survey. More recently, Jose David Fernández and Francisco Vico (Fernández & Vico, 2013) did another massive update, their article being a very complete and up to date survey for the field, and therefore we will depart from these two references to introduce this discussion.

Algorithmic composition is a subset of a larger area: computational creativity. The problem of computational creativity in itself is still difficult to define and formalize well. It can basically be said to be "the computational analysis and/or synthesis of works of art, in a partially or fully automated way" (Fernández & Vico, 2013, p. 513). On the other hand, the most common approaches and problems algorithmic composition had to solve are now systematized and well-defined.

We will reproduce the classification system Fernández and Vico adopted (Fernández & Vico, 2013, p. 519). We are adopting this classification system because of its systematic and formal coherence: it focuses on the different methods implemented from the point of view of the *processes* they are trying to model, which is exactly the task we are pursuing ourselves (figure 12.1).

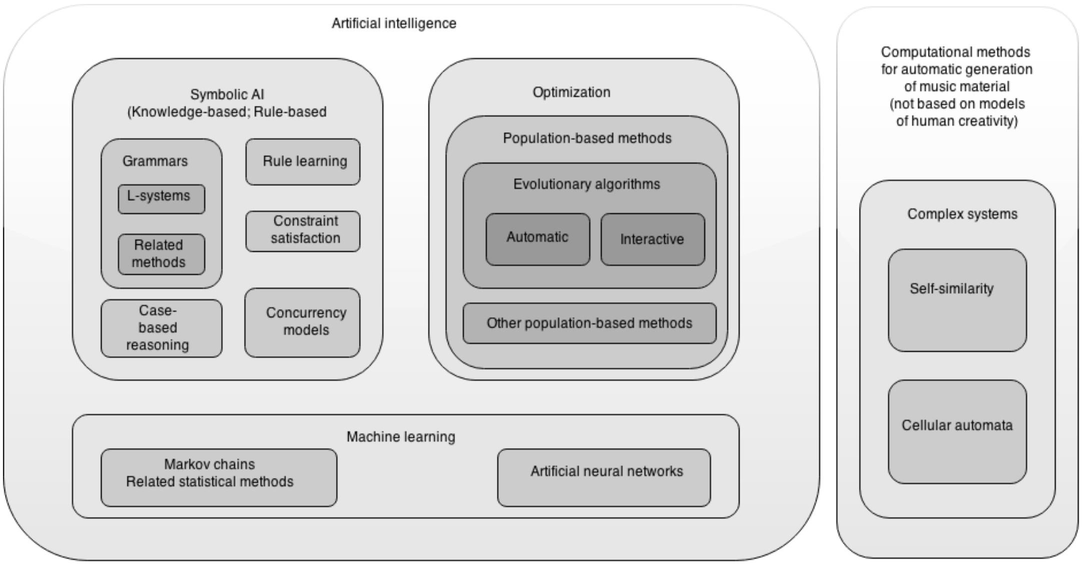

FIGURE 12.1: Fernández and Vico (2013, p. 519) classification system.

There are two big areas representing two radically different approaches. Either one can observe how intelligences typically create and then model their behavior or reasoning (artificial intelligence) or one can simply focus on getting good musical results even if a human would never be able to do it that way. These last approaches usually represent processes found in nature and are assumed to be the result of chaos or complex interactions without any intelligence behind. Among these complex systems one can find self-similarity processes (fractals, for instance) and cellular automata.

Among artificial intelligence, one finds processes that intelligent beings use. Those are divided into three main areas: symbolic processes, optimization and machine learning.

Symbolic artificial intelligence relies mainly on modeling the *process* of creation by the use of simple rules. They usually represent the creation of symbols and their subsequent manipulation and transformation. These approaches depend on the idea that the creative processes can be described in formal terms and reduced to a theory. The problems must be well-defined and their boundaries established, as well as its constants, variables and sets of operations. In this case, the rules must be conveyed by the programmer, who obtained them through the previous observation and analysis of the processes involved.

Optimization processes derive mainly from the idea that one can depart from very simple units or imperfect samples (members of a representative population) and combine, recombine and eventually transform them through successive trial and error operations. The strongest and fittest combinations are selected, while the weakest and most unsuitable ones are discarded, until results start to improve and eventually get optimal. These processes resemble the Darwinist idea of evolution.

Machine learning processes, on the other hand, focus on analyzing the outcomes of previous creations. A representative corpus is constituted, processed and analyzed, and then new predictive or prescriptive rules are inferred by the machine. Using those rules the computer will, then, be able to generate new works.

12.1.1 Symbolic artificial intelligence

The concept of formalizing processes through the use of symbols and their subsequent manipulation has historical precedence in almost every scientific area of knowledge. One of the most important historical approaches to symbolic artificial intelligence is the use of grammars. Grammars consist of a series of abstract rules that are provided in order to build or infer a new sequence after a given basic set of symbols, ideas or objects. They have their origin in the study of linguistics, namely in the model developed by Noam Chomsky in 1957 (Chomsky, 2002), and in the parallel thought that music is a hierarchical structure (musical notes can be seen as phonemes that can be used to build words, sentences, paragraphs, etc.) (Bernstein, 1976), (Miranda, 2001, pp. 72-78). This kind of formalization was very influential in the development of derived theoretical models, namely *A generative theory of tonal music* developed, in the early eighties, by Lerdahl and Jackendoff (Lerdahl *et al.*, 1996), which was subsequently upgraded (Lerdahl, 2005, Margulis, 2005).The derivation of the grammatical rules and their subsequent mapping seems to be the major factor determining the quality of the results. Historically they have been mostly derived by hand, based on previous knowledge or observation of musical corpora. However, some attempts at inferencing the rules automatically have also been tried. The application of grammars to music systems usually suffers from linearity, since they are only able to deal with one layer at a time. Nevertheless, they are a very powerful tool and have been sometimes used in Jazz improvisation programs and in chord progression creation (Nierhaus, 2008, pp. 83-118), (Steedman, 1996).

A recent example concerning the use of Grammars is the work of Tojo et al., a musical analysis system based on A generative theory of tonal music, which is a vast elaboration on previous projects which included a music expectation method, predicting the next notes needed to assist musical novices in playing improvisations, and a melody morphing method, generating an intermediate melody between two melodies in a systematic order in accordance with a specific numerical measure (Tojo *et al.*, 2013). Another recent example is the work of Quick and Hudak, presenting a new class of generative grammars called *Probabilistic Temporal Graph Grammars*, which they claim to be able to handle temporal aspects of music in a way they retain a coherent metrical structure and also phrase repetition (Quick & Hudak, 2013).

Grammars exist in other variants. One of them, featuring parallel rewriting, is known as Lindenmayer Systems, or L-systems. They are mostly useful for modeling self-similarity patterns, especially in visual renderings using turtle graphics. A popular use of these systems in algorithmic composition is "to pre-generate a collection of short fragments and/or other musical objects, and define an algorithm to interpret the final sequence of symbols as instructions that transform and arrange the fragments into a composition" (Fernández & Vico, 2013, pp. 523-524).

A borderline case of grammars, Transition Networks are a graphical representation of finite automata in which the nodes represent the state of each single automaton and where the edges indicate transitions. The structures may allow recursiveness. In their conceptual basis they derive from grammars and are borrowed from computational linguistics (Woods, 1970). In the musical applications discussed, they can be considered more like an intelligent approach than a rule-based system, since their application is usually based on inference and retrieval of patterns within a provided corpus (Nierhaus, 2008, pp. 121-130).

Inside this category, the most relevant and successful case is David Cope with his EMI and Emily Howell programs. Following a composer's block, Cope generated the idea for a computer program that would be able to aid him by making sense of his overall musical style and mimicking it, composing new music that sounded like him. Utopian as it may sound, searching for a machine to replicate one's own creativity might not be a mere "aid" but more of a kind of immortality. According to Hayles, Minsky seemed to believe that "if we can become the information we have constructed, we can achieve effective immortality" (Hayles, 1999, p. 13). Just imagine the consequences of a computer producing Cope's music after Cope no longer exists. Moreover, "no longer about 'life', life science is now about the fact that there is nothing but story, nothing but information. This information is the sublime body" (Doyle, 1997, p. 22). Is it really feasible to extract one's own essence into mere code, information, and replicate it with a machine? However, at least musically, Cope thought this could succeed.

According to Cope's website[2] and related literature (Cope, 2005, Silva, 2003), his program functions after building a database with relevant material of a given composer in MIDI format. Therefore, it is possible to generate a choral similar to Bach's, by inserting in the database as many of Bach's chorals as one can. The more information the computer has access to, the better the outcome will be. Cope explains in a rough way how the computer works recognizing *signatures* (to determine the overall style), *patterns* (to identify recurrent motifs), *allusions* (to identify certain formal processes that replicate themselves). Then, using the information retrieved, it is possible to apply a series of techniques as *recombination*, *association* or *integration* to generate a new piece of work that will resemble the ones in the original database.

Regarding these issues, there are two things to account for: the first is that the whole process of composition relies in *solving problems by making choices*; the second is that the computer does not have established rules on how to compose. It will have to *learn* and deduce them from the compositions that are fed to it. In informatics and in Cope's case, the concept of learning is intimately related with trial and error processing – a constant back and forth that is recursively executed until success is achieved. Let one imagine that to accomplish a certain goal in a composition only the note B would fit. The first time it was running, the program would test every note one by one, and all would be rejected by the programmer instructions until B was accepted. The computer would keep that situation in its database for future reference, so the next time a similar situation were to occur the machine would have already "learned" what the adequate solution would be and would promptly answer with it. It can be seen that the more often a computer runs

[2] `http://artsites.ucsc.edu/faculty/cope/experiments.htm`, accessed June, 6, 2015

these processes, the quicker it becomes, because it is "learning" and keeping the good solutions for its problems. So, machine learning is understood as a continuous optimization process of adequacy of the proposed solutions to presented problems (Cope, 2005, pp. 177-219).

Many of the processes symbolic artificial intelligences model are based on *rules*, thus shaping rule-based systems. Often they are not always hierarchically structured like grammars; instead, these rules are often implemented as a set of iterative procedures. An iteration is the successive replication of a mathematical procedure, often building up in outcome of the previous step. A value chosen to map a certain musical parameter might be constantly transformed in this way. Usually iterative processes depend on functions that cause three types of outcome: either one tends to achieve a stable fixed value, or oscillating between certain values, or oscillating in an unpredictable way (chaotic behavior). Usually, the potential in algorithmic composition of the first case is not very appealing, since listening to music relies heavily on a good balance between repetition of musical elements and novelty. On the other hand, chaos has an enormous potential and it is widely used, especially because of its unpredictability and possibility of novelty generation. Associated with iterative procedures, there are also series of functions able to generate self-similarity (fractals). These are interesting because they mirror patterns and structures often found in nature. The main issues surrounding iterative procedures lie on the control (or lack of it) over them: specifically in chaotic functions, a very small deviation in the initial states can add up to an enormous difference in the outcome. Moreover, once applied, they evolve by themselves and one cannot do much to change the flow of the events. Also, the outcome is very difficult to foresee, which is not the case with other rule-based systems applied to music (Miranda, 2001, 83-98) (Nierhaus, 2008, pp. 131-155). For more information on iterative procedures applied to music see Gogins (Gogins, 1991).

The evolution of rule-based systems in the 80s and 90s led to a more sophisticated formalization. The process of composing, this process of *making choices* could also be seen as a constraint satisfaction problem, because the choices do not occur in an unlimited space of options. An obvious example is the choice of tempo for any given musical work: reasonably one seldom finds tempi below 40 beats per minute or above 200 beats per measure. These two numbers establish boundaries constraining a particular musical parameter. Therefore, the formalization of any given style or process, implies that every time a rule is created or inferred, and a choice has to be made, also some constraints have to be established to limit the available options to achieve reasonable and realistic results. The choice of constraints will, of course, enhance or impair the results: over-constraining the problem will lead to more predictable and repetitive results, while allowing too much fluctuation might lead to more innovative but also surrealistic outcomes. The recent project of Flow Machines[3], coordinated by François Pachet, and jointly hosted by SONY CSL and UPMC – Paris 6, is an example of a constrained based formalization. Instead of focusing on the process of creating an individual artwork, the project targets the formalization of *style*, through the use of *Markov constraints*. A user should be able to create not one, but several works, all conceptually connected, assembling a coherent corpus. In their examples, they have shown how jazz virtuosity may be modeled as a Markov sequence generation problem with unary constraints holding on specific notes of the melody. Several jazz lead-sheets are available and new music can be created in the style of famous composers, or even chimeras. An example provided is the "Boulez Blues", this being the composition of chord sequences using the style of Charlie Parker, constrained by a Boulez requisite that all chords must be different (Pachet & Roy, 2014, Pachet *et al.*, 2013).

Another frame for rule-based systems is case-based reasoning. A database of possible cases is assembled representing problems and their solutions, generally including structured knowledge on how the case is solved. Each time the program runs, it goes to the database to find the more adequate solution. When accepted, the new case and its solution might be recorded and added to the original database.

Because the musical process can be seen as the constant output and synchronization of several agents at the same time (namely a live performance, or improvisation), another way to formally describe and model it was to make use of concurrency models. Concurrency models provide primitives to specify the semantics of distributed systems.

Papadopoulos and Wiggins (Papadopoulos & Wiggins, 1999) presented a survey pointing out many examples of symbolic artificial intelligence and describing their scope, namely the *CHORAL* program by Ebcioğlu (a rule-based, constrain satisfaction, expert system for the harmonization of chorales in the style of J.S.

[3] `http://www.flow-machines.com/`, accessed June, 6, 2015

Bach) or the real-time jazz improvisations by Ramalho and Ganascia (case-based reasoning), among many others.

They left out, however, the very famous *Lexikon Sonate* by Essl, one of the best examples of a successful rule based system.

> “Lexikon-Sonate is a work-in-progress which was started in 1992. Instead of being a composition in which the structure is fixed by notation, it manifests itself as a computer program that composes the piece – or, more precisely: an excerpt of a virtually endless piano piece – in real time. It lacks two characteristics of a traditional piano piece: there is no pre-composed text to be interpreted, and there is no need for a pianist or an interpreter. Instead, the instructions for playing the piano – the indication ‘which key should be pressed how quickly and held down for how long’ – are directly generated by a computer program and transmitted immediately to a player piano (or a MIDI/software synthesizer) which executes them.” (Essl, 1992).

This represents a computer that, when the program is running, is self-sufficient and is able to compose for itself a piece in real-time and execute it without human intervention, once the process has started. Each time the program is executed it generates a different piece and the program can be executed as many times and for how long as desired[4].

The piece itself is constituted by 21 possible modules. Each one of these modules corresponds to a set of instructions leading to certain way of sounding having a high degree of freedom. All these modules might be combined in clusters of two, three, four, etc, *a piacere* of the listener, who may decide which ones to activate, or simply lie back and rely on a randomizer to pick them. Analyzing this piece, one acknowledges that it is a sort of dice game pieces popularized in the eighteenth century. However, it is applied in a textural plan and not chronologically – instead of a pre-set fragment following another one, here there is a kind of texture or way of playing that is going to be mixed with another. In a certain way, one might say that the piece respects a certain style. However, one’s ears may not be able to recognize that linearly: one may imagine listening to an excerpt now having three

[4]It is possible to execute an online version of Lexikon Sonate in `http://www.essl.at/works/lexson-online.html`, accessed June, 6, 2015

modules activated, then, on another occasion, another excerpt with another three, and then, in yet another occasion, a third excerpt with another three different modules. It would be reasonable to think that one is listening to three different pieces with three different styles. The only way to realize the style of the piece, or a development of it, would be listening to it several times, many times. It must be remembered that the *Lexikon Sonate* is one virtually endless piece, meaning that whenever one hears it, one never knows which part is being played, or even what is being listened to. There is no beginning or end. This piece transcends traditional human listening, and moreover, has ubiquitous properties. Imagining two or more computers running the software in the same room, one would be listening to different instantiations of the same infinite piece. In a certain way, *Lexikon Sonate* has within itself the potential of providing *all possible music in that style*, and that is more than humans can handle in their limited lifetimes (the odds of it repeating itself are very small). This kind of generated pieces of music brings very interesting consequences, as well as many philosophical questions.

In a detailed paper on six techniques for algorithmic music composition, Langston describes a technique called "Riffology" in which a pre-set of melodic phrases are fed to the computer, along with rules to combine them structurally.

> "The riffology algorithm makes dynamically-weighted random choices for many parameters such as which riff from a repertoire of melody fragments to play next, how fast to play the riff, how loud to play it, when to omit or elide notes, when to insert a rhythmic break, and other such choices. These choices are predicated on the model of a facile, unimaginative, (and slightly lazy) guitarist" (Langston, 1989, p. 6).

He also refers in detail another technique called "Key Phrase animation":

> "Once the key frames are drawn, the 'in-between' frames are produced by interpolation between the key frames. (. . .) If we let melodic phrases take the place of the key frames (assuming that starting and ending phrases have the same number of notes) and simply interpolate pitches and time values between corresponding notes in the phrases, we achieve a musical version of key frame animation." (Langston, 1989, p. 12).

One can easily imagine a fruitful combination of these two techniques in style imitation, using the first one to provide pre-fixed structures and skeletons of each piece and the second one to fill in the gaps creating the melodies that were missing.

12.1.2 Machine Learning

Machine learning is an approach that relies on previous sets of data. The algorithms programmed, instead of being generative rules, are *learning* rules that use the data provided to infer a model. Based on that model they can then make decisions or predictions. In the case of algorithm composition, musical corpora are often used as the initial data, the goal being to imitate the style of a given corpus or to manipulate it.

A very popular approach concerning machine learning is the use of Markov models. Markov chains represent the probabilities associated with transition states and are built in a way that future events depend on one or more past ones (Miranda, 2001, pp. 69-72), (Nierhaus, 2008, pp. 68-82). The concept was first introduced by Russian mathematician Andrey Andreyevich Markov (1856-1922), who applied his chains to the distribution of vowels and consonants in Pushkin's poem "Eugeny Onegin" (Basharin *et al.*, 2004), (Nierhaus, 2008, p. 67). The term "Markov chains" applied to this class of stochastic procedures was first used in 1926 in a publication of the Russian mathematician Sergey Natanovich Bernstein (Bernshtein, 1926), (Nierhaus, 2008, p. 68). Harry Olson was the first to use them in the context of algorithmic composition by analyzing eleven melodies by Stephen Foster and producing Markov models of first and second order in regard to pitches and rhythm (Nierhaus, 2008, p. 71), (Olson, 1967, pp. 430-433). These models, due to their simplicity and rule-based functioning adapt very well to style imitation. However, their structure only allows the description of context dependencies in linear succession, which means that one can only analyze and generate one musical parameter at a time, when most music has a vertical dimension and not only a horizontal one. Thus, Markov models are applied considering fractioning music to single states in a rather theoretical approach. Furthermore, as models of higher orders lead to very large transition tables, their use is usually generalized to the analysis of a previous database. *Cybernetic Composer* (Ames & Domino, 1992) is a program that generates pieces in different genres, such as jazz, rock or ragtime using Markov chains to generate the rhythm at one stage, and the melody at a later stage.

A step ahead, in terms of machine learning, was to try to model the way brains process data and infer knowledge and, therefore, to assume the *neuron* as the main basic unit and use this principle. While, historically, the first formalizations and attempts date back to the early 40s (McCulloch & Pitts, 1943), mainly for image recognition and classification purposes, only more recently they were employed in music systems. Most artificial neural networks are designed as a type of automaton and, as such, they can be represented as weighted graphs, where each node encapsulates an individual neuron and the weighted edges represent the synaptic links. Usually there is also an activation function associated to each node in order to scale the output values. Training a neural network involves presenting it with a series of samples of the problem to be solved and an example of a solution for each sample problem (Miranda, 2001, pp. 99-118). Artificial Neural Networks may generate satisfying results over short passages, but show weaknesses in the creation of larger context-dependent material. On the one hand, the reason for these difficulties lies in the application of the back-propagation algorithm used frequently in the training, which has problems in processing an exhaustive context. On the other hand, the modeling of large and context-dependent musical sections is a general problem for all methods of algorithmic composition that are not able to process information as a hierarchically ordered structure. For the treatment of material which is context-dependent over long passages, generative grammars are well suited. When knowledge about the domain to be modeled exists, rule-based systems are generally preferred. Moreover, the generations in a neural network often end up in stationary situations. Another disadvantage is the fact that, for the production of longer musical segments, a great number of training cycles is in most cases required. A great advantage of neural networks over Markov models and generative grammars, however, becomes evident in the production of smaller musical components. Both in generative grammars and also in Markov models, only transitions (e.g. of tone pitches) that are also explicitly contained in the corpus may be generated. Here, the neural network may produce surprising movements that nevertheless meet the requirements of the underlying corpus – this aspect of artificial neural networks may also represent an interesting motivation for their application in a framework of innovative compositional concepts (Nierhaus, 2008, pp. 205-223).

Papadopoulos and Wiggins (Papadopoulos & Wiggins, 1999) have done a comprehensible survey about programs like this, presenting the feed-forward Artificial Neural Networks that Todd used with feedback for melody generation; the *Boltzmann* machine for harmonization by Bellgard and Tsang; Toiviainen jazz improvisator; Hörnel and Degenhardt baroque-style melodic improvisation; Schwanauer's *MUSE* chorale harmonizer, among many others.

12.1.3 Optimization

Optimization starts from the idea that a model can become better or more efficient with time, thus presupposing evolution. Evolutionary systems are derived from a Darwinist model of evolution. An initial population is expected to *evolve* during the course of several iterations of successive evaluations. This implies that at each stage members of the population suffer some kind of mutation (typically random transformations or recombinations), which are then evaluated through some kind of *fitness* function which will assert its quality. If the quality is above a certain threshold, determined by the fitness function, then the new specimen survives, and it is integrated in the original population; if not, it is discarded. Overtime, the population will become more fit (its best and mean fitness will increase), according to the established criteria.

Within the category of evolutionary systems there are the genetic algorithms. They can be seen as an adaptive system of sounds used by a number of individuals in a certain community. These "musical-living-organisms" can be mapped to evolve according to certain rules and suffer transformations, thus generating new material or spreading and diversifying the already existing one. Domain-specific knowledge of the problem to be solved is not necessary for the application of a genetic algorithm. Therefore, this class of algorithms is especially suitable for tasks that are difficult to model mathematically or for problem domains that do not have an explicit superior rule system. The architecture of this class of algorithms promotes the production of a large number of small form segments in the generation of musical structure. An essential feature of a genetic algorithm is the continuous generation and examination of symbolic strings – a procedure that is highly suitable for process-like compositional concepts. However, because a genetic algorithm usually generates new outputs by continuously arranging fragments of chromosomes, different transformations within a chromosome are combined and therefore lose their structural functions. Therefore, its application to style imitation can become problematic (Miranda, 2001, pp. 119-157), (Nierhaus, 2008, pp. 157-204).

A successful case of evolutionary algorithms applied to music composition is the project *Melomics*[5]. It started out with the creation of a computer cluster called *Iamus*, which generates compositions based on formal constraints and aesthetic principles (Diaz-Jerez, 2011). The compositions then evolve following a strategy of genomic encoding, in a way resembling embryological development. A fitness function including values on instrumentation and preferred duration evaluates the successive steps. The whole project was transferred to the music industry and the music it produces is sold as a commodity (Fernández & Vico, 2013, p. 550).

12.1.4 Complex Systems

Complex systems is a term used to represent all kinds of methods not considered artificial intelligences, because they are not modeling any intelligent process. One of them, cellular automata, fits very well modelling systems that are dynamic and change according to time or space, in discrete quantities. Each state is represented through cells (usually in an endless n-dimensional grid), which are elements that will suffer the effects of predetermined transition rules. All cells are updated at the same time and can be used to model virtually everything that changes in the course of time-steps. A famous instantiation of this process is Conway's Game of Life. Eduardo Reck Miranda created *CAMUS*, a system using two cellular automata to produce music: one to determine the melody; the other, the instrumentation (Miranda, 1993). Unfortunately, the results were not as successful as he expected. More recently, he argues that this kind of method is more suited to generate pleasing results when applied to sound synthesis (Miranda & Biles, 2007, pp. 170-193).

Self-similarity traits, often found in nature, are another set of tools used in terms of algorithmic composition. It has been found that $1/f$ noise is able to produce pleasing results due to this fact – "its structure is statistically similar across several orders of magnitude" (Fernández & Vico, 2013, p. 556). Since then it has been used numerous times either as a device to generate raw material or as

[5]`http://melomics.com/`, accessed June, 6, 2015

a modifier. Although $1/f$ noise is preferred for that fact, other kinds of noise, like pink or Brownian noise, are also employed. Jeon et al, use noise to both generate and modify melodies, thus creating variants (Jeon *et al.*, 2006).

12.2 Advantages and Disadvantages

When dealing with algorithmic systems in order to emulate a certain practice, one must understand that the goal is somewhat different from simply using procedures to empower creativity to produce a single piece of art with an aesthetic goal. A practice may be characterized by many parameters, and so the approach must reflect carefully as many relevant parameters as possible and provide a sufficient margin so that an infinite number of different solutions may arise. Therefore, one should start by considering the quality and quantity of works within the desired practice about to be mimicked.

Thinking about symbolic rule-based systems

> "first, user-provided rules limit programs only to styles with which the user is familiar and can code. Second, user-provided rules often derive from a statistical or at least generalized model of a style and rarely reflect the idiosyncrasies which often help define musical style. Third, user-provided rules often require exhaustive amounts of code, since such rules can often contradict one another and/or require backtracking or other time-consuming and inelegant processes" (Cope, 2002a, p. 124).

Furthermore, the rule-based approach depends heavily on the ability of the programmer, since the computer only works with the rules assigned to it. For a rule-based system to have a successful result the stochastic scope has to be wide enough to provide an enormous number of valid solutions. However, by granting this much liberty, it is not guaranteed that the outcome is appropriately generated in terms of the style to be modeled. On the other hand, highly restricting the algorithm might end up leading to the mere reproduction of examples of the corpus (Nierhaus, 2008, p. 271).

When working with symbolic systems one can imagine many more problems. Grammars, for instance, are hierarchical structures. Since a lot of music is not, musical grammar implementations do not make any strong claims about the semantics of the pieces. Usually, a grammar can generate a large number of musical strings of questionable quality.

Optimization methods also present the problem of subjectivity and efficiency, since they depend on the users to evaluate and filter provisional results or intermediate steps of the compositional process. This can easily lead to fatigue from the user's point of view, in the case of manual selection. The programming of automatic fitness functions can be highly problematic as well and may not reflect what the end users expect quality to be.

A corpus reflecting a musical practice that encompasses works that can be very different between themselves might not be suitable to be modeled by a machine learning system. The reason for this is the risk of not producing coherent rules. That would jeopardize the quality of the future output since:

> "the structure of the corpus is to a large extent jointly responsible for the quality of the generated output. The selected examples should be able to efficiently represent the class of possible compositions and at the same time, depending on the strategy of the algorithm, these musical pieces should be able to be combined with each other – this means that the corpus must not join several classes of compositions whose structural properties are not interchangeable" (Nierhaus, 2008, p. 271).

In this situation, a previous human analysis could be more effective by finding ways to standardize the corpus, or by reducing the style into smaller groups of similar works and extracting the main rules that govern them. Moreover, when using Artificial Neural Networks, the representation of time cannot be dealt with efficiently, even in those cases for which it has feedback. Also, they usually solve toy problems, with many simplifications, when compared with symbolic rule-based approaches (Papadopoulos & Wiggins, 1999).

Complex systems present the problem that from a scientific point of view they are not modeling any concrete *process* intelligent agents actually *consciously* use when making music. If the challenge is to know more about the composition process in particular and about human agency in general, then one might be missing the point by employing them. On the other hand, it is true that many human decisions, in particular subtasks, seem grounded on random or cosmic laws that transcend our best tries to rationalize them. In those particular points they might be useful.

Furthermore, there are reality constraints: with what means and within how much time should the system be produced? Having all the time and means in the world, one could in all seriousness be advised to use a machine learning approach, since it deals with the most purist and abstractionist reasoning an academic can aspire to: modeling a brain, able to learn and capture all the intricacies that even a trained human is not able to, if one points at the big picture (for more on the subject see (Dreyfus & Dreyfus, 1988)). However, having a strict deadline and the need to present convincing results, then a symbolic system approach, as simple as it might be, is always a safer one, since it will always allow the presentation of something. It can lack depth, but that will always be a price to pay. No work can ever be done to perfection, so one must weight very well all factors, and make a decision.

12.3 Conclusion

Empirical experience shows that all the considered approaches to algorithmic composition have flaws and strong points depending on the target. The main factor in consideration regards the practice to be mimicked and the kind of corpus it presents. Practices with a large corpus, unfamiliar to the user, and similar structures seem more appropriate to machine learning systems; on the other hand, practices that seem very intuitive to the programmer and that pose problems regarding the consistency of the corpus are filtered more easily by a human intelligence and then explained to a computer by symbolic systems. This latter approach seems also more predictable, providing expected results very similar to the ones in the corpus (since all the rules and constraints of the practice are read correctly by the user), whereas the automatic machine learning systems approach is more likely to fluctuate within the idiosyncrasies of the practice and present somewhat unexpected results (or even gibberish), considering a wide corpus is provided.

Chapter 13

The model

Following the ideas of Brian Eno, it seemed to us that the most elegant model is the one that, taking the least amount of information possible, is able to extract the maximum of it, and yet still retain the core ingredients of the process, of the sequential steps undertaken to compose a song. That translates into a generative process like the one of planting a seed and then seeing how an entire tree grows out of it (Eno, 1996). This seems to imply strong hierarchical structures and a good degree of self-similarity. Our observations suggest that, given a lyrical text (what would be literally a fado), then the entire musical work derives from it, using a set of predefined conventions, shared grammars and transformations. Moreover, we believe this same idea can be applied to most song-writing traditions, only changing the characteristics of the text and the predefined conventions, grammars and transformations. Furthermore, we also believe that the text in itself, can be dispensable, sometimes, in the composition process. One can work, in fact, with only some information about its structure, namely the number of stanzas, lines, syllables and, eventually, accents. Having this seminal information, and the correct rules and transformations defined, then, one is able to, just following them, very similarly to following a kitchen recipe, obtain a suitable musical work, complying with the genre modeled.

The model (figure 13.1) assumes the sequential order through which fados are typically performed and simulates the various agents and decision processes involved, as observed in detail in the first part of this dissertation. The point of departure is a text (a fado, in the form of a poem) that will be sung by a performer on top of an instrumental accompaniment. Either the composer or the

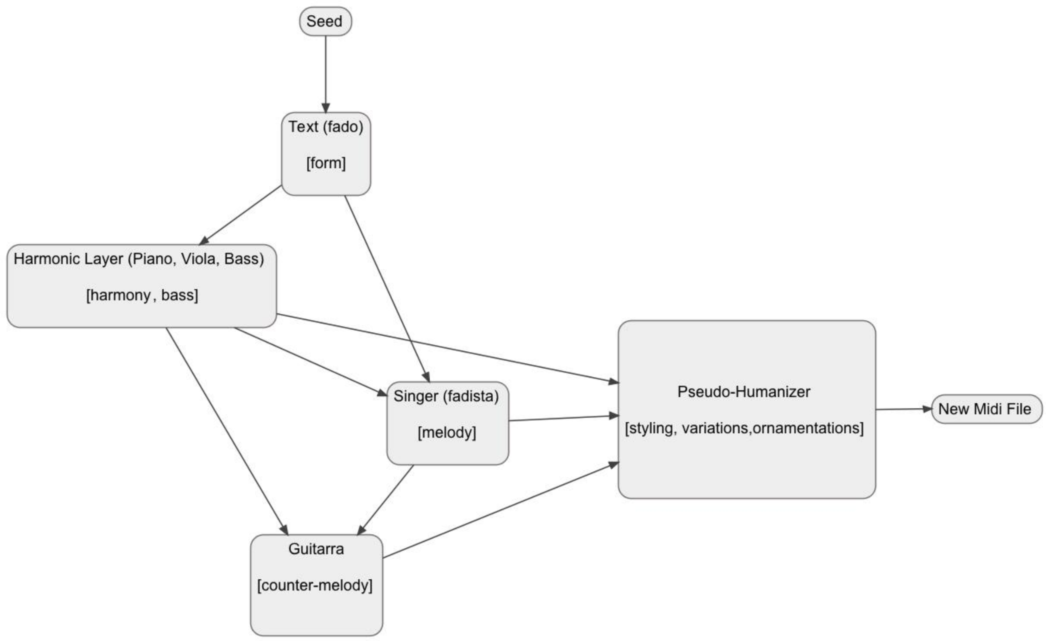

FIGURE 13.1: A fado model.

fadista (when the *fadista* is the composer in real time) creates a melody out of that text. At this stage, we are not working with actual lyrics or textual content, although that would be ideal in the future. Therefore, the first module in only pretending that there is a text, and, based on a seed, it creates a list of symbols in numeric format. Those numbers represent the relevant information an original text would carry: namely the number of stanzas, lines per stanza and syllables per line. One could argue that in a real text all information is relevant (namely semantic content); however, as seen in the first part of this dissertation, fado practitioners claim that as long as the metrical structure is the same, the lyrics can be easily interchangeable between the fados. So, while it can still be argued that accents and vowel quality might affect the prosody (and therefore the melody to some extent), the core values that define the importance of a text, in structural terms, are the ones we are indeed retrieving/generating. This is because the number of stanzas determines the number of sections the work will have (hence, the overall form), and the number of lines determines the length of each section (number of melodic phrases per section). The number of syllables of each line determines the rhythms of the melody (constraints the number of notes of each melodic phrase).

A second module simulates the agents involved in the instrumental harmonic accompaniment (either a piano, or, more commonly, a viola and a bass). This module retrieves information from the "text" module (the form and general structure of the sections) and generates suitable harmonic progressions and scales to fit into them. It also generates *ostinati* and bass lines based on those progressions and scales.

A third module simulates the singer. This module retrieves the information from the "text" module (namely the number of syllables of each line) to generate the rhythms of the melody. It combines this information with the harmonic information retrieved from the second module to assign suitable pitches, and therefore simulating the creation of melodic lines on top of the previously known stock-accompaniment.

A fourth module simulates the guitar. This module retrieves information on all previous modules and is then able to generate suitable counter-melodies or melodic figurations that simultaneously fit in the harmonic progressions, and at the same time, simulate a reaction to the melodies generated by the singer.

All these four modules generate what we would call an *urtext* score, similar to the ones in the database. A raw, quantized ideal, to be, then, performed. This implies the repetition of sections and styling. A MIDI file exported at this stage would be ideal to be printed as a music score.

A fifth module, a pseudo-humanizer, consists in a series of functions that will transform some of the generated parameters to originate variants. The transformations, when applied to the melodies, will simulate the styling of *fadistas*, therefore slightly changing rhythms, pitches and adding ornamentation. When applied to the accompaniments they might originate pauses, and small rhythmic and melodic variations as well. This will simulate the real practice, guaranteeing that virtually any repetition of a section will sound slightly different each time. A MIDI file exported at this stage reflects the performed fado, not suitable to be printed as a score, but perfect to be imported into a digital audio workstation to be recorded with virtual instruments.

A sixth module is idealized as an extension of the fifth module. However, we were not able to implement it in time to produce convincing results and will be implemented at a later stage. It will involve micro-transformations to enhance the humanizer results, namely by controlling "groove" and syncopation in a not random fashion, and also controlling pitch bend messages to be able to generate portamentos, glides, slides and more convincing tremolos and *mordentes*.

Chapter 14

Methodology

The observation of the practice, the processes it encompasses, and the model obtained determines the methodology to be followed. Since the problem of song composition, in general, and the musics and vocal sounds of fado, in particular, has been modeled as a hierarchical linear generative process, a symbolic artificial intelligence is the logical choice. Each step of the process involves either the generation of symbolic material, its retrieval from another source (a table, a list), or its transformation, via a set of rules. It is either a chain of *choices* or *orders*, each one having boundaries and probabilities of happening or not. Therefore, it is mainly a consecutive series of constraint-satisfaction problems.

The main inspiration for this research project, David Cope (Cope, 1991, 1996, 2000, 2002b, 2004, 2005, 2008), uses a borderline approach based on grammars and transition networks; however, he also relies on direct feeding from corpora for style imitation. The strong aspect of his work are the actual results, since most of the works displayed seem well-formed and coherent structurally. They could perfectly be the manual labor of any aspiring composition student imitating the style of past masters. Although Cope's arguments and descriptions are clear, the actual computational processes seem obscure and his algorithms are never made explicit enough for replication. On the other hand, the more recent approach of Pachet et al. in the Flow Machines project (Pachet & Roy, 2014, Pachet *et al.*, 2013) seems promising and more of an actual source of reliable inspiration. Still, their integration with lyrics is not yet done and one is not able to discern how the text influences or shapes the music. Also, their examples of jazz lead-sheets lack the depth of a fully developed song in terms of form and variation. Moreover, their content sometimes resembles just a collage in which their individual components lack the semantic context from which they were originally derived, therefore the ending result losing coherence. The work of Toivanen et al. (Toivanen *et al.*, 2013), however, seems a good example of what it is pursued: they aim at automatic composition of lyrical songs, and create a module that actually generates text and this text directly influences the musical content. This approach, theoretically, makes perfect sense. The mapping of the textual parameters regarding the musical ones seem consequent regarding what are the actual processes and practices observed. They also imply that the semantic content of the text should affect the mood of the music (according to arbitrary Western-European conventions), by mapping it to tonality, which seems also logical within many genres. However, their program also lacks the formal coherence of what it would be expected a typical song to be like. There is not a clear phrasal structure, neither a complete form defined over time (regarding repetition and variations, the songs just seem run-on), neither does it have a performative layer: the program merely generates quantized MIDI scores.

These detailed examples, two of them still in progress, act as direct inspirations for the model and all of them rely on hybrid symbolic approaches mixing several techniques to solve the constrained-choices along the way, or to generate specific sets of material. Therefore, it has been decided to pursue the same path, learning from their research and trying to integrate in the model the best ideas one could find among them, while discarding, changing or improving the ones thought to not be adequate. Hence, a hybrid constraint-satisfaction method has been applied, in order to be possible to build the main structures of the instrumental music desired. This method was basically a generative reverse engineering of the analytical-decomposition done previously when we have applied the semiotic analytical method to reduce each fado occurrence to its essential matrix. We were able, after setting the model, and seeing the rules that govern the practice as reflected in the corpus, to build it up again. After all, "the point of analysis is to explain what is obvious – the experience of musical unity or whatever – in terms of structures that are not obvious and can only be deduced from analytical study" (Cook, 1994, p. 222).

With enough rules provided, justified on previous statistical analysis and patterns discussed in the first part of this thesis, we were able to generate new scores of archetypal music associated with fado. These new sketch-scores were then "filled again" (using the philological method) with the parameters we first removed (introductions and *codas*, ornaments, and even bugs). We understand that

> "each system of notation, then, involves its own patterns of emphasis and omission. (...) Consequently when a composer writes down music he is relying heavily on the reader's musical ear and imagination in supplying the precise intervallic, rhythmic and dynamic values that the notation omits, just as he has to contribute sonorous, dramatic and emotional values that cannot possibly be specified in score.(...) None of this happens if you make a strictly 'scientific' analysis of a score – analyzing the distribution of notated intervals in terms of set theory, say, of by means of statistical comparisons. When you do this, you are analyzing the score without actually reading it in the sense I have described. (...) Consequently, if you analyze a given composition this way, your analysis may be scientific in the sense of having an explicit methodology, but it will not be at all scientific in the sense of having any meaningful or predictable relationship to the music's physical or psychological reality – that is, to the noise it makes or the effect it has on people. Indeed, the more strictly deductive your analysis of the score is, the more directly will it be conditioned by the particular cultural and pragmatic assumptions built into the notation and less bearing it will have upon the music you actually wanted to find out about" (Cook, 1994, p. 237).

So, regardless of how precise, methodic or scientific all this process might be, we never lose sight of the fact that we are still lacking some essential components of the performance practice we have been studying. As mentioned before, we have no access at all to the sounds of the performance as it was in the nineteenth century, for instance, so we are aware that our primary goal is to reconstruct *musical scores* following the same conventions of the corpus, because that was the starting point in the first place. To pretend that we would end up reconstructing the performance practice as it was supposed to be in the nineteenth century from the musical scores would be utopic, because the textual sources lack a variety of performative dimensions very difficult to reproduce at this stage. We try, in fact, to add some of those dimensions to the musical scores afterward using other methods but that is a whole new issue related with the reproduction of a human performance of the scores and not necessarily correlated with the procedures pointed out so far.

Concluding this point – we were able to reconstruct musical scores based on the ones we began with: the instrumental music, and the vocal music reduced to a melodic instrumental line as well, associated with fado, lacking context and a series of human dimensions that needed to be filled in later. These are fados that are comparable with the universe of those subjective transcriptions made by the musicographers of that time. Having done that, we may say that we have concluded an important part of the project, as well as the most objective and pedagogical part of it.

14.1 Interactivity

Generating new music associated with fado practice implies to us that the user should be able to interact within the process by choosing some parameters. We have aimed to make the interpretation process also *interactive*.

> "To analyze a piece of music is to weight alternatives, to judge how it would have been if the composer had done this instead of that – it is, in a sense, to recompose the music in a way that normal, concert-hall listening is not" (Cook, 1994, p. 232).

We have given people (the ultimate goal of this project – music – is for people to listen and enjoy) the opportunity to take part in the composition of "their" fado. There were several ways and techniques to do this and we have had to make some subjective choices regarding the parameters that could be customized by assigning some variables and also the ways in which the user could actually manipulate those parameters.

Interaction presupposes a dialogue in opposition to a soliloquy, and there are many ways and degrees to do that concerning music. Robert Rowe assumes that the participation should be occurring on the level of music making in opposition to passive listening. The computer would be receiving input in real time by analyzing a real-life performance and reacting to it, much in the style of jazz players interacting with each other (Rowe, 1999). This view is also shared by Chadabe (Chadabe, 1984), and historically interactive music has often been designed this way. A fairly recent application by Dias et al., *Gimme the Blues* is a Jazz improviser in real time, reacting to stimuli provided by the users on virtual instruments set up via a friendly graphic user interface using touch screen technology (Dias & Guedes, 2012, Dias *et al.*, 2012). All these approaches, however, start from the notion that the users are in the role of *musicians* or *performers* and the computer is simulating their counterparts. Our approach, on the other side, departs from the perspective of the user as *composer*, and the role of the computer is to automate as many of the composition processes as they desire. The system will interact as little or as much in the sense that the user is able to decide how many and which parameters they want to chose or leave them up to the software.

Although Todd Winkler wrote a reference book on interactive composition also aiming mainly at interaction in the sense of a constant real-time performance and feedback loops between the computer and the user in the role of performer, one can understand how interactivity does not necessarily have to occur at this level. He mentions in a negative light the example of television as being "not very interactive (yet)". Nevertheless, by doing so he is recognizing that the mere fact of one being able to switch channels, change volume and altering controls for color, tint and horizontal hold is, in fact, *some* interactivity (Winkler, 2001, p. 3). He also mentions how a *slightly* interactive piece may be a predetermined score where the user has the ability to change one parameter as tempo, and how *sophistication* increases with the number of parameters one is able to change and thus shape the final results (Winkler, 2001, p. 6). Moreover, an interactive composition is then defined in detail by the following characteristics:

> "
>
> 1. Human input, instruments – Human activity is translated into digital information and sent to the computer.
> 2. Computer listening, performance analysis – The computer receives the human input and analyzes the performance information for timing, pitch, dynamics, or other musical characteristics.
> 3. Interpretation – The software interprets the computer listener information, generating data that will influence the composition.
> 4. Computer composition – Computer processes, responsible for all aspects of the computer generated music, are based on the results of the computer's interpretation of the performance.
> 5. Sound generation and output, performance – The computer plays the music, using sounds created internally, or by sending musical

> information to devices that generate sound " (Winkler, 2001, p. 6).

As one can see, the model proposed by Winkler for an interactive piece is respected integrally by our model, if one regards the user in the role of composer. Their performance (as typical of composers) instead of corresponding to the act of playing an instrument, corresponds to the act of deliberating and making choices and then notating them symbolically. In this case, the results of those deliberations are fed to the computer, which proceeds to the next steps, receiving that information and shaping the music accordingly, and then returning it back to the composer, in the form of a score or a rendition. One can easily understand that if the role of the user would be the role of *fadista* (singer) or of instrumentalist (viola player, for instance), then the program would necessarily be totally different. Certainly *more* interactive, in the sense that it would require constant back and forth mechanisms and feedback loops, but at the same time, it would correspond to a different intention than this one represents. Being creative and mostly interested in the process of song composition, we tailored the design of the research according to our own bias holding this perspective. Therefore, we constrained, to some extent, the degree of interactivity the program can possibly have. Nevertheless, it can certainly be considered interactive.

14.2 Work Flow

We have developed the initial coding work, under the mentoring of Professor Bruce Pennycook, in Austin, regarding the modeling of the generator. At first, we had thought of implement the program in *Max/Msp*, since we had taken classes and workshops using this programing environment and we were already familiar with it. However, considering that a musical generator of this magnitude implies a serious amount of symbolic manipulation, and the need for a very flexible language that allowed the definition of several modules and customized functions, we opted for the use of a Lisp based language instead. This decision took into account prior projects of the experts and references in the area (Nierhaus, 2008), namely David Cope (Cope, 2004, 2008). It made sense to keep their methodologies and ideas, in the long run, even if that implied a steeper curve, and having to learn a whole new language from scratch. Having this in mind, it was necessary to learn to code in Lisp, which required several months of training.

Initially we started practicing and implementing some algorithms in *Common Music*, an open source software developed by Henrich Taube[1]. However, after some insipid, yet important, developments we soon reached the conclusion that *Common Music* was not powerful enough for the desired purposes because it lacked predefined functions ready to deal with a model of tonal music implementation. It would have taken several months to create those functions from scratch. That work, however, had already been done by Tonality Systems and their software *Symbolic Composer*[2], also Lisp based, but with a set of numerous musical functions already predefined which would allow us to save time and resources and concentrate on the concrete problem and work in higher-level detail, thus enhancing the final result greatly. So, it was decided to buy this software and we started working with it in the beginning of 2012. Although one might think that time was wasted in previous experiences, it was not the case at all, because all coding had been done in Lisp, the same base, so everything was relevant to the learning and mastering of the language.

Since we began working with *Symbolic Composer*, the main structure of the generator has been coded and a modular structure was conceived in order to keep the problem the simplest and most elegant possible. The program is flexible enough to allow several parameters to be defined by the user (like key, tempo, *ostinati*), or it can be completely independent generating music at its "will". The experiences conducted led to the successful generation of *ostinati* and harmonic progressions with controlled weightings. To determine the weight values of the harmonic progressions and *ostinati*, we have used the values presented in the tables of the previous chapter as a reference. These values were refined due to aesthetic purposes as it will be described later. The aim was to have a final generator that was able to represent integrally the database as it was in its final stage, and also flexible enough to allow more variety depending on other musical factors.

It was detected that, although the "harmonizer" successfully generated functional accompaniments, at some point those were not very credible due to voice leading problems arising from the randomness of the chord inversions and the lack of independence of the bass line in relation to chords. These problems did not

[1] `http://commonmusic.sourceforge.net/`, accessed June, 6, 2015

[2] `http://www.symboliccomposer.com/page_main.shtml`, accessed June, 6, 2015

prevent the development of the coding itself, as the final weights were only needed in the end. In the meantime we could work with estimations or random values, and let the database grow at its own pace and even to be completed after the generator was completed.

When the first stage was complete, we entered a much more subjective (and creative) area of the project, which dealt essentially with the interpretation of the generated musical scores. As pedagogical and rewarding as it might be to have new musical scores produced, we felt that the digital dimension of the project would not achieve its maximum potential unless we could reproduce those scores, at least in a moderately convincing way. Hearing the quantized MIDI files led to some satisfaction, although clearly not enough for any casual listener. The timbre quality of the instruments used in the actual practice (and that are crucial sonic cues) were missing and also the *groove* and *waddled feeling* imposed by human performance.

As the work on the fifth module progressed, with the new introductory distortions provided to humanize the performance, the program was able to generate sonic output, but it was still considered far from being acceptable by the standards we had in mind: often the outcome created a sensation of "uncanny valley" when heard: while it clearly seemed that we were going in the right direction, and we were obtaining some results, they were not close enough to a human performance, they still seemed robotic, or sometimes just odd. Sometimes we just wondered if a minimal almost quantized version was not better all along. The poor output has also shown that some re-writing of the module was required following empirical and personal compositional experiences as a way to achieve more realistic results. Although we have obtained some improvements over time, we still find the results were not what we expected and we envision a sixth module at this stage, hopefully to be implemented in the future.

Chapter 15

Implementation of the Model

During the conception of the model, we were constantly struggling with the consilience of the performative practice emulation with the practice reflected in the corpus of musical scores. In the first part of this dissertation, we have presented and discussed ideas, values and arguments in an attempt to understand fado from the perspective of the community, practitioners and listeners. On the other hand, we gave accounts of work with a very specific corpus of musical scores, which comprises a certain representation of that same practice. Having this in mind, the initial idea was to somehow build an artificial intelligence (following mainly the goal of David Cope) that mimicked and represented this corpus in the generation of new scores similar to the existent ones. In order to do that, we have built a program that mainly recombined weighted lists containing fragments, and specific parameter values extracted from that same corpus with little to no variation. It was a simple approach that gave us controlled and predictable results lying within the desire scope, but that lacked inventiveness, the ability of going further. Moreover, it neither expressed algorithmically any particular new idea regarding the methods of composing with computers, nor it was challenging to code regarding the current state of the art. As a consequence of this fact, after the first round of initial programming we decided to explore a second approach and build a second artificial intelligence that, instead of just using lists with weights and data derived from the corpus, actually generates lists from scratch using functions. This second approach was much more challenging, because we actually had to try to formalize the sub-processes the musical creation involves. The result was a series of abstractions able to generate a whole series of different parameters that were later combined with one another and integrated and nested in the previously designed architecture. Due to the very nature of what an abstraction is, and how a function works, it allows the users either to be very strict and confined, thus providing predictable results, or if they decide to use arguments outside the expected range, it will provide totally unexpected and unpredictable ones. Furthermore, it can be even more unpredictable if one decides to let a randomizer pick what the possible range is and what parameters it may randomize. The point is that, using this approach, we have obtained a very flexible artificial intelligence and anyone can decide how much further one wants to go exploring it.

Each module comprises a series of constraint-satisfaction problems to be solved. As such, having arrived at this point, we decided that the best solution would be the combination of both approaches. Either they can be solved by resorting to a symbolic artificial intelligence based on the statistical data retrieved from the corpus (thus the weighted lists, the fragments) or via a second symbolic artificial intelligence working with formalizations of the sub-process involved (translated into grammars, rule-based algorithms or other iterative procedures). The combination of both approaches is more flexible and unpredictable regarding the results users may have in their minds, increasing the possibilities of interactivity (by allowing them to customize and manipulate more parameters). In order for this to work in a manageable way, we have designed a coefficient of representativeness (CR) that varies between 0 and 100, 100 being total representativeness of the corpus and 0 total inventiveness. So, when the user decides this coefficient is 100, only the artificial intelligence dealing with the corpus generates results. When it is 0, all the parameters are retrieved from the lists generated by the second artificial intelligence. When it is any value in between, this value equates the percentage of probability, for each calculated parameter, to be picked from either of them. Ideally, the default should be something along the lines of 70 if one wants a general, predictable score with a spice of novelty, but it can obviously be changed if the user is willing to take some risks and decides to have a more out of boundaries musical piece.

15.1 First Module

The first module of the model corresponds to the triggering of a seed that will cause the information retrieval of a simulated lyrical text, in order to constrain subsequent choices and structures.

15.1.1 Seed

A generative program like the one coded relies heavily on random functions and constrained decisions that depend on seeds to run. As previously discussed there is no true randomness inside the chaotic and random functions, as they all depend on a seed to perform their calculations. Along with this issue comes the fact that, if one wants each and any instance of the program to be reproducible, then they must all be attached to the same seed. Therefore, we have decided to program right at the beginning of the generator a function that generates a variable called "my-random-seed". Every time the program is called, it will generate a different result. But, at the same time, if the user likes any of the outcomes and wants to replicate it, then they are able to do so by choosing exactly the same seed. So, in other words, each seed represents an instance of a given score, and it is like its own ID number. And the user has total control over it:

```
(setq my-random-seed (* (float (/ (get-universal-time)
        1000000000000)) (rnd-in 100) ))
(init-rnd my-random-seed)
```

The block of code shown basically uses the universal clock of the computer to generate a seed. And it has a resolution up to the milliseconds. So virtually every time the program is run it will generate a different score, because the time will always be different. If one likes it, one just has to keep track of the inspector window and take note of the number that will appear there and one can keep that seed for later use. The entire score depends on this seed in order to work properly and it is the initial trigger to derive everything that follows.

15.1.2 Text

The text is in fact just a simulation of what would be a complete lyrical text and the relevant numerical information about its structure. It corresponds to the parameters number of stanzas, lines per stanza and syllables per lines. These three parameters are positive integer numbers and are stored in variables. This can be done as merely a constrained random generation or they can be defined by the user.

Those numbers, in theory, can be whatever the user envisions, but, as previously discussed in this dissertation, they are constrained among specific values. The number of stanzas is usually a small number between two and six, being four the most common; the number of lines usually also varies between three and ten, four being the most common and five and six being rather common as well, especially since the beginning of the twentieth century; the number of syllables per line varies between four and twelve, being seven the most common, by far.

For demonstrative purposes, in the version presented in this dissertation, we are assuming four stanzas with four lines and seven syllables, but all other values can be implemented with some future refining.

15.1.3 Form

The overall form will impose a hierarchical superstructure containing and constraining everything else that follows. As shown in previous chapters, the form of a fado is decided by the lyrical content: namely, the number of stanzas and lines. At this stage, this dissertation does not deal with lyrical content in concrete; however, one can deal with its consequences in an abstract way, by following its trends. A text with four quatrains in heptasyllabic lines, for instance, can be extrapolated into how one would typically sing such a text. Following Ernesto Vieira's model one would sing the first line over a two bar antecedent melodic phrase ($a1$), and the second line over a two bar consequent melodic phrase ($a2$). These two lines of text would represent a typical A section, four bars long, on top of a certain harmonic progression. This A section could be immediately repeated (representing the textual repetition of the same two lines) or it could be followed by a contrasting B section representing the following two lines of the quatrain. So, departing from this simple quatrain one could end up with several possible combinations – AB, AAB, $AABB$, ABB, $ABAB$, all of those already explored in previous chapters of this dissertation. At this point, and knowing that there are still three quatrains to sing, several options arise: either they would be exact replications of the first one, and, therefore, a typical Ernesto Vieira's strophic fado: $ABAB\ ABAB\ ABAB\ ABAB$ or $AABB\ AABB\ AABB\ AABB$, for instance, or it could be assumed that the first two quatrains were one fado in the minor mode and the last two quatrains could have a different music in the major mode, and so they would represent the doubled version of the same model, and it would be something like $ABAB\,ABAB\,CDCD\,CDCD$ or $AABB\,AABB\,CCDD\,CCDD$, for instance.

Having this in mind, one then realizes that even if the concrete text is not known (its semantic content), one can try to model the form of the music based on its structure (number of stanzas, lines per stanza and syllables per line). The simplest way to formalize this is to simply define a list containing the distribution of the sections, each section represented by an alphabetic character. Going one step further, we assume for the model different versions of each section to represent slightly different performances of the same section whenever they are repeated. A different version is obtained by applying transformations to some parameters in order to obtain what can be called variations. The concrete implementation of these variations will be discussed later. This increases variety and models what often happens in performance. To each variation we append an integer to identify them. There is no clear boundary on how many variations one could have. In theory, each instance of any given section is sung uniquely, therefore it could be a variation, resulting in at least as many variations as the total numbers of stanzas. Therefore, the resulting variables assume the form:

$$\text{Section} = Xn, x \in \{A, B, C, D \dots\}, n \in \mathbb{N}_0$$

A form list is then the chronologically ordered sequence of these variables, reflecting the idiosyncrasies of the lyrical text, completed with the uniquely titled sections "introduction" (Intro), optional intermezzos and "*coda*". Our example of the four heptasyllabic quatrains following the simplest Ernesto Vieira's model, without redundancy, would result in the list:

$$F = \langle \text{Intro}, A0, B0, A1, B1, A2, B2, A3, B3, \text{coda} \rangle$$

In practice such a list might be doubled since in many fados the singers repeat the lines. This list represents the superstructure of the piece, its overall form. It is, in fact, the formalization of the time dimension in a linear fashion.

There are at least three ways of generating such a list. The first one is to let it literally be defined by the user. In a fully developed app this could be a decision mediated by a graphic user interface, in order to simplify the process, based on the structure of the text. The user would just need to provide the number of stanzas, the number of lines and the number of syllables, at their will.

The second one is using the retrieved simplified forms from the corpus and building a weighted list of all reasonable structures. There are 53 different simplified forms in the corpus, and a table with the most common of them is presented below. These are the simplified forms that appear at least 3 times.

TABLE 15.1: Most common forms in the corpus

Simplified Form	#
$AABB$	23
$AABC$	7
$ABAC\,DEDE$	5
$AABB\,CCDD$	4
$ABAB$	4
$ABCC$	3
$ABCD$	3

These simplified forms can be implemented simply by letting the computer randomly pick one according to its weight, and then subsequently transforming it in order to obtain a full well-formed form. The first transformation is the decision how many times the chosen simplified form is to be repeated, which can be done by appending the list to itself the amount of times desired (usually no more than four if one does not want an endless song): $T_1(F) \rightarrow F \cup F \cup F \ldots$

The second transformation is to concatenate each symbol, of the resulting list, with an integer corresponding to its variation. This integer is randomly picked from another list. For the purpose of keeping the program within a reasonable degree of simplicity, we are generating only 3 versions of each section which is more than enough for demonstrative purposes:

$T_2(F) \rightarrow \forall X \in F, X \Rightarrow Xn : n \in \{0, 1, 2\}$.

However, technically one could have as many variations as there are unique elements in the list to be transformed, so the general formula would be:

$$T_2(F) \rightarrow \forall X \in F, X \Rightarrow Xn : n \in \{n \in \mathbb{N}_0 | 0 \leq n \leq i : i = \#\langle \forall j, k \in F \rangle : j \neq k\}.$$

The third transformation consists in appending the Intro section to the beginning of the list, and the coda to the end, which is just a trivial list manipulation operation:

$$T_3(F) \rightarrow \langle \text{Intro} \rangle \cup F \cup \langle \text{coda} \rangle$$

The result could look something like this:

$$F = \langle \text{Intro}, A2, A1, B1, B1, A0, A2, B1, B0, A0, A1, B1, B2, A0, A0, B2, B0, \text{coda} \rangle$$

Notice that the variation indexes are random and do not follow any ordered criterion; the point being that there is not a hierarchy concerning variations, since they are all equally valid versions of a given material, therefore the users are oblivious to which one is the presumed "original" and which one are the variations.

The third way to generate a well-formed form is formalizing an abstraction that randomly generates a simplified form. A well-formed simplified form can be implemented as:

1. Define the total number of sections as i, which is a positive integer: $i \in N$
2. Create the empty list F and the empty set S:$F = \langle\rangle; S = \{\}$
3. Define p as the length of the unique elements of F plus 1:
   $p = 1 + \#\langle \forall j, k \in F : j \neq k \rangle$
4. Append the alphabetic character in position p to set S:
   $S = S \cup \{X_p\} : X \in \{A, B, C, D, \dots\}$
5. Append a randomly picked element from S to F: $F = F \cup \langle s_n \rangle : s \in S$
6. repeat 3 to 5 i times

This will generate a simplified form that can be subsequently transformed into a well-formed form using the same procedures exemplified in the simplified form derived from the corpus.

In the generator we implemented both solutions and one or the other is triggered, depending on the coefficient of representativeness.

15.1.4 Section

Each section can be seen as a hierarchical class that has one relevant time-domain property: length. This length can be one single value, but often it is a set of them, each one corresponding to a bar unit, mirroring the typical divisions of notated music. Therefore, its implementation takes the form of a list of lengths.

$\forall\,\#\text{Section}_{Xn} = \langle \text{bar unit}_1, \text{bar unit}_2, \text{bar unit}_3, \ldots \rangle$

This definition formalizes the whole-form of the song, encompassing its total time span and constraining all the other time-dependent elements hierarchically below this level.

The value these lengths assume depends, of course, on the song and style to be modeled, and can be fixed or variable. They can be randomly generated or defined by the user. Its implementation depends largely on the problem to be solved.

In the specific case of fado, and following the empirical data retrieved from the first part of this dissertation, it is assumed that each section corresponds to four measures, each one with a length of 2/4, and this has been implemented as such:

$\forall\,\#\text{Section}_{Xn} = \langle \frac{2}{4}, \frac{2}{4}, \frac{2}{4}, \frac{2}{4} \rangle$

Modifying these values could radically change the final results and the entire perception of the practice.

In the software *Symbolic Composer* this can be implemented using the class "Zone", which is already predefined, and corresponds to the length of a section, taking the form of a list of durations.

15.1.5 Example of a single section

At this point, and while we may be getting ahead of the formalization of the other structural elements, we must stress that in terms of organization of the narrative it is important to explain how the hierarchical structures were actually implemented in code within *Symbolic Composer*. While the formalization of the model allows it to be implemented in other languages and probably using other kinds of nesting, the software *Symbolic Composer* that we have used to code the generator has its own architecture of already defined objects and classes, simplifying some of the low level operations. After the overall form is decided and one has all the sections needed, it is possible to build a modular frame based on this superstructure that can be used as a template for any other different superstructure in the future. We assumed each section as a basic module to support all other parameters inside. Therefore, we will exemplify how we have programmed the generator explaining one possible way to program the first four bars of an archetypical Ernesto Vieira's fado as a concrete example. Then we will extrapolate to the more general model. We will show how we have made a template defining one single section and how it will be similar for all subsequent sections and variants.

Inside this template section we will explain the global parameters that will apply to all instruments in this section. They are called "default" parameters and in this case the parameters are "zone" and "tempo".

Zone is defined as the total length of the section. In this case, we are assigning four 2/4 bars for the A section – as extracted from the Ernesto Vieira's model, but it can be any length one wishes.

Tempo stands for at how many beats per minute the song will be played. One can decide to go for a strict tempo, or let the computer decide it randomly within a certain range acceptable for that section. Tempo is a list of values, each value corresponding to a zone. If one has a list with four zones and a list with four different tempos it will use a different tempo for each zone, but one can assign just one tempo and it will play the same tempo within all the four zones.

Then we need to define the instruments. In this example we used just piano for now, right hand, that we have called "voice" (it creates the melody) and left hand that we have simply called "*ostinato*" (it creates the accompaniment), very much like the scores from the database. One can create as many instruments as one desires.

Inside each of these instruments we have defined our local parameters; this means the parameters that only affect a particular instrument or voice:

Tonality, stands for the scales and chords that were used in this section. In this work we have decided to base everything in non-accidentals scales and chords and then use a variable as a transposition factor to contemplate the other possibilities.

Length is the rhythm of each voice. Basically it is a list of durations. Ideally the sum of these durations should match the length of the previously defined zone. If it is shorter, the rhythm will loop until that value is exhausted, if it is longer, then it is truncated.

Symbol is a list of alphabetic characters and accidental symbols that will be associated both with the chords and scales defined in tonality (and thus becoming pitches) and with the durations defined in length, becoming notes. As with previous parameters the number of elements in the pitch list should match the number of elements in the length list for ideal correspondence. In case of a mismatch, the shorter list will be repeated and mapped onto the other until it exhausts all of its elements.

Velocity is a list of velocities, ranging from 0 to 127, associated with each note generated by the previous parameters. In order to obtain maximum correspondence and efficiency, the number of elements of this list should also match the number of elements both in symbol and length.

Program is the timbre of the instrument. Usually it is a value between 0-127 that corresponds to a list of the available sounds according to the synthesizers available. In case of a generic MIDI set, the value 0 stands for a piano.

Channel is the MIDI channel associated with that particular instrument, ranging from 1 to 16, and number 10 typically reserved for percussion.

So basically a template in *Symbolic Composer*, like a blank canvas for generating one section is something that is coded like this:

```
;;section A
(def-section A
   default
      zone
      tempo
   voice
      tonality
      length
      symbol
      velocity
      program
      channel
   ostinato
      tonality
      length
      symbol
      velocity
      program
      channel
 )
```

And this template was the same for any section or sub-section we ever needed to compose. We found it very reasonable, because it employs pretty much the same parameters one would use to compose with pen and paper or with a notation program.

After this stage, one just needs to know exactly what is desired inside each section and generate the material for every possible parameter defined. We can demonstrate for a hypothetical basic section A.

Inside section A, we were trying to generate our first four bars of music, meaning we were in fact combining sub-sections a1 and a2 regarding some of the parameters. Therefore the zone has to be a list that adds up to four bars of 2/4. Notice it can be any length one desires, so it can be easily adapted to any other genre or variation one desires in the future. Notice how a list is coded as simply a bracketed set of numbers preceded by a '.

```
'(2/4 2/4 2/4 2/4)
```

Then, there were many options for tempo. For the sake of simplicity we could have simply pointed out to a single value like 78, as that is the average of the database. Another option was to have the entire interval 72 to 84 available, therefore the best way was to tell the computer to generate a random number between 0 and 12 and add 72 to it. Because tempo needs to be a list of values (even when it has only one value) we needed to tell the computer to make it a list.

```
(list (+ (rnd-in 12) 72))
```

Then we started by dealing with the instrument "voice".

For the sake of simplicity in this example one is assuming a melody that is going to be built on top of the archetypical T|D|D|T harmonic progression. Therefore, the melody will be built on top of either a major or minor scale. And since it is the right hand, to be in a comfortable realistic range it is best to center it around octave 6 (in *Symbolic Composer* the first symbol of octave 6 is two octaves above central C, midi pitch 60). So we have assigned:

```
(activate-tonality (0 major c 6))
```

Note that it can be any tonality or tonalities one wants in any range desired. It can be even detuned tonalities. One can further explore this at one's will or even change the score later for any other scale one wants and see the differences.

The next step is to define the rhythm of the melody. There are at least two approaches, the first is to assign a list of specific durations, either totally determined, or picked up from a set of different choices. The second approach is to have a generative function that, based on algorithms, creates a list of suitable durations from scratch. For this example we will just assign the Frederico de Freitas' archetypical rhythm, however, other options will be explored further ahead:

```
'(1/8 1/8 1/16 1/8 1/16 1/8 1/8 -1/8 1/8 1/8 1/8
       1/16 1/8 1/16 1/8 1/8 -1/8 1/8)
```

Notice how the durations fitting four entire measures are being defined, which means the same two bar scheme repeated twice. Notice also the negative values, which represent pauses. Finally, notice as well that the way the structure was built the pick-up note is missing because it pertains to a previous section (an introduction for instance), and how the last notes following the pause are actually pick-up notes for the following sections.

The following step was to generate the pitches of the melody, so symbols were needed. Each symbol is basically a letter that represents an element of the scale previously activated. In this case, the scale was C major. Then the first symbol "a" represents the first element of that scale that is the pitch class c. The second symbol "b" represents the second element of that scale that is the pitch class d. Negative symbols work the same way in the opposite direction.

There are countless ways to generate a list of symbols. One can type them if specific notes are desired, or they can be generated more or less randomly. For this example we have used a random generation around the center of the scale:

```
(find-minimal (vector-to-symbol -d d
       (gen-noise-Brownian 4 my-random-seed 0.5)))
```

Basically we used a mathematical function that comes with the program "gen-noise-Brownian" (there are many others) that generates a random walk, a singable contour, based on Brownian noise. Using another pre-set function "vector-to-symbol" we mapped this numeric contour into symbols within the range "-d" up to "d" (so around the center of our scale that would be "a"), and used another pre-set function called "find-minimal" to remove all repetitions while still preserving the general shape of the curve. Running this set of nested functions once, we have obtained the following result:

```
--> (a -c -b -d -c -b d c d b c a b a)
```

This is a perfectly singable undulating line. One can try out with different values, seeds and nested combinations and see what happens. One can try out some of the other mathematical functions that come with the program, like "gen-pink-noise", etc. More possibilities and the ones actually used in the generator are explored further ahead.

Then we just needed to define the velocities. A velocity is a number between 0 and 127 that represents how loud a note sounds. We just wanted something very stable and smooth. So we have opted for another kind of randomization, using again a Brownian-noise generator:

```
(vector-round 64 100 (gen-noise-Brownian 5 0.75 0.75))
```

Again, there are countless ways of doing this. This is just one of many. One can play with these values and see what happens. We were just happy with these ones after trial and error. The generated values will be all between 64 and 100, so, all in the range of *mezzo-forte*. A more sophisticated algorithm for dynamics used in the generator will be explored in its own section.

Then, keeping the example simple, we assigned the default instrument piano to the voice, which is program 1. We told it to play on channel 1 as well. One can assign any number between 0-127 for instrument – 74, for instance is a general MIDI flute.

```
program 1
channel 1
```

And this concludes the definition of the first four bars of melody. As one can see it is pretty much free within some constrains: a melody with a tonal sound around a range of one octave around c6 and with Frederico de Freitas' archetypical rhythm will be obtained.

Then we needed to define an *ostinato* to go along with it. This time we have decided exactly what we wanted. We just defined the same zone so they will match. The tonalities activated, since we needed the T|D|D|T movement in the major mode, were the appropriate chords – C major and G7 major – complemented with the appropriate voice leading inversions provided. Therefore:

```
(activate-tonality (2 ch-maj c 4) (0 ch-7 g 4)
        (0 ch-7 g 4) (2 ch-maj c 4))
```

We have centered the *ostinato* around octave 4 so it does not clash with the melody and it is in the appropriate lower register. We have provided a defined length, since it is a stock march/fox rhythmic pattern. This list represents the durations as we would write them on paper or a notation program. Notice how we just need to write out two bars of the *ostinato*, even if the zone is four bars long, since it is assumed that, in case where the list is shorter, it will loop until it exhausts the time.

```
'(1/8 1/8 1/8 1/8 1/8 1/16 1/16 1/8 1/8)
```

The same is true also for the symbols, which in this case are all pre-determined.

```
'((-12 a) bcd -b bcd -c bcd bcd -b bcd)
```

Notice the logic of construction around the symbols – the "-12" attached to the first symbol indicates to play it twelve semi-tones below, forcing it to be a bass note, as expected in this kind of *ostinato*. The cluster "bcd" means that these three symbols are played as simultaneously as possible.

We kept the same solution for the velocities as we did in the melody: let them be somewhat random.

```
(vector-round 64 100 (gen-noise-Brownian 5 0.75 0.75))
```

For the program we kept the piano but we wanted this hand to be played on another channel. So we assigned it to channel 2.

```
program 1
channel 2
```

So basically the coding of a four bar long section A is finished. It looks like this:

```
(def-section A
   default
      zone '(2/4 2/4 2/4 2/4)
      tempo (list (+ (rnd-in 12) 72))
   voice
      tonality (activate-tonality (0 major c 6))
      length '(1/8 1/8 1/16 1/8 1/16 1/8 1/8 -1/8 1/8 1/8
              1/8 1/16 1/8 1/16 1/8 1/8 -1/8 1/8)
      symbol (find-minimal (vector-to-symbol -d d
              (gen-noise-Brownian 4 my-random-seed 0.5)))
      velocity (vector-round 64 100
               (gen-noise-Brownian 5 0.75 0.75))
      program 1
      channel 1
   \emph{ostinato}
      tonality (activate-tonality (2 ch-maj c 4) (0 ch-7 g 4)
(0 ch-7 g 4) (2 ch-maj c 4))
      length '(1/8 1/8 1/8 1/8 1/8 1/16 1/16 1/8 1/8)
      symbol '((-12 a) bcd -b bcd -c bcd bcd -b bcd)
      velocity (vector-round 64 100
              (gen-noise-Brownian 5 0.75 0.75))
      program 1
      channel 2
 )
```

As one can easily understand if we desired to proceed and define a section B, all we had to do was to copy-paste the same template and change the desired parameters, and repeat the process as many times as sections needed in order to complete the piece.

An efficient way to automate this process is to consider this example as an archetype and to define an abstraction that generates as many sections desired, from scratch, just changing the relevant parameters.

Having presented a way of implementing sections, nested inside the superstructure of form, one can now understand the hierarchical dimension of the model.

While it has a vertical dimension of six modules representing all the agents involved, in their orders of dependency, one also understands that it has a horizontal dimension of one section at a time, and how each section seems to be independent from each other. And the implementation of the following modules consists in generating the materials for these agents in a modular fashion. Generating the material for a hypothetical section A, and then repeating the entire process for a section B, and again for a section C and so on.

15.2 Second Module

In this section we will detail how we have formalized the harmonic layer and which assumptions and algorithms were used.

In order to formalize any accompaniment or melodic process, the harmonic environment has to be defined, and represented in symbolic terms. Fado musics are tonal and, as such, tonality has to be modeled. That kind of formal exercise has already been done several times, namely in the works of Elaine Chew, who presented a mathematical model for tonality and its description in formal terms (Chew, 2000a,b, 2001). We have also drawn inspiration from the work of Martin Rohrmeier (Rohrmeier, 2011), who proposed a generative syntax of tonal harmony.

The predefined objects and classes in the software that we have used shaped how the problem was formalized, in the sense that we were building our reasoning on top of them. Tonality, in *Symbolic Composer*, is a class defined as a foundational set of audible frequencies: $Tonality_x = \{freq_1, freq_2, freq_3, \ldots, freq_n\}$. Therefore, a tonality is often equated to a scale from which the pitches will be derived. These sounds can be virtually any, and are not constrained by any boundaries. Users can literally build artificial sonic worlds by defining their own tonalities. While it is possible to define a tonality in terms like

$$Tonality_{example} = \{245\,hz, 277\,hz, 389\,hz, 411\,hz, 447\,hz\}$$

most of the time this is not convenient. Alternatively, by using a morphism it is possible to map frequencies into a pair of symbols such that the first one is an alphabetic character corresponding to a pitch and the second one is an integer corresponding to an octave. An octave establishes a principle of equivalence such as an increase of a unit corresponds to the doubling of the frequency. And within an octave there is room for twelve equidistant different pitches. The 128 available MIDI pitches are defined this way, with a reference frequency of A4 = 440 Hz. At present, this convention is widely used and there is no need for further exploration and formalization in the scope of this dissertation. It suffices to say that a tonality can be also defined, using this convention equivalence, in terms of a scale, such as

$$Tonality_{example} = \{C3, D\#3, E3, F\#3, G3, A\#3, B3\}.$$

In the particular case of fado, as observed in the practice and from the examples of the corpus, there are four tonalities involved and their possible transpositions within the twelve tone system. They correspond to the major mode (Ionian) and the three minor modes, since fado is a part of a tonal tradition in the Western sense of the term. Therefore, within the program, the tonality has been formalized as such scales.

$$Tonality_{Major} = \{C3, D3, E3, F3, G3, A3, B3\}$$

$$Tonality_{Minor} = \{C3, D3, Eb3, F3, G3, Ab3, Bb3\}$$

$$Tonality_{Harmonic} = \{C3, D3, Eb3, F3, G3, Ab3, B3\}$$

$$Tonality_{Melodic} = \{C3, D3, Eb3, F3, G3, A3, B3\}$$

Two modifier functions were also considered to account for all possible transpositions, and to allow the definition of either local or global modulations.

$$f : \forall n \in Tonality_x \rightarrow n = (n + t + m) : \{t, m \in \mathbb{Z} | [-6, 6]\}$$

In this way, the sonic domain for fado is defined and constrained in a modular fashion. It could be argued that not all transpositions have the same weight, and indeed statistics were presented accounting for that fact, and, at least within the corpus there are some degrees that are never present. Therefore the value of t, formalized above, could be further constrained to reflect these weights. At present we do not feel that need, since in the current practice, and among skilled performers, transpositions are often chosen based on the range of the singer and do not reflect the original tonality the composer has chosen. Moreover, the lack of use among some tonalities often reflected the mere inability of amateurs to perform them, it did not reflect any intrinsic aesthetic decision regarding the musical content. Since these works are to be performed by the computer, and the computer has no difficulty in performing them in whatever transposition assigned, then it makes no sense to artificially constrain them. The modifier m, however, is constrained, and only makes sense in very specific cases. Not all modulations occur in the practice, and often this modifier is contextually attached to the harmonic progressions used, namely to generate secondary dominants, which is something to be developed further ahead.

While it is now possible to derive all possible pitches for the harmonies and melodies from this foundational base, it is clear that this structure, by itself, is a huge determinant in shaping the final sounds and in the characterization of the practice. It seems also obvious that a simple change in these definitions can radically alter the final result. After some experimentations we dare to say that entirely different practices and genres might be achieved simply by changing this parameter alone.

The problem of automatic harmonization is now considered a well-defined problem, especially when seen from the typical viewpoint of generating logical, yet inventive, chords to accompany a given melody. One of the most recent papers by Pachet and Roy has shown that "standard Markov models, using various vertical viewpoints, are not adapted for such a task, because the problem is basically over constrained" (Pachet & Roy, 2014). Their proposed solution consists in implementing their technique of Markov constraints to *fioriture* (melodic ornamentation, defined as random walks with unary constraints). The end results are claimed to be more effective and musically interesting.

While these approaches seem promising, they all rely on the idea that there is a base melody *per se* to be harmonized. However, in the case of fado, what one usually sees in performance is the reverse: there is a prior harmonic structure, on top of which the text is sung. So, while the rhythm of the melody and its general contour derive from constraints emerging from the lyrical structure, the pitches are mostly derived from the scalar structure of the underlying harmonic progression. Hence, one needs another kind of approach to solve this problem.

If the overall form is a foundation to structure the span of time and the internal recurrences of patterns inside a fado, the harmonic foundation reflected in the scalar structures, is the foundation of each section of fado regarding the way the pitches behave. By choosing a scale, derived from the tonalities assigned, one is able to derive pitches that will be coherent with the melody, accompaniment and counter-melodies, within context, and will make the existence of the piece possible.

15.2.1 Harmonic Progressions

Based on the tables previously obtained, and detailed in the first part of this dissertation, we made a list containing all the relevant harmonic progressions found in the musical scores.

A chord is formalized as an object corresponding to a set of symbols that is defined using four attributes (or modifiers): quality, root, octave and inversion.

$Ch_x = \langle Q, r, o, i \rangle$

The quality is a set that specifies the amount and relation between the symbols that compose the chord. A major chord is predefined as a triad in which the interval between the root and the second symbol is of four semi-tones, while the interval between the root and third symbol is of seven semi-tones, for instance:

$Q_{maj} = \{0, 4, 7\}$; $Q_{min} = \{0, 3, 7\}$; $Q_7 = \{0, 4, 7, 10\}$, etc...

There are numerous possible qualities for chords (diminished, augmented, extensions...) and all may be formalized in the same fashion.

The root of a chord is a modifier that assumes the form of an alphabetic symbol relative to the pitch of the defined tonality that is active at the time the chord is called. Hence, the root "a" corresponds to the first pitch of the scale defined (in case the tonality was defined as a scale) or to the first frequency defined (in case the tonality was defined as a list of frequencies). The root "b" corresponds to the second, "c" to the third and so on. Negative values work in the opposite direction.

The octave of a chord is also another modifier, which is an integer corresponding to the octave in which the root is to be placed. Finally, the inversion is yet another modifier, corresponding to an integer, which will determine which element from the ones available in the quality set will correspond to the first note.

A harmonic progression can be thus formalized as a list of chords.

$HP_x = \langle Ch_1, Ch_2, Ch_3, Ch_4, \dots \rangle$

As an example, the formalization of a typical T|D|D|T progression can be done as:

$$HP_{T|D|D|T} = \langle\langle\{0,4,7\},c,3,2\rangle,\langle\{0,4,7,10\},g,3,0\rangle,$$
$$\langle\{0,4,7,10\},g,3,0\rangle,\langle\{0,4,7\},c,3,2\rangle\rangle$$

This specific case reflects the formalization of a progression of $\mathrm{I}^{6/4}|\mathrm{V7}|\mathrm{V7}|\mathrm{I}^{6/4}$, in the third octave. In this example, the tonic chord is presented in the second inversion, so that its bass note is a common note with the following dominant.

Most of these modifiers, instead of being fixed, can be variables. The modifier "inversion" can be further modified by an offset variable, to increase variability. As an example attaching a fixed offset to every inversion in each chord, could be easily done as such:

$$HP_{T|D|D|T} = \langle\langle\{0,4,7\},c,3,(2+i)\rangle,\langle\{0,4,7,10\},g,3,i\rangle,$$
$$\langle\{0,4,7,10\},g,3,i\rangle,\langle\{0,4,7\},c,3,(2+i)\rangle\rangle : i \in \mathbb{Z}$$

Defining the variable i as "+1", would cause all chords to be offset by one inversion, so that the tonic chord would be presented in "third inversion". In this case, that would be the fundamental state again (one octave higher though), while the dominant chord would go for the first inversion, which would still create a very acceptable voice leading context with minimum finger movement.

The implementation of the harmonic progressions, as seen in the corpus, can be done as weighted lists. To optimize resources, all possible progressions are defined as a sequence, in which the position in the list identifies the progression.

$Possible\ HPs = \{HP_1, HP_2, HP_3, HP_4, \dots\}$

Each defined progression has scales associated with it, reflecting both the tonality that is active and a modifier offset for local modulations (concrete values for the parameter m). For instance, if in a given progression there is a secondary dominant, this means that this progression involves two different versions of a given scale, therefore the modifier has to change accordingly. If a progression has borrowed chords from the relative, then it involves two different scales. As such, parallel to the sequence of possible harmonic progressions a sequence of lists of scales is also defined, respecting the same order, so that their position matches.

$Scale_x = \langle Tonality_x, t, m\rangle$

$S_x = \langle Scale_1, Scale_2, Scale_3, \dots \rangle$

$Possible\ Scales = \{S_1, S_2, S_3, S_4, \dots\}$

Then, further sets for each section are built containing the weights, in the same order the progressions and scales were defined.

$Weights\ for\ Section\ Xn = \{w_1, w_2, w_3, w_4, \dots\}$

As such, when one wants to assign a progression and a scale for a section Xn there is a probability w_n, constraining both the choice of HP_n and S_n simultaneously.

$\forall\ w_n\ \exists\ HP_n, S_n : (HP_n, S_n) \Rightarrow Xn$

Implementing the progressions in this modular fashion means one only has to define them once, and can alter them at any stage. It is also easy to change the weights among each section, alter them, nullify some of its elements (meaning that in any given sections, some progressions will never be picked up, even when they are defined) or force them. It also means one can actually make them vary with time, if one decides to define the list of weights as variables instead of fixed values. The same can be said about the progressions and scales themselves, since they are defined as symbolic data. In this way, instead of needing to create a complex generative function to act as a second artificial intelligence to deal with the coefficient of representativeness, we just had to make a second set of weights with a more unpredictable behavior. This way, the program might either pick up progressions and scales from the set of weights that fully mirror the corpus (as shown in the tables, in the first part of this dissertation), or pick up progressions and scales drawing values from the unpredictable set of weights, hence creating more adventurous musical results.

The option to use weighted lists, instead of other methods, relies on the fact that we believe this best represents the process that actually happens in the practice. People do not generate progressions out of thin air, neither do they seem to generate them in a purely sequential form, Markov chain or random-walk like fashion. Instead, they seem to rely on previous implicit knowledge, in a kind of mental scheme of already known progressions that work within the tradition. This is done either by copying the records, other musicians or by resorting to other songs they already know. It is not by chance that harmonic progressions in the musics of fado also depend on the education of the musicians. Schooled ones like

Reynaldo Varela, Alain Oulman or Jorge Fernando often employ more complex progressions, since they are borrowing them from other traditions, namely from the erudite music or jazz universes. Therefore, by using weighted lists this previous knowledge of which progressions work best and which not (also according to their temporal context within the repertoire), its distribution among the overall population, and the choice to pick them, is modeled.

Symbolic Composer already has objects defined to predict all the possible chords used in tonal music and it is possible to define custom chords as well, therefore this template can be modified or extended at one's will in case one wants to model other practices or refine this one. Each chord of the progression was defined according to a specific inversion in order to respect voice leading rules and logical transitions between chords. In order to not constrain the progressions to just one possible inversion, each chord was also assigned to an off-set variable to be picked up at random at each generation. This offset variable allows that, while keeping the transitions consistent (and thus the voice leading), one can still obtain all possible inversions in each progression.

Using the formalization described above we are presenting a bit of code as an example of the implementation of three different harmonic progressions. Notice that the syntax of *Symbolic Composer* uses the modifier inversion in the first place, and only then, quality, root and octave.

```
;;0-I-V7-V7-I
((,(+ i 2) ch-maj c 3) (,(+ i 0) ch-7 g 3)
(,(+ i 0) ch-7 g 3) (,(+ i 2) ch-maj c 3))
;;1-I-ii-V7-I
((,(+ i 2) ch-maj c 3) (,(+ i 1) ch-m d 3)
 (,(+ i 0) ch-7 g 3) (,(+ i 2) ch-maj c 3))
;;2-I-IV-V7-I
((,(+ i 2) ch-maj c 3) (,(+ i 1) ch-maj f 3)
 (,(+ i 0) ch-7 g 3) (,(+ i 2) ch-maj c 3))
```

Alongside with this list of all possible progressions, we coded a way to call them in a weighted form according to the section where they will be used. In this case, as an example:

```
;;---WEIGHTS FOR PROGRESSIONS OF SECTION "A"
(setq iProgA
(first
(gn-weight 1 '(

(0 36) (1 3) (2 1) (3 0) (4 1) (5 0) (6 0) (7 0) (8 25)
(9 1) (10 5) (11 0) (12 2) (13 0) (14 0) (15 0)

))))

;;---WEIGHTS FOR PROGRESSIONS OF SECTION "B"
(setq iProgB
(first
(gn-weight 1 '(

(0 15) (1 5) (2 2) (3 3) (4 4) (5 6) (6 3) (7 1) (8 17)
(9 2) (10 2) (11 1) (12 1) (13 2) (14 3) (15 1)

))))
```

The variable "iProgA" represents the element of the list of progressions to be picked up, to be later used as a harmonic progression in section A. In this case, one can see that the element 0 has a 36 factor associated with it, followed by the element 8 with a factor 25, and they are the elements most likely to be picked up. In the progressions list, the element 0, as shown before, corresponds to the progression T|D|D|T in the major mode, while the element 8 corresponds to the progression t|D|D|t in the minor mode. These are the factors obtained in the tables, and, as one can see, they are very easy to change. The way we have built the functions separate means that we can have just one large list to have all possible progressions and we have smaller lists to carry the weights for all different sections. This allows us to also refine each of these modules and, for instance, to code a function to generate new progressions from scratch and add them to the list of another abstraction able to generate weights from scratch.

15.2.2 *Ostinati*

The analysis of the corpus has shown that the accompaniment layer in fados is mainly comprised of *ostinati*: a stock rhythmic pattern that repeats itself over and over during a certain period. Sometimes it goes along the entire fado, but other times it just spans through some sections, having other contrasting *ostinati* in the other sections. In order to mimic this layer, we have studied the kind of *ostinati* that appear in the corpus. Most of these *ostinati* are recurrent figurations vastly used in other performative traditions and already have designations and categories by which they are known and there are already some established rules regarding the way players should approach them. One can find marches, *alberti* bass like figurations, *habanera*s, popular marches, and hybrid versions between them, as already detailed in the first part of this dissertation.

The first approach regarding this problem was to make a weighted list of all the relevant patterns that appear in the corpus and then let the computer pick one, because this models what happens in the actual practice: players just chose one figuration from a previously known group. The formalization of these stock patterns was done by literally expressing the archetypical stock figurations as music fragments, as displayed in the first part of this dissertation. In order to facilitate the process each *ostinato* was broken in two parts, representing what happens in the real practice: a bass layer and a harmonic chordal layer. Often, the bass and chordal layers are played by the same instrument and they do not overlap each other, but other times they can be separated, especially when there is a bass instrument present. Moreover, the chordal layer usually has notes deriving from the chords while the bass layer may present additional scalar material. Both layers were expressed as lists containing the explicit durations and symbols of the patterns in their atomic form. The atomic form is the minimum fragment that needs to be provided so it can be looped in order to generate the complete accompaniment. In order to be looped correctly, the total duration of this fragment should match the total duration of a section or at least be divisible by it without a remainder. In the case of fado, since the sections are four binary bars long, equivalent to eight quarter notes, this implies fragments with the length equivalent to two, four, or eight quarter notes. Both the durations and symbols are represented in lists in which the position matters, since it is this linearity and correspondence that allows each value to be matched with the others at a later stage.

$$Ostinato\,Chord\,Durations_x = \langle dur_1, dur_2, dur_3, dur_4, \dots \rangle,$$
$$m(\#Ostinato\,Chord\,Durations_x) = \#Xn : m \in \mathbb{N}$$

$$Ostinato\,Chord\,Symbols_x = \langle Ch_1, Ch_2, Ch_3, Ch_4, \dots \rangle : Ch_n \in HP_n \Leftarrow Xn$$

$$Ostinato\,Bass\,Durations_x = \langle dur_1, dur_2, dur_3, dur_4, \dots \rangle,$$
$$m(\#Ostinato\,Bass\,Durations_x) = \#Xn : m \in \mathbb{N}$$

$$Ostinato\,Bass\,Symbols_x = \langle s_1, s_2, s_3, s_4, \dots \rangle : s_n \in S_n \Leftarrow Xn$$

These lists comprise the rhythms and symbols, abstracted from these patterns. They have to be mapped into any given section Xn, so they will retrieve the information regarding which harmonic progressions and scales are active at that point, and that will allow the symbols to be relatively converted into suitable pitches.

As suggested by Professor Bruce Pennycook, we have also programmed a function that would, somewhat randomly, generate pauses within the *ostinati*, and so approaching a live performance and the freedom the players have when they actually perform them. One of the main concerns in increasing the realism of this function was to make sure the pauses would neither happen in the strong beats of each section, nor be so many that they would prevent the listener from actually recognizing the *ostinati* as such. This approach concerning the accompaniment has the advantage of being totally representative of the corpus and coherent within the tradition. It also handles very well the problems of voice leading, since by having concrete lists of symbols to pitches, usually one automatically assigns the most commonly used chord inversions at each stage, which actually are more natural to the way a keyboard player would approach them. The model of Toivanen et al, creates accompaniments in many styles, like *alberti* bass and many other chord patterns, which, we believe, can be similar to our own. They have used a model of voice leading that chooses chord inversions based on a minimal total movement (smallest sum of intervals of simultaneous voices) (Toivanen *et al.*, 2013).

Our second approach to this issue was to actually build a second artificial intelligence, triggered according to the coefficient of representativeness, consisting of some functions that would generate *ostinati* and rhythmic patterns from scratch. The symbols derived from the harmonic progression were then assigned to those durations and new and inventive *ostinati* were obtained. This approach has the advantage of generating out-of-the-box rhythmic patterns and expands the possibilities for diversity and for unexpected results making the outcome more interesting. However, this approach has also the problem that it might generate patterns that lack coherence regarding voice leading, the way a keyboard player usually performs them. It also presents the problem that, even within the constraints we have designed, it may generate *ostinati* that might not be recognizable within the tradition, therefore jeopardizing the common expectations of what a fado should sound like.

We believe the weighted combination of these two approaches is the best solution in order to generate convincing *ostinati* for the fados, but one may keep the door open for having some sections with original accompaniment, something that makes sense when one thinks of a live performance with inventive players.

15.3 Third Module

In this section we will detail how we have coded the melody and which assumptions and algorithms were used.

There are several ways to approach the problem of generating a melody. According to previous research on the topic, in most cases the authors adopt a modular strategy in which the main focus is on two parameters: rhythm and pitch. Usually the first task is to generate a rhythm, a pattern, and then assign pitches to that same rhythm. Since the melody in fado is intimately connected with lyrics and prosody, our main references were the state of the art references dealing with the generation of melodies in the context of songs. Therefore, we studied the approach proposed by a team of Finnish researchers who developed the prototype *M.U. Sicus-Apparatus* (Toivanen *et al.*, 2013). This program generates art songs, writing lyrics first and then composing music to match the lyrics. The idea of music composition in order to match a previous lyrical content is of crucial interest to our own project, for obvious reasons. The program consists of two modules: one that writes the lyrics based on user input of a theme and a second one that receives an emotional valence and composes the music. In order to generate the melody, the program first generates a rhythm based on the prosody of the already written lyrics. It breaks down each word into syllables and then assigns a rhythmic element with as many notes as there are syllables. Those rhythmic elements come randomly from a set of commonly found patterns in art songs. Then, the program randomly chooses a scale coherent with the emotional valence previously provided and generates a harmonic progression based on a second-order Markov chain with common progressions found in diatonic Western classical music. It also assigns time values, in a probabilistic manner, for each chord generated so that the overall length of the accompaniment structure will be consistent with the rhythm of the melody. After this stage, pitches are assigned to the rhythm of the melody. The underlying harmony defines a probability distribution for pitches which can be used, and the subsequent note is found by the means of a random-walk favoring small intervals (Toivanen *et al.*, 2013, p. 89).

Another approach to melody generation and edition was the one presented by Young-Woo Jeon et al. using a noise function, specifically Perlin noise, because it "is bounded, band-limited, non-periodic, stationary, and isotropic" (Jeon *et al.*, 2006, p. 164). These traits would make the noise function ideal because, while it preserves a decent amount of randomness, it still is controllable and presents somewhat predictable results to the user. Mainly, Jeon et al. present the idea that Perlin noise can generate a melody from scratch (if mapped into pitches) or be mapped into an already existing melody to change some of its elements while still preserving its original shape. This concept can also be extended to any other parameter, like timing information, tempo or dynamics. The smoothness of the curve that noise can produce, under certain values, is ideal for altering any parameter originating what one would call a "humanizer", because in the final outcome it produces small deviations similar to the ones a human would introduce when performing a certain task, since human behavior is slightly erratic and imperfect. Jeon et al, also present the idea that after the noise is applied to anything it can then be further processed to revise some things that might get off-place or that the user desires to be constrained, for instance, certain melody notes on key points to be determined instead of purely random. They conclude that

> "noise function makes the modification of an existing melody easy and fast. The modified melody shares the basic form of the original melody, but the details are randomly different. The extreme changes that can be caused by white noise are not found in the modification because of the ideal band-limited feature of the [perlin] noise function.

> By noise editing, it is possible to control the composition or modification process precisely to reflect a composer's intent in the work" (Jeon *et al.*, 2006, pp. 167-168).

In our own explorations with the software *Symbolic Composer* we have noticed how several functions based on noise already came predefined and ready to use, namely generators of white, pink, red or Brownian noise. Also, another set of generators based on other types of curves and waves like triangular, for instance, or even real time readings of astronomic patterns and walks like solar wind or flux particles. We consider that the same ideas Jeon et al. present in their paper are suitable for our own use; it is just a matter of, again, picking up the suitable generator and deciding its seed and steepness and one is able to achieve desirable results. We have found that Brownian noise and its graphic curves are suitable for melodic generation the way they, themselves, generate contours similar to the ones a human voice can do. A number of combinations of more than one noise are able to generate virtually all the melodic contour archetypes described by Huron and already surveyed in the first part of this dissertation (Huron, 1996, 2008), and thus be successfully applied in algorithms with the intent of either melody generation or creating melody variation on previous melodies.

Also, we have pushed further into noise explorations to also make them suitable for creating variations or simple humanizations on several parameters like rhythms, tempo, dynamics, etc.

Our approach to the problem of melody generation was to model what we have found in the data analyzed and to try to replicate those results. Basically, when one is composing a melody for a fado, one is really setting up a lyrical line on top of a harmonic progression set over the span of two measures. The first task was to decide how to divide and break the total span into smaller figures, thus creating a rhythm. And, according to the data, nearly almost any combination is suitable, there is really no clear pattern on what might happen. Surely, the semiographic schemes tend to favor regular and simple divisions, like beats with quarter notes, a group of two eight notes, or the syncopated figure of two sixteenth notes with an eight note in between them. However, as already seen and discussed in the "rhythm of the melody" section, triplets are frequent and dotted figures and other combinations also arise. Furthermore, even when they are not notated, they eventually show up later in the performance and can effectively be heard.

The conclusion is that one can expect virtually any subdivision of a measure into smaller figures as long as it consists of a reasonable number corresponding roughly to the number of syllables of the lyrical line. And even that is just a rough estimate, because sometimes a singer can prolong the same syllable over two or more different notes. Therefore, taking into account the typical heptasyllabic verse, it would make sense to hear any subdivision consisting of seven to ten notes. Since there is no concrete textual line to which one is referring, there is no prosodic reference to be coherent with in terms of accents, for instance. Therefore, the issue is not so much the apparent chaotic randomness of such freedom, but rather the consistency of the recurrence of this same pattern once generated. This is so because what the lines have in common is their metric regularity. As such, even if one does not know exactly how a particular rhythm was generated, because of the lack of a concrete text, one knows that the quantized version of such rhythm has to be repeated over and over, simulating a consistent stanza.

Having this in mind, our first thought was to initially have actual weighted list of the most common rhythms of the melodies used in the corpus. Having these lists and weights, the artificial intelligence would simply pick up a list comprising a rhythm that we knew made sense because of it being used successfully in the past. This approach, however, relies on previous material and, of course, lacks inventiveness. Moreover, contrary to what happens with harmonic progressions and *ostinati*, such an approach actually does not reflect the practice. In a good practice *fadistas* style their melodies on the spot, this being one of the most defining traits, therefore using quantized versions of past performances is not an elegant solution. This solution would eventually model what some recent amateur performers do when they literally imitate the records. However, this way of doing things, regarding this specific parameter, is not considered a good practice among the members of the community. Hence, we took another approach and decided to code an abstraction that would generate an acceptable list from scratch, trying to model the behavior that the rhythm of the melodies is generated on the spot.

This particular list is important because its quantized version represents a base pattern that will give consistency to the entire work in a cross-sectional fashion. As discussed before, the rhythm of the melody is important because of its constant recurrence with small variation (the non-quantized versions), within the same work. Therefore, after we have generated it once, we have a structural foundation that we can use to build upon or further manipulate in order to create variations, and in this particular case, extending beyond one simple section.

In order to efficiently generate the rhythm of one line, we broke down each line into its parts. As one can observe from the semiographic scheme from Frederico de Freitas (for instance), a line comprises pick-up notes, followed by what we will call "rhythm head" (the first measure), and then a "rhythm-tail", corresponding to the second measure. Typically there are less figures and larger durations in the "rhythm-tail" in order to end the line. The second beat of the second bar is, in fact, the pick-up of the following bar:

$$Rhythm_{line} = \langle \langle Rhythm_{pick-up} \rangle, \langle Rhythm_{head} \rangle, \langle Rhythm_{tail} \rangle \rangle.$$

Each one of those rhythms can be generated by slicing the available length by a random integer. Usually, smaller numbers are preferred, since one is usually dealing with already short durations. Two, three, four and eight will yield more realistic results, while five, six and seven generate complex rhythms. Above nine things can become surreal. The second step is picking up those slices and concatenating some of them into larger units in order to obtain durations of unequal length. Obviously, the sum of the durations of all resulting slices remains equal to the original available length.

$$Rhythm_n = \sum\{[\#(Rhythm_n)/j] \times k_i\} : (\sum k_i) = j; j, k \in \mathbb{N}$$

This process of slicing lengths and redistributing the sliced durations can be refined if applied to smaller hierarchical units when desired. For instance, since "rhythm-head" represents an entire bar, which in the case of fado comprises two beats, it can make sense to actually apply the process separately to each beat, instead of the whole bar. Also, no matter which integer j has been used to slice the "rhythm-head", it makes sense for it to be a smaller value when applied to "rhythm-tail" so it generates relatively longer durations, and one actually obtains a tail effect.

Once all those sub-rhythms have been generated and joined into a single list comprising what would be the rhythm of a line, one might notice that all durations are positive values and represent notes. This is not realistic, since every line has to contain a few pauses. One of them, in the case of fado, is always determined and occurs in the beginning of the second beat of the second bar, corresponding to the end of the tail and the beginning of the pick-up notes. Therefore, for the sake of simplicity, the pick-up rhythm is implemented as a quarter-note duration slot, including an eight-note pause, followed by the actual pick-up note or notes. Experience taught us that in most of the cases it is just a single eight-note, and seldom other durations. A small weighted list suffices in this particular case. All other rhythms might include additional pauses that can be implemented using a random function to switch any of the available durations to a negative value.

In order to code such implementation in *Symbolic Composer*, we started by coding the “rhythm head”. We have simply coded a small function that slices each beat into smaller units (even or unevenly for more realism), and assemble those durations onto a list. The function has weighted optional parameters that can lead to favor even divisions or larger durations on the odd beats, for instance. Since the resulting list is always a list of positive durations, a second function “length-syncopate” filters its content having the possibility of creating some pauses.

```
;;rhythm for head in section A

(setq rhythm-A-head
(mapcar 'get-ratio
  (length-syncopate my-random-seed 5 1
     (flatten (rhythm-ornament 4 8 '(1/4 1/4)
              :seed my-random-seed :pcnt 100 :to-pcnt 70)
        )
     )
))
```

Basically, we are asking the computer to divide each 1/4 duration 4 up to 8 times. We are also telling it to only divide 70 to 100 percent of these durations. Note the variable “my-random-seed” there. Everything is customizable and changeable in order to be extremely flexible and to easily allow modifications. Then, we coded the “rhythm tail”, a second function similar to the previous one, but with changed seed and parameters in order to slice only one beat into smaller units (but not so small) appended to the outcome of a weighted list representing possible pick-up notes. These two lists are then appended and flattened. Every time one runs this function one obtains a list comprising the durations of the rhythm of one line.

Once obtained the rhythm of the melody of one line (a list of durations and pauses adding up to two 2/4 bars, in fact): $Rhythm_{Xn} = \langle d_1, d_2, d_3, \ldots, d_n \rangle$, the next step is to assign pitches to each one of those durations. Again, there are several ways to approach this problem. The most obvious and consistent way of assigning pitches to durations is to rely on the underlying harmonic progression. The harmonic progressions for the *ostinati* are already defined in the second module, so the most logical step would be to assign pitches derived from the chords used in each beat by means of a weighted function. By doing this one obtains, for sure, a melody that will sound consonant, however, lacking fluidity and contour. The second approach is to apply only this principle to hierarchical relevant durations (those which stand in the first tick of each beat, for instance) and then fill in the gaps with other notes from the scale, but not necessarily from the chord. These notes will behave as passing tones. The problem with this approach is that it might simply generate non-realistic intervals and strange contours between the notes, so one has to refine this reasoning through the means of that constraint: use tones from the scale but that are stepwise apart from the previous chord tone assigned in a random-walk fashion.

Another totally different approach is to simply rely on templates and formulas. Based on the data collected from the corpus, there are already a series of melodies known to work, that sound good and realistic and that, in fact, represent the corpus. So it is possible to obtain a supply of reliable melodies simply by having an archive with sequences of pitches that work together and represent different types of melodic contours and then using a weighted function to randomly pick some. Then, they can be transformed using a second weighted function to add slight variety to it. The outcome of this method has the enormous advantage of being somewhat predictable, aesthetically pleasing and making sense in the context, and has the extreme disadvantage of being a small remix of already existing material, thus not increasing the span of possibilities by that much.

However, we believe the best approach is to try to mimic what happens in real performances with real singers. What they do is to improvise a melody on top of a harmonic texture. By doing that they are relying on the knowledge of the underlying harmonic progression, but mainly the scale associated with it, respecting the mode in which it pertains. The precise way in which the pitches are chosen among those constraints is incredibly complex and derives from an entanglement not yet fully understood. There are obvious relations between the semantic and syntactic content of the lyrical text, since the speech contours should influence the melodic contour. Not only that but the language in which the text is written also influences the pitch. It is known that the pitch of speech is a cultural construct based on the pitches people hear around them when they are infants. It is a function of the linguistic community (Deutsch *et al.*, 2009, Dolson, 1994). Those dimensions are impossible to model in our current state. Moreover, the physical constraints of the singers also constrain the available choices, since some people have wider ranges and theatrical performances while others prefer to sing in an almost spoken form thus, narrowing the overall range of their melodies. Therefore acknowledging these difficulties and limitations we have opted, in this case, to try to simulate this complex behavior using the ideas proposed by Jeon et al. (Jeon *et al.*, 2006) and using noise as a central concept in shaping the melodic contour.

For each of the chordal harmonic progressions listed previously, and used to generate the *ostinati*, we have built a second list of all the possible associated harmonic scalar progressions, indexed in the same position. Therefore, it is possible to use them to retrieve the pitches for the melody. These scales, however, should also be modified and further constrained by an offset variable in order to build coherent contours and avoid strange intervals, influencing the voice leading.

$$Melody_x = \langle \langle Scale_1, o_1 \rangle, \langle Scale_2, o_2 \rangle, \langle Scale_3, o_3 \rangle, \dots \rangle : \\ \forall\, s_n \in Scale_x, s_n = s_{n+o} : o \in \mathbb{Z}$$

The offset variables o_i are local transformational devices in the form of a rotation implying that all elements on a scale change their positions back or forward accordingly. This transformation is used to force the first symbol in any given scale to be the one desired, in order to condition the future mapping into pitches.

As an example, the progression T|D|D|T in the minor mode, "i|V7|V7|i", the first chord "i" is best associated with the "natural-minor" scale, starting in the first symbol, with an offset 0. The second chord "V7", however, is best associated with the "harmonic-minor" scale. This is so because the second note of the chord "V7" does not exist in the "natural-minor" scale; it is part of the harmonic or borrowed from the major mode. Also, it would be better starting with an offset of either 1 or -1, influencing the voice leading so that the first symbol of the scale is the nearest one matching a chordal tone. Following this reasoning, the third chord, again "V7", and thinking in how a melody usually evolves, arch shaped up and not down, could be best associated with the same "harmonic-minor" scale but with an offset of 3 or 4, the nearest notes of the scale that are chordal tones.

$$\begin{aligned} Melody_{T|D|D|T} = \langle\langle\langle Tonality_{minor}, t, m\rangle, 0\rangle, \langle\langle Tonality_{harmonic}, t, m\rangle, 1\rangle, \\ \langle\langle Tonality_{harmonic}, t, m\rangle, 4\rangle, \langle\langle Tonality_{minor}, t, m\rangle, 0\rangle\rangle : \\ \forall\, s_n \in Scale_x, s_n = s_{n+o} : o \in \mathbb{Z} \end{aligned}$$

In terms of *Symbolic Composer* coding this can be done as follows:

```
;;0-I-V7-V7-I
((0 major c 5) (1 major c 5) (4 major c 5) (0 major c 5)
)
;;1-I-ii-V7-I
((0 major c 5) (1 major c 5) (4 major c 5) (0 major c 5)
)
;;2-I-IV-V7-I
((0 major c 5) (3 major c 5) (4 major c 5) (0 major c 5)
)
```

Of course, some of these are subjective decisions and in a way influence the voice-leading and the general melodic contour, but none of these decisions is final. They all can be refined at any moment, and any of these offsets (or all of them) can be set to variables.

The point being made is that, having a harmonic progression based on scales, constrained by the chords, one is now fully apt to apply a contour to it to generate suitable pitches.

In order to generate such a contour, a function that generates a vector based on Brownian noise ($PSD \propto 1/f^2$) with 257 samples was used, in order to have a considerable shape while avoiding repetition. Then, the vector is scaled to the length of the actual "rhythm-head" list, and converted to symbols within the desired range. This allows having the precise length needed, while retaining the overall shape of the contour. The operation is repeated to generate a second vector that is applied to the "rhythm-tail" list. Both vectors are appended and the result is a list of symbols, whose length is the same as the list of durations, and that has a realistic contour: $Melody_{Xn} = \langle s_1, s_2, s_3, \ldots, s_n \rangle : n = \#(Rhythm_{Xn})$

When that contour is applied on top of the corresponding harmonic scalar progression the symbols are converted to pitches that actually make sense within the context of the chords being played in the *ostinato*. Therefore, the melodies will always sound consonant, respecting the tradition involved. The coding in *Symbolic Composer* corresponds to:

```
;;Melody ‘‘a1’’ generator
;head

(setq melody-a1-head
  (vector-to-symbol a f (vector-quantize 257
(length rhythm-A-head) (gen-noise-Brownian 8 my-random-seed 0.5)))
)
```

Modifying the range of the symbols or the samples of the vectors can greatly influence the result and the quality and realism of the melodies. Using other noise functions and hybrid functions that generate graphical contours can have similar effects. The limit is one's imagination, and the code is flexible enough to allow very easily the refinement of the abstraction.

15.4 Fourth Module

In this section we will detail how we have coded the countermelody and bass layers and which assumptions and algorithms were used.

The countermelody is a layer that often appears in the practice. However, it is many times omitted in the earliest scores. The more complex scores include parts of it and it roughly corresponds to what a modern *guitarra* does, by filling in the spaces in between the melody. In order to mimic this layer, we have prepared a set of stock figurations based on the figures of Salwa Castelo-Branco already presented in the first part of this dissertation, but also on a set of observations we did on our own, observing players and listening to records. Basically, these stock figurations are based on arpeggiations, small scalar figures or even motifs drawn out of the melody. If one uses Ernesto Vieira's model as a base, then they usually occur in the middle of the second bar, right when the voice is beginning to end a line, and end in the downbeat of the following bar, when a new line has just started. In terms of coding, since they apply mostly scalar figures, we had to prepare a weighted list of possible stock figurations, much alike the one we have done for the *ostinati*, just with the difference that, instead of associating them with the chordal harmonic progressions, we have associated them with the scalar harmonic progressions used for the melody, to allow passing tones and half-scales. In a way, they are fragments of pre-composed music selected more or less at random and having variations. A way to refine this whole process was to, once again, code an abstraction that generates little motives based on small vectors with Brownian (and similar) noises. Of course, this later approach originates more unexpected results and sometimes results that do not conform with the tradition. The best approach, in our opinion, is a weighted combination of both solutions.

The bass line is covered in this same section because the principle it is the same. The bass line in fado practice is usually redundant, since most of the times one does not have a bass present and the bass is contained in the *ostinati* performed by the viola (already described in the second module). However, the solution found for *ostinati* only allows chordal material and, although this is enough for most of the earliest scores, and probably reflects the simpler forms of the practice, the truth is that often the bass also performs scalar material, sometimes performing like a walking bass when connecting sections or even in the same *ostinati* patterns like marches and foxes. In these cases, one can really say that the bass presents counter-melodic material. So we have decided to take this into account and prepare a layer that most of the time performs the same bass notes as the viola, but it is linked to the scalar harmonic progressions and also performs stock scalar figurations, namely alternating ascending and descending motives.

15.5 Fifth Module

As we have been presenting in this text, every musical score is omissive in several parameters that are to be completed by the performer within the cultural practice, context, society and audience expectations. Fado is no exception, and for a musical score to be a convincing display of this practice, that human factor ought to be present, so the musical score generated should not be played neither too randomly, neither strictly and mechanically, as any MIDI file can be. The automatic performance of quantized MIDI scores has been studied in the Royal Institute of Technology (KTH) and models for human performance are presented in the studies of Friberg and colleagues (Friberg *et al.*, 2000, 2006). These models present and implement a series of rules (hereby referred as the KTH performance rules) inferred from the empirical study of real performances, namely how the performer shapes all audible parameters such as tempo, sound level, or articulations. It has been found that each note suffers micro-deviations relatively to the notated value, not only due to human imprecision, but also as a systematic variations, implying things like long notes tend to be lengthened and louder and short notes to be shortened and softened; the higher the pitch the louder the note; notes in uphill motion have a decreasing duration, etc...

We have thought to include in the generated musical scores something that would model the major characteristics inherent to human performance, such as crucial articulations that our analysis has shown to define the genre, and that we have defined and discussed as "gestures" – some particular legatos, *mordentes*, *tenutos*, suspensions, portamentos, and so on. This can be done with an extra layer of transformative functions built on top of the quantized musical score generated. We see them as a "humanizer" that adds some kind of swing and deflection on the exact values provided by the MIDI score. We will explain with examples how the humanizer was coded and implemented and how it can be refined at any time.

As detailed in previous sections most of what the generator does is to generate fragments of music, semiographic schemes, much like a normal score generated by pen and pencil would present. The problem with this approach is that each instance of the scheme would be presented exactly as the previous one, thus becoming dull and repetitive. It is known for a fact that in human performance the same does not happen, as each instance of a semiographic scheme is varied. Therefore, and in order to have the best of all worlds, the way to have consistency and coherence among the score is to effectively have these semiographic schemes repeated over and over again in each section, instead of constantly generating new bits of music. However, each time they are repeated something about them has also to change. Therefore we formalized a series of abstractions, inspired in the KTH performance rules, that generate a little variety in each scheme and thus allow us to create variations regarding the same scheme.

For any given section $X0$ in the form, transformations are applied originating slightly varied sections Xn. Further transformations built on top of Xn might be applied, originating more varied sections:

$$f : T_{variation}(X0) \rightarrow Xn;\ f : T_{variation}(Xn) \rightarrow Xm : n \neq m$$

The best way to take advantage of the implementation of these functions is to use them as transformations to create alternative sections for each base section created. Therefore when a section $A0$ is generated, it has corresponding lists of rhythms and lists of symbols. The section $A1$ would have the same lists affected by some of these gestural functions. The section $A2$ could have the same base lists affected again by the same or other gestural functions to randomly distort them in a different way. The ornamental functions can also be used cumulatively in order to create more variety.

15.5.1 Rhythmic variations

If one observes the text, the prosody and the defining base of the sections, one understands that the rhythm of the melody is one of the anchors present in every section of every work. Each rhythm is a list of values that has a fixed total length. Therefore, the only way to increase variety within this parameter is to slightly skew the values within the constraint of this fixed length by stealing some duration to some notes and adding it to others. We have created three functions to so do. The first one, "length-emphasize", emphasizes a rhythm by a factor, keeping the length intact within resolution, implying that 0% – almost no distortion, 100% – maximum practical distortion to avoid smaller values becoming void. This function is implemented as follows: the absolute value of each duration is powered by a factor (a variable between 0 and 100) divided by 33.4 plus 1. This will mean that each duration is powered by a number varying between 1 and 4. Not only that but each duration is also added up to a random micro-number varying between 0 and one tenth of itself:

$$f : \forall\, r \in Rhythm_{melody},\, r_i \rightarrow q_i = r^{[1+(n/33.4)]} + x : x \in [0, r/10],\, n \in [0, 100]$$

Then all values will be divided by a common factor that is the result between the sum of all original durations divided by the sum of all the new durations. This will guarantee that the length of the list of the transformed durations will be the same as the original durations:

$f : \forall\, q, q \rightarrow q \times (\frac{\sum q_i}{\sum r_i})$

Depending on the factor and original durations, sometimes micro-values might be originated in this process. Therefore it is suggested that the final values might be quantized to a minimum of a 32nd note, for instance. This algorithm will create distortions in each duration in such a way that in practical terms the longer values will become even longer and the shorter values will become shorter. The coding of such a function in *Symbolic Composer* becomes rather complex and nested:

```
(defun length-emphasize (factor list &optional seed)
  (diagnostic2 "length-emphasize" $cr$)
  (do-quietly
     (init-rnd seed)
     ;;quantizes the list to realistic resolution values
     (let* ((a (length-quantize-grid '1/32
                  ;;resizes list to adjust the differences
                  (length-resize (make-zone list)
                     (let ((result nil))
                       (dotimes (i (length list))
                         ;;emphasizes list by factor and
                                 adds a bit distortion to each element
                         (setq f (expt (abs (nth i list))
                                         (+ (/ factor 33.4) 1)))
                         (push (+ f (rnd2 0 (/ f 10)))
                                result))
                       (reverse result)))))
            (b (append (list (+ (first a)
                    (- (make-zone list) (make-zone a)))) (rest a)))
            (result nil))
       (dotimes (i (length b))
         (push (if (minusp (nth i list))
                  (- (abs (nth i b))) (nth i b)) result))
       (reverse result))))

\#\textbar
(length-emphasize 30 '(1/1 1/2 1/2 1/4 1/4 1/4 1/4))
--> (53/32 13/32 7/16 1/8 1/8 1/8 1/8)
```

Secondly, we have created the "length-homogenize" function that does exactly the reverse, meaning that the larger values become smaller and the smaller ones become longer, thus making the lists more "uniform". Finally, in a similar fashion, "length-distort", randomly steals durations from some values adding them to others, distorting a rhythm by a certain factor, in a non-uniform way, keeping the length intact within the desired resolution. With a wise combination of these three functions, we have a useful resource to obtain variations of the semiographic rhythmic schemes.

15.5.2 Melodic variations

Another way to obtain variation is to slightly change some of the symbols from a list that pertains to a melody. *Symbolic Composer* already has such built-in functions, so there was no need to build them. Mainly the idea is to use noise to modulate any list, by slightly increasing or decreasing some of its elements at random:

$$\exists\ s_n \in Melody_{Xn} : s_n \rightarrow (s+t)_n : t \in [-2, 2]$$

Thinking idiomatically about the piano, and how some fados might be played on a piano, one of the most common resources in the literature is the repetition of the same melodic motif played in octaves as a reinforcement. Such transformational function can be implemented as well, simply by concatenating each symbol, from a list of melodies, with itself displaced by a variable:

$$\forall\ s_n \in Melody_{Xn}, s_n \rightarrow s_n * (s+t)_n : t \in \mathbb{Z}$$

In this case, if the variable is twelve, then this will generate a list of dyads in which each element is an octave apart from the original. Modifying the value of the variable originates different kinds of dyads resulting in other interesting effects.

In *Symbolic Composer*, we created the function "Octavate" to allow the idiomatic piano effect.

```
(defun octavate (melody)
 (let ((result nil))
 (dotimes (i (length melody))
 (push (merge-symbols (append '(+12)
        (list ',(nth (- (- (length melody) i) 1) melody)))
       ',(nth (- (- (length melody) i) 1) melody)) result))
 result)
)
```

And then we have decided to create a similar and even more powerful abstraction when we realized that one could decide to have the same effect by whichever interval desired. The reasoning is the same, and one can append whichever distance one wants. One can even randomize the interval and create diverse melodies. All this just shows how having a modular structure allows us infinite variations and effects with relative ease.

15.5.3 Mixed Variations

Another class of variations can be obtained by simultaneously changing pitches and durations. Although trickier, they are also doable. We decided to do so by creating an abstraction for one of the most common gestures heard in fado, namely performed by Amália Rodrigues: the *mordente*. We define the *mordente* as the quick alternation between a note and the diatonic note immediately above. Sometimes, in highly melismatic singing, a chain of *mordentes* is performed. The algorithm consists in dividing the duration of the note in four parts, knowing that the first quarter is the original note, the second quarter is assigned to the diatonic note above, and the third and fourth quarters are again the original note. This specific function is already implemented in Symbolic composer as "mord", but to be assigned to a specific note. It has been improved in a way to randomly assign it to a whole phrase. Since the rhythm of the melodies and the symbols of the melodies have been defined as paired lists with the same length, such task can be performed by randomly pick specific positions and applying the algorithm to those positions in both lists.

$$f : Mordenter = \exists\, d_n \in Rhythm_{Xn}\,, s_n \in Melody_{Xn} :$$
$$d_n \to \langle \frac{d_n}{4}, \frac{d_n}{4}, \frac{d_n}{2} \rangle, s_n \to \langle s_n, (s+1)_n, s_n \rangle$$

The abstraction coded, "mordenter", receives as an input a list of rhythms and a list of symbols and outputs a mixed list. Then the auxiliary functions "rhymord" and "melmord" allow the rhythm and symbols lists to be retrieved. Both lists are equal to the original ones, except they now have random *mordentes* assigned to them.

This example shows yet another way of bringing color to the performances in a flexible modular way.

```
;;Function "Mordenter": Randomly assigns mordentes to a rhythm+melody
(defun mordenter (rhythm melody)
  (prog (out)
  (dotimes (i (length rhythm))
     (setq a (random 10))
     (if (> 7 a)
      (append (push (nth i rhythm) out)
      (push (nth i melody) out))
      (append (push (reverse
              (nth 0 (mord (nth i rhythm) (nth i melody)))) out)
      (push (reverse (nth 1 (mord
              (nth i rhythm) (nth i melody)))) out))
       ))
  (return  (reverse (flatten out)))
  ))

;;returns the rhythm of mordenter
(defun rhymord (list)
(prog (out)
(dotimes (i (length list))
(if (numberp (nth i list))
            ( push (nth i list) out)))
(return (reverse out))))

;;returns the melody of mordenter
(defun melmord (list)
(prog (out)
(dotimes (i (length list))
(if (numberp (nth i list)) nil
            ( push (nth i list) out)))
(return (reverse out))))
```

15.6 Global Parameters

15.6.1 Dynamics

Dynamics in MIDI files are usually implemented as a combination of *velocities* and *volume* and they are associated with a given note (therefore a pitch and a duration). Since the durations and pitches have been implemented as lists of equal length, the velocities follow the same principle and therefore are implemented as such: $Velocity_{Xn} = \langle v_1, v_2, v_3, v_4, \dots \rangle$

The model of Toivanen et al. creates dynamic markings in the music based on a coefficient of arousal retrieved from the lyrical content. This coefficient is calculated according to the proportion of substituted words in a given line (Toivanen *et al.*, 2013, p. 90). We have decided that, although one does not have a text, one has the conventions from the practice associated with emotional prosody, from which it is possible to extrapolate the dynamics as a function of durations and symbols, following the reasoning presented in the KTH performance rules (Friberg *et al.*, 2000, 2006). Therefore, the velocities are defined as a function of the product of durations and symbols.

The conversion is not direct, since some mapping or scaling has to occur first. Symbols are expressed as alphabetic characters, therefore one has to guarantee that all symbols are prior mapped into an integer between 0 and 100. This operation is trivial and in *Symbolic Composer* can be done applying the predefined function "symbol-to-vector" and then specifying the desired range:

$$f : \forall\ s_n \in Melody_{Xn} \rightarrow N_{Melody_{Xn}} : N \in [1, 2, 3, \dots, 100]$$

Furthermore all durations have to be positive, so their absolute value is taken instead.

$$f : \forall\ d_n \in Rhythm_{Xn}, \exists\ v_n \in Velocity_{Xn} : v_n = |d_n| \times N_{Melody_{Xn}}$$

And finally, one can also constrain the range of results to realistic velocities by scaling the possible range to values between 64 and 100 instead of 0 to 127, for instance.

$$f : \forall\ v_n \in Velocity_{Xn} \rightarrow Vel_{Velocity_{Xn}} : Vel \in [64, 100]$$

This last step largely depends on taste and on the genre to be modeled and can be modified at will. In terms of *Symbolic Composer* the code looks as follows:

```
(setq velocity-section-A (vector-round 64 100
(mapcar '* (symbol-to-vector 0 100 symbol-section-A)
(mapcar 'abs rhythm-section-A))))
```

The formula basically obtains the absolute ratios of the list of durations of a certain section and multiplies them by the symbols, which were previously converted into a vector mapped within a range of 0 to 100 values. The outcome is then mapped to a vector within the range of 64 to 100. These values we decided for voice (all within the *mezzo-forte* range) can be, of course, modified at any time. Notice how the formula applied is exactly the inverse of the used in tempo. We consider that dynamics and tempo have an inverse relationship in this practice. The exact coefficients are yet to be determined with more study and experimentation and are not the scope of this work.

15.6.2 Tempo

Opposing all other parameters discussed so far, which are generally local parameters and have to be generated and assigned for each melodic line, in each possible instrument, tempo is a global parameter. This means that in each section it affects all instruments and lines being performed. The first and most obvious solution is to simply assign one simple value for tempo that affects the entire piece or section. This is what often happens in most quantized scores. A more realistic approach, also based on the KTH performance rules, however, is to have tempo dealt in a local way.

In the program, tempo is not fixed and its fluctuation is defined as a function of other factors, trying to emulate what happens in a real performance. According to the conventions of emotional prosodic styles, relying on text, and as a general rule of thumb, the higher the pitch is, the longer the duration, consequently the louder the velocity and the slower the tempo. Conversely, the shortest rhythms and the lower pitches are usually sung quieter and also slightly rushed. So, having this general idea, the tempo fluctuation was formalized as the inversion of the product of durations and pitches: $T_{max} - T_{min} \Leftarrow (Duration_{Xn} \times Pitch_{Xn})^{-1}$.

For the implementation of this idea a base tempo is set up in the initial settings. Since 72-84 bpm was referred as the tempo range acceptable by the standards of Ernesto Vieira's dictionary (Vieira, 1890, p. 55), we decided to remove one third of the top value to find a minimum tempo of 56 as a base. Using the same 12 bpm range, our minimum tempo will vary between 56 up to 68 bpm:$T_{min} = 62 \pm 6$. The maximum tempo is defined as four-thirds times this value (reverse-engineering the one-third fluctuation ratio):$T_{max} = 4/3 \times T_{min}$.

Having these references as a fluctuation threshold, then inside each section the tempo is mapped according to the inversion of symbols and durations. Each symbol is converted and mapped into an integer between 100 and 1. This can be done in *Symbolic Composer* using the "symbol-to-vector" function.

$$f : \forall\ Symbol_{Xn} \rightarrow N_{Symbol_{Xn}} : N \in [100, 99, 98, \ldots, 1]$$

Each duration is converted to an absolute ratio (to avoid negative values), and the product of these two values is then proportionally mapped into a value between our previously defined minimum and maximum tempos. This mapping can be coded in *Symbolic Composer* using the "vector-round" function.

$$f : \forall\ (|Duration_{Xn}| \times N_{Symbol_{Xn}}) \rightarrow T_{Xn} : T \in [T_{min}, \ldots, T_{max}]$$

The outcome is a list of tempo values, one for each note. Having such a detailed tempo, on the note level, and reflecting the direct effect of the other parameters, makes the performance fluid and organic.

15.6.3 Groove

Cumulatively with the tempo and velocities that are derived from the durations and symbols (and symbols in a certain way are already derived from the rhythms), we also consider that groove can be defined as a function of inverse of velocities, much similar to tempo.

The principle is similar to the one applied earlier – the list with the velocities is mapped onto values, in this case a range between -1 and 2, which are divided by an extremely high value, in this case 256, in order to obtain really small durations.

$$f : \forall\ v_n \in Velocity_{Xn} \rightarrow g_{Xn} : g \in \frac{[-1,2]}{256}$$

This resulting list of really small durations can in fact be considered a pattern of small *deviations*, to be applied within the section: $Groove_{Xn} = \langle g_1, g_2, g_3, \ldots \rangle$.

We have experimented with several values and, for instance, the use of divisions for 64 or 128 gave a sense of hiccup or uncanny valley to the performance. The coding can be done as:

```
(setq groove-section-A
(mapcar \#'(lambda (x) (/ x 256))
(vector-round -1 2 velocity-section-A )))
```

The formula on groove can be refined, as all others, given more time, since studies have been made, namely (Naveda *et al.*, 2011, Sioros *et al.*, 2012).

Chapter 16

Templates for rendering the MIDI files

In order to listen to and record the generated music, several options are available. The most recent version of *Symbolic Composer* has a system that integrates the software *MIDI Trail*, which allows following the score in almost real time with an interesting graphic user interface, and using internal soft synths. It has also a connection to *LilyPond*, so it generates a score for immediate visualization[1]. The score poses problems since the gestural parameters rendered by the humanizer originate many strange symbols due to lack of quantization and constant tempo changes that render the score unreadable. It must be noticed that a score is prepared to be read as a semiographic simple scheme, therefore, it is only suitable if the gestural parameters are not applied to it, which is only possible with a dumbed-down version of the generator (only the first four modules active).

Another option was to rewire the software to a sequencer and create a template with the number of MIDI tracks needed. We find extremely important the parameter timbre, crucial in defining the practice of fado, as shown in the first part of this dissertation. Unfortunately MIDI scores are very poor in dealing with this particular parameter. Therefore, taking advantage of recent sample libraries released, namely *Alfama*[2] by Adamastor Virtual Instruments, we have rewired both the melody and countermelody tracks to be played by a sampled *guitarra*, with the harmony and bass tracks to be played by a sampled viola. This sampled *guitarra*

[1] The latest version of the generator as well all the necessary auxiliary functions can be retrieved in `http://tiagovideira.com/2015/06/07/instrumental-fado/`.

[2] `http://adamastorvi.com/`, accessed April, 6, 2015

allows us to recreate the iconic timbre that most of the time is a valuable cue in identifying the practice. We have also pre-mixed and pre-mastered the tracks, setting up the equalizers, compressors, reverbs and the additional plug-ins we desired. We saved that file as a template. Now all we have to do is run *Symbolic Composer* and generate new MIDI files, and then switch to the template and drag the file into the sequencer. The tracks will fit into the right place and they are ready to go. We can listen to them immediately or bounce them as high-quality mp3s. If we are not happy with this MIDI file, we can obviously make changes, tweaks, or whatever we want. Or we can just select the tracks and delete them, switch to *Symbolic Composer* and evaluate the program again. It will generate a new MIDI file that replaces the previous one. So, we just have to drag it again into the same setup and we are ready to go again. We can virtually listen in almost real time or record several high-quality Mp3's in a flash as soon as we have built our templates.

Chapter 17

Conclusions

In this section we will detail the outcome of the model and why we think it is successful. We will highlight its strengths and limitations and how and why the generated outcome can be perceived as instrumental interactive music that is usually associated with fado practice. We will also detail the pedagogical framework of the project and how this research was an ever flowing path of self-discovery and personal growth. We will also emphasize all the relevant data and material that has been produced and it is now available for the general public to use in future work and research.

We consider we have accomplished our goals in the sense that we were able to deal with the problems posed by David Cope and at the same time respect the ideas of Brian Eno[1], two important precursors in this kind of systems. First, we have built a generator that, with the click of a button, even without further human interaction, generates a new piece from scratch. In this sense it works like an organic unique seed from which a whole plant grows. By having all abstractions indexed to the same seed, the outcomes are reproducible to anyone who desires to do so. The work is also interactive enough in the sense that a user that wishes to provide some constraints or make some decisions on their own is able to do so – the user can decide several of the parameters and by doing so we believe the process becomes interactive. The architecture of the program, being modular and highly flexible and customizable, acts as a case study for fado but can be easily adapted to other contexts. This workflow shows how the automatization of the composition process is very useful in case one just desires to produce a large

[1] `http://www.inmotionmagazine.com/eno1.html`, accessed June, 6, 2015

amount of instrumental songs in a short span of time. It obviously works better if they are all within the same style, maintaining the same instrumentation, in order to generate a thematic album. Still, the modular structure of the model allows for relatively easy modeling of other styles and ensembles by changing the relevant variables. Basically, we believe we have fulfilled our own expectations in the sense that we have not only built a proof of concept generator of music usually associated with fado practice, but also developed a set of skills and templates that allow us and any user that follows our steps and algorithms to develop their own generators for virtually any kind of music. We have built a template for style imitation, a virtual composer that is able to compose polkas, marches, rock music or even music in the style of Satie just by changing a few of the values, parameters and constraints of the generator.

We think the project falls short in terms of the melodic component mainly because of the lack of a real text. The more we worked the more we understood the importance of the semantic content and the patterns of stresses and lengths of the vowels in shaping the actual rhythms and pitches governing a melody. Moreover, when coding the gestural performance and paying attention to the KTH performance rules we also realized that these parameters were also constrained by the same factor. So, while we still acknowledge the hierarchical importance of this parameter, in the whole process, the lack of its ideal implementation, in fact, impacts the results. Therefore in order to refine this or similar projects, we cannot stress enough the importance of the text implementation to its full extent, building a database of a given linguistic community and both a lyrical generator and extensive rules on how the words shape the subsequent parameters in a more realistic way.

We have also developed a set of tools useful for humanizing the scores generated and explained ways and solutions to easily render and record them. This makes this set of tools a highly appreciated device for the music industry, namely for the composer who wishes to work for the music libraries industry, allowing the composition, production and recording of large sets of music in much reduced times.

The project successfully identified a series of traits in fado music that were never explored up to date. In this sense, we believe we have identified a series of correlations and useful ways with pedagogical value. One is now able to discern how to build a fado from scratch using pen and paper and understand how the text is a valuable seed and how most parameters, including tempo, dynamics and groove might have a relation to the text. The project also helps in understanding the importance of the social and sound features, in the sense that now there is a comparative point between the musical materials, the symbolic content and the practice in real life. And each one is now able to be confronted with both and decide which ones are relevant to their own sense and classification of the genre. For instance, if one listens to the outcome of the generator in a MIDI piano sound, does that make a difference from listening to the same output rendered using the *Alfama* virtual library? Or does it make a difference to listen to the same score played live by real musicians? Does a member of the fado community practice consider fado the scores and MIDI files we provided in our database?

By building a digital database of fado, we have also unearthed repertoire that was long forgotten. We have studied it, we have found ways to recreate it and, in a sense, we want to be involved with the community and give it back to the community so that this knowledge is integrated in the proper context, and the debate can go on with new sets of information. We will realize better what the values involved in all these issues are and what is really important to make the practice evolve. We are confident we have contributed in an original way for the creation of more tools to understand fado and help it to evolve.

We believe all this can be extrapolated to other musical practices, namely vocal practices relying on text. We believe our main original contribution to the field was basically to demonstrate that indeed it is *possible* to do so by identifying a series of simple steps and a series of algorithms. We demonstrated how one can *make music*, can *understand* music, can understand how *some humans compose* music, in the same way someone can deconstruct a culinary practice by writing a recipe book. In a certain way, this dissertation is a proposition for a holistic method that shows it is possible to derive, deduce and build musical recipes in order to generate new musical works that are actually aesthetically pleasing. It also shows that even when the composer does not want to fully automatize the whole process, they can do so by shortening just some aspects of it.

17.1 Evaluation

An important issue when considering the production of any system is the process of evaluation of the success or failure of that system. When thinking of an automatic music generator to mimic a practice, one might wonder how its efficiency can be measured. Considering that music produced in this manner, especially in academic context, aims to achieve a somewhat utopian status of scientific validation of the rules that govern a certain style, there has to be a way to test the outcome produced. The most suitable way, and since music is a human phenomenon, seems to be presenting it to human listeners. Cope (Cope, 2005, pp. 345-359), however, discusses the problems that arise when listeners know, a priori, that it is computer generated music, being influenced by this fact on their judgment. To avoid that, then, a kind of Turing test could be a suitable solution. The music produced could be presented to random listeners who should not be aware that the music they are hearing is automatically generated and take into account their feedback. If the listeners recognize what they are listening as genuine examples of tunes within the practice pretended, then one may be able to say that the system accomplished its goal.

We acknowledge the limitations of any aesthetic evaluation system, because each one has different values. And even within the same culture tastes differ greatly, and so we aspired to also have a more objective goal of evaluation than just to rely on human ears.

It occurred to us that a simple test could be devised to perform an automatic evaluation task using the same software used to retrieve musical information. One can simply generate a fair number of new fado recordings and then supply them to the trained classifier, just as we did when we tested the coherence of the corpus. If most of them are classified as fado and not as any of the 38 other taxonomies then we have a guarantee that the generator has produced music that is closer to the music of the corpus than to the other music from the database. Of course, this still does not tell us anything about its closeness to many other genres not present in the database, but it is a promising start. Using these procedures, one would be able to have a better evaluation of the system based on objective and reproducible standards. Regarding this specific hypothesis, only the first four modules of the generator should be used to generate scores, since in the trained corpus all exemplars are based on quantized short-form piano versions and not full fado instrumentals, with melodies and counter-melodies. These last versions (the ones generated with all five modules and rendered with *Alfama* libraries), we speculate, could only be evaluated correctly by human hears, since they aim to model the actual practice and not just the scores.

In order to test these hypotheses 200 fados recordings were generated, in the MIDI file format[2]. 100 were generated using only the four modules version, what we can call "Piano fados" resembling the ones in the database. But we have also generated 100 fados using all modules, what we can call ensemble fados "for viola and *guitarra*". In order to control bias, it was decided to look up the internet for recorded MIDI files based on piano reductions. We have found the site of Doug McKenzie[3], from which a random sample of 25 recordings were downloaded, all supposedly from "jazz related" genres.

We trained Cory McKay's database using 38 taxonomies with 25 recordings each, plus the 100 fado recordings from the corpus. Then, the 100 piano fado recordings, plus the 100 ensemble fado recordings and the 25 piano jazz recordings were supplied. We asked *Bodhidharma* to classify all these recordings. The results give a very positive evaluation of the generator. 99 of the 100 piano fado recordings were indeed classified as fado. 77 of the ensemble fado recordings were classified as fado, as well, while 16 were classified as "unknown". Three gave error and were impossible to classify at all. Only 2 of the jazz recordings from the control group were classified as fado, most of them being classified into jazz related genres (cool, bebop).

These results show that the output of the generator is closer to the corpus than to any other of the recordings available to sample the world musics. Moreover, they show that even the generated fados in the form of ensemble still retain more characteristics of fado than any other genres available in the other taxonomies. However, the relevant number of 16 "unknown" and 3 impossible to classify at all also show that refinement is possible. On the other hand, we are seeing this as a good thing, since we also intend for the system to innovate in some way. Hence, some fados not being recognized as such, and at the same time not being recognized as anything else, can be seen as a possible pathway for innovation. The control group results have also shown that there seems to be very little bias induced due to both the overrepresentation of fados in the training process and

[2]They can be retrieved in `http://tiagovideira.com/2015/06/07/instrumental-fado/`.
[3]`http://www.bushgrafts.com/jazz/midi.htm`, accessed 22 May 2015

the fact that they are all in the form of piano reductions. The fact that the vast majority of recordings classified as jazz piano solos, by an external source, were indeed classified as jazz related genres reinforces the idea that fado piano solos in particular and fado in general carry enough relevant harmonic, melodic and rhythmic characteristics, per se, to be possible to be identified as a genre.

Regarding the pleasantness of the output, the most suitable way, and since music is a human phenomenon, seems to be presenting it to human listeners. Cope (Cope, 2005, pp. 345-359), however, discusses the problems that arise when listeners know, a priori, that it is computer generated music, being influenced by this fact on their judgment. To avoid that, then, a kind of Turing test was a suitable solution. Five random samples were drawn from the 200 generated MIDI files (C1, C2, C3, C4 and C5). Another five random samples were drawn from the corpus (H1, H2, H3, H4 and H5). Excerpts with duration of roughly 30 seconds (corresponding to coherent sections, no cuts in between thematic material) were recorded using the same template to prevent bias from different sound quality or production issues. These excerpts were mixed randomly. We obtained a final track with 10 coherent excerpts, with the same sound quality, in which the only variable was the fact that five were generated by the program and five were composed by humans. The listeners were oblivious to this fact. An online quiz was created in which we asked the subjects to listen to the track, in its entirety, for them to have an idea of the overall sounding environment they were judging. Then, they were asked to attribute a note ranging from 0 to 10 to each excerpt, according to their personal, subjective, aesthetic criteria. There was also an open text box for users to leave their general commentaries, if they wished to. There was no further leading and no personal data was collected, apart from their relationship with music (listener, amateur or professional performers) and level of music education. Although we recognize the sample seems small, there was no other practical way to do this in a timely manner, since most people have no time or disposition to answer to long or complex enquires. 65 subjects answered the enquiry and their answers were then analyzed. We realized that most excerpts had all kinds of possible classifications, showing the enormous variety of opinions among different people, although some tendencies emerged. Overall, the distributions were rather normal and there were neither exceptionally unpleasant nor particularly pleasant excerpts, with global means ranging between 4 and 7.

A one-way ANOVA test revealed that there were differences among the classifications not explained by chance (figure 17.1). A Tukeys HSD (honest significant difference) test revealed that C1 was significantly better classified that the other four computer generated excerpts. It also revealed that H3, H4 and H5 were better classified than H1 and H2. C1 was better classified than the two lowest (H1, H2) and in pair with the other three human composed (H3, H4, H5) excerpts. However, the other four computer generated (C2, C3, C4, C5) excerpts were just comparable with the two lowest and significantly worse than the three highest human composed excerpts.

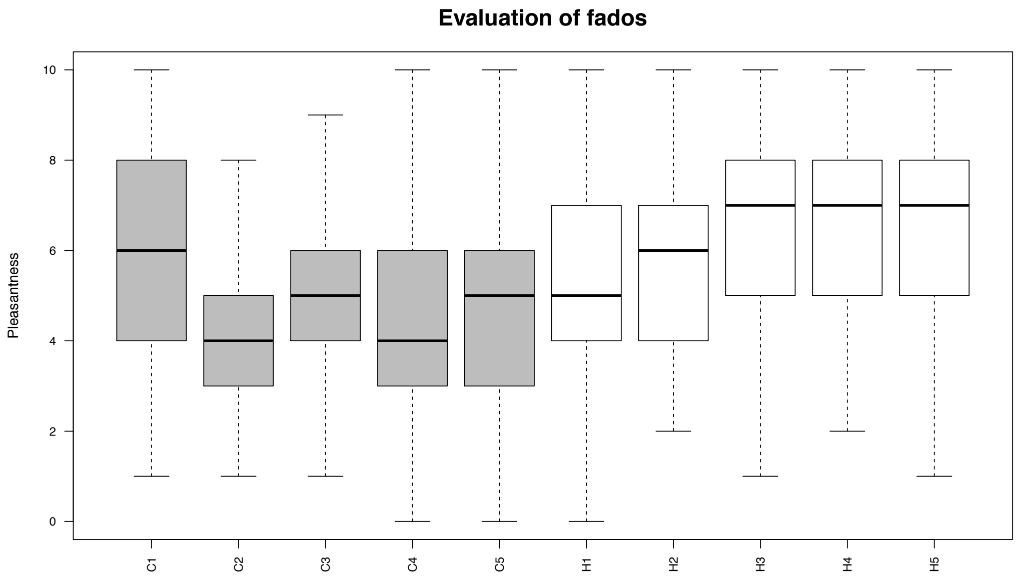

FIGURE 17.1: Model Evaluation with human subjects.

Overall (figure 17.2), the cluster of computer generated excerpts had a lower classification than the cluster of human composed excerpts in a significative difference of 1.06 points of pleasantness in the scale of 0 to 10.

These results indicate that the generator succeeded in creating output that has relatively relevant pleasantness (global mean of 5) and the ability of producing some high quality samples, once in a while, while avoiding garbage. However, it has also shown that there is room for improvement, since most of the time its results are perceived as slightly worse than human-composed music (global mean

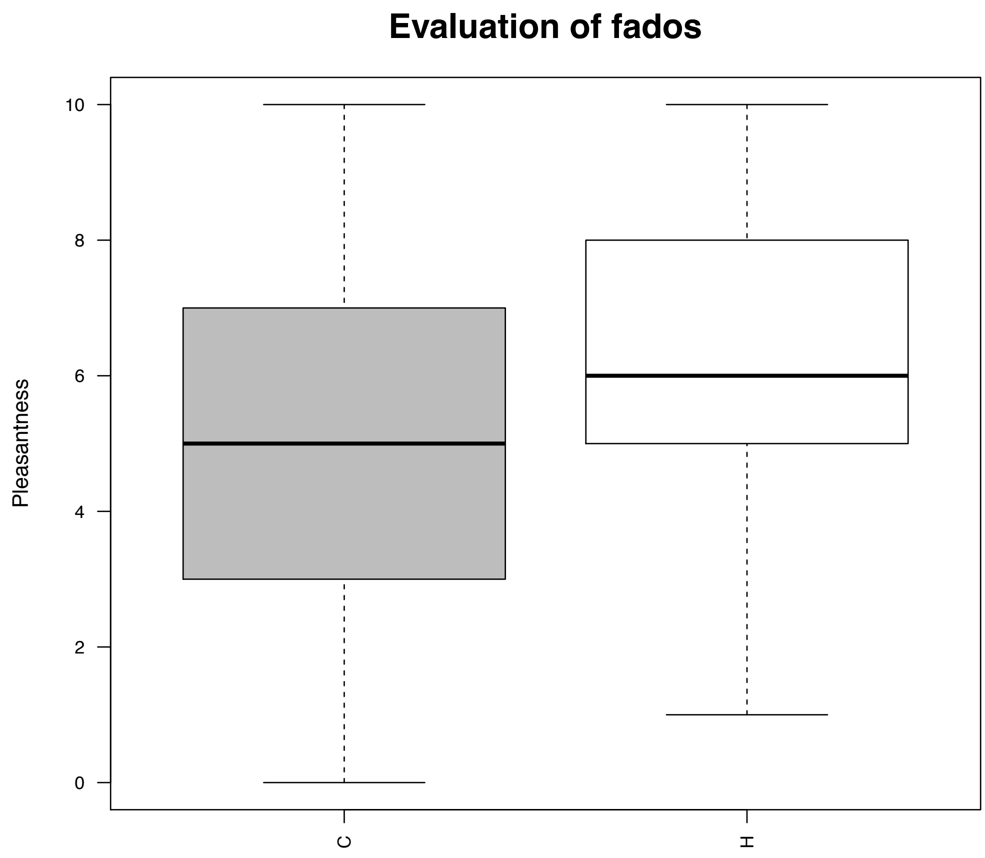

FIGURE 17.2: Overall Human versus Computer composed samples.

of 6). The difference of only 1,06 points of pleasantness, although significative, gives us hope, since it could be much worse.

We can also say, based on our knowledge of the samples, that the most out-of-the-box, innovative fados generated by the program polarized the subjects. While some of them applauded the results and preferred the difference and innovation, and thus gave better grades, others, greatly penalized these excerpts in favor of more traditional ones (both computer generated and human composed). Therefore, the subjective taste of the audience and the general level of music education of the subjects has and will always play a role in their preferences. An output that may be seen as garbage by many will actually be seen as pleasant for others.

Therefore, the fact that there was no negative consensus, and even the worst classified samples were also able to obtain a relevant number of high classifications, leads us to believe that the generator has good perspectives.

Chapter 18

Future Work

18.1 Regarding the model

We believe the database should be concluded. There are several more fados to be transcribed into digital versions, as well as a series of other pieces of Portuguese repertoire waiting to be unveiled. It could be of extreme patrimonial importance to recover and analyze all these pieces and maybe compare them contextually and find convergence points and rules. Automatic music classification and generation of this repertoire could also be a future project (namely *habaneras*s, *descantes*, *lundums*, work songs...). The critical editions of all these scores, also in physical format, is an open project that we think should be pursued. Having the database completed to its full extent would also allow for the refining of the weights and all the statistical work around them.

The integration of sound records and data in the form of actual sound could be an ambitious step to complement these. Having more accurate and complete data can never be a bad thing, in order to build better models. Also the statistical work could be deepened with more tests, different features, and more inferential instead of merely descriptive or comparative statistics. In order to pursue a real explicative theory much more data (especially the data in sound format) and work are necessary.

As already stated and stressed, the implementation of the lyrical module to its full extent should be mandatory in order to optimize this model. Such work would require the coordination with other researchers already working with the lyrics of fado, in order to have more empirical studies regarding their data. The work of Toivanen et al. is a good inspiration in order to accomplish this task (Toivanen *et al.*, 2013).

At this point we will briefly discuss the concept of "performer profile" as an idea that could, and certainly will, lead to another project too complex to detail here, but that will be open for future research connected to this one. The main idea behind the "performer profile" is that a score has a human dimension associated with the interpretation of the instructions it carries, much like the projects that lead to the KTH performance rules (Friberg *et al.*, 2000, 2006). In our project this was done by the means of the fifth module, which was inspired in the work of Friberg et al. and implemented in a sort of intuitive way. However, it would be much more interesting if these gestures, instead of being experimental, intuitive and vaguely based on our perception of what the records are, were based on real empirical data based on the typical behaviors of well-known *fadistas*. So, if one could engage in a performance practice study based on recordings of real performances made by, say, Amália Rodrigues or Alfredo Marceneiro, one could build up a profile of those performances. Then it would be possible to program the computer so that it would apply those profiles to the newly generated fados, leading to a much more curious and interesting rendition of them. That, however, is an idea that still requires some maturation, resources and a whole new set of methods to be carried out. About performance practice methodology, however, we can leave as a reference the chapter by Eric Clarke (Clarke & Cook, 2004).

18.2 Regarding Industry

A proof-of-concept modular generator that can recreate other styles was programmed. We have also demonstrated how a setup can be used to quickly generate content suitable to be used in the music library industry in general, or allow the individual composer to produce general abstractions, instead of individual compositions, thus reducing the overall time. We believe the next step would be to test the market and develop applications, namely generative standalone applications, such as the ones devised by Brian Eno, already on the market, but this time devoted to other markets. We believe the association of the generator with the sample engine *Alfama* and a friendly graphic user interface can easily be used in the market of background music in many Portuguese contexts where it makes sense: monuments, restaurants and public places. We also believe the code and architecture in itself is suitable to be replicated in open source software, like *Common Music*, to be taught in schools. We believe a new paradigm for the teaching of music composition and music applications is now open.

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Appendix A

Supplemental Material

Included in this dissertation is:

1. The References for all the 100 fados transcribed
2. The musical scores of the *Urtext* corpus
3. The musical scores of the Edition corpus
4. Statistics on the 100 fados

Further Supplemental Material can be retrieved on:

`http://tiagovideira.com/2015/06/07/instrumental-fado`

<table>
<tr><th>ID</th><th>Fonte</th><th>Data</th><th>Compositor</th><th>Designação</th><th>Comentário da Fonte</th><th>Comentário Pessoal</th><th>Comentário Filológico</th><th>Cp.</th><th>Andamento</th><th>Tom</th><th>Compassos</th><th>Forma</th><th>Progressão</th></tr>
<tr><td>1</td><td>Pimentel, A., A Triste Canção do Sul , Livraria Central de Gomes de Carvalho, Lisboa, 1904, p. 35</td><td>1840</td><td></td><td>Fado do Marinheiro</td><td>Parece ser dos primeiros que se vulgarizaram em Lisboa, segundo informa o velho guitarrista Ambrósio Fernandes Maia. Ele não tem ideia de outro qualquer fado mais antigo.</td><td></td><td></td><td>2/4</td><td></td><td>Ré menor</td><td>16 compassos</td><td>AA'BB'</td><td>|| (Dm) i || V7 || V7 || i ||
|| i || V7 || V7 || i ||
|| i || V7 || i-V7 || i ||</td></tr>
<tr><td>2</td><td>1. Pimentel, A., A Triste Canção do Sul , Livraria Central de Gomes de Carvalho, Lisboa, 1904, p. 862. Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, pp. 186-188</td><td>1845</td><td></td><td>Fado Corrido</td><td>O Cancioneiro de músicas Populares diz que este fado já era popularíssimo em 1870, e dá-lhe a letra de algumas quadras que andam na tradição oral. Mas o Corrido não é mais que o simples acompanhamento do canto. Sobre este tipo melódico têm sido bordadas muitas variantes por Alexandre Rey Colaço, Reynaldo Varella, Militão e outros, incluindo um compositor estrangeiro, Munier.
O Fado Corrido anda em todas as colecções.</td><td></td><td>Transcrição descritiva.</td><td>2/4</td><td>Andante</td><td>Fá menor – Fá maior</td><td>44 Compassos</td><td>I1I2 AA B CC' D O</td><td>|| (F) I || V7 || V7 || I ||
|| ii || V7 || I-V7 || I ||
|| I || V7 || V7 || I ||
|| I || V7 || V7 || I ||</td></tr>
<tr><td>3</td><td>1. Pimentel, A., A Triste Canção do Sul , Livraria Central de Gomes de Carvalho, Lisboa, 1904, p. 139
2. Neves, César das, Cancioneiro de Músicas Populares , vol.1, Typographia Occidental, Porto, 1893, p. 217</td><td>1845</td><td></td><td>Fado Choradinho</td><td>O Cancioneiro de musicas populares (fase. 18) traz este popularissimo Fado com a seguinte annotação:
«Recolhido em Lisboa, em 1850. Este é um dos fados propriamente ditos, e dos mais antigos, por onde se moldaram outros muitos que posteriomente appareceram.»

Não ha duvida que é, chronologicamente, dos primeiros. Mas o primeiro decerto não foi. (Vide Fado do marinheiro). Bem podia ele ter estabelecido o tipo deste género de canções a julgar pela sua grande espontaneidade de sentimento, singela e profunda. Todavia a designação de Fado choradinho parece indicar que já havia outros, e que este se distinguia por um tom ainda mais plangente, donde lhe viera o nome. Em verdade, dir-se-ia um rosário musical feito de gemidos e suspiros.

O Cancioneiro dá-lhe a lettra de algumas quadras populares, tais como esta:

Quem tiver filhas no mundo
Não fale das malfadadas:
Porque as filhas da desgraça
Também nasceram honradas.

É claro que se lhe pôde applicar qualquer outra letra.Este Fado está vulgarisadissimo.
Em Lisboa anda nas collecções das casas Sassetti, Engestrom, Lambertini, etc.

No Porto, Moreira de Sá escreveu sobre ele variações para piano, para rabeca, bandolim ou flauta com acompanhamento de piano ou de violão e guitarra.

Em Lisboa, Rey Colaço também glosou o Fado choradinho; dizia o jornal Novidades, de 31 de janeiro de 1903:

«Foi agora posto á venda mais um trabalho do illustre pianista Rey Colaço, uma das mais poderosas organisações artisticas do nosso paiz. É um fado (choradinho), e, como todas as producções inspiradas na melopeia que é o característico da nossa raça, esta de

Rey Colaço é cheia d'uma melancolia de poente do outono, terna e triste como uma despedida.

«O delicioso fado, que é dedicado ao sr. Raul Lino e estampa no frontispicio a reproducção da casa portugueza que aquelle architecto anda a construir para Rey Colaço, está á venda em todos os armazéns de musica.»</td><td></td><td>Transcrição descritiva.Na fonte não aparece a repetição de CCNa fonte apenas A aparece à oitava na repetiçãoNa fonte o 2º tempo do 4º compasso aparece com pausa no acompanhamento.</td><td>2/4</td><td>Andante</td><td>Ré Menor</td><td>32 Compassos</td><td>AABB CC CC (4+4+4+4 +4+4+4+4)</td><td>|| (Dm) i || V7 || V7 || i || (2x)
|| i || iv || V7 || i || (2x)
|| i || V7 || V7 || i || (4x)</td></tr>
<tr><td>4</td><td>1. Pimentel, A.,"A Triste Canção do Sul", Livraria Central de Gomes de Carvalho, Lisboa, 1904, p. 1582. Neves, Céssar das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, p. 127</td><td>1848</td><td>Sousa do Casacão</td><td>Fado da Severa</td><td></td><td>A letra do Fado refere "Hoje mesmo faz um ano que a Severa faleceu". Sendo a data da sua morte apontada como 1846, estimo que este fado não seja muito posterior.</td><td>Transcrição descritiva.</td><td>2/4</td><td>Allegretto</td><td>Lá menor</td><td>3 + 32 Compassos</td><td>Intro ABAB(3 + 8+8+8+8)</td><td>|| (Am) i || V7 || i ||
|| i || V7 || V7 || i ||
|| i || V7 || i-V7 || i || (2x)</td></tr>
</table>

5	1. Pimentel, A., A Triste Canção do Sul , Livraria Central de Gomes de Carvalho, Lisboa, 1904, p. 1832. Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, p. 128	1864	Sales Patuscão	Fado do Conde de Vimioso	O Fado do Vimioso foi publicado no fascículo 61 do Cancioneiro de musicas populares portuguesas. Acompanham-no algumas quadras, de origem manifestamente popular, porque são incorrectas e banais. O conde é ahi tratado pelo anagramma de Moisivo. A lettra é muito posterior á morte de D. Francisco de Paula, como se vè da seguinte quadra, penúltima do Fado: Aqui ponho agora ponto. Na lenda que finda está : Foram casos d'oulra era, SSo voltas que o mundo dá. O auctor da lettra explora a lenda (elle mesmo emprega esta palavra) da «paixão» do conde pela Severa, cujos encantos avulta com poética phantasia: Quem lhe vê a lace morena, Quem vê seus olhos tyrannos, Nada vê que mais captive Inda que viva mil annos. Quem uma vez lhe ouviu Sua voz enternecida, Ainda depois da morte Aos seus ais recobra a vida. Quem a vê dançar o fado Com rigor desconhecido, Ao vel-a batendo forte liça um doido pt-rdido. E, continuando a lenda, falia do conde como de um cego amante que tivesse morrido de amor: Assim Moisivo carpia No auge da desventura. E ao outro dia, já cadáver, Foi levado á sepultura. Chorae, fadistas, chorae, Ah! chorai a mais não ser, Que d'outro tão fino amante Não torna o fado a dizer O que é certo é que a lenda da Severa e do conde de Vimioso, tal como a musa popular a foi cantando ao sabor das multidões, estimulou a corrente que vulgarisou o Fado, especialmente no sul do paiz, e que lhe reforçou um caracter de vaga saudade, de tristeza plangente, em que parece pairar a longínqua memoria de uma supposta allucinação amorosa que um fidalgo bohemio experimentou por uma pobre moça fadista, de chinella de polimento ponteada a retroz vermelho. Todas as mulheres dos bairros iufamados, todas as criadas de servir, todas as camareras de botequim cantam de preferencia o Fado da Severa e o Fado do conde de Vimioso, dando-lhe uma intenção de aristocracia rehabilitadora pela esperança de que um novo conde, seguindo o exemplo de D. Francisco de Paula, venha enamorado, dedilhar a banza, em honra de uma segunda Severa plebea. «Ainda hoje, diz Pinheiro Chagas, (1) se ouve cantar a deshoras, com acompanhamento de guitarras, por vozes nem sempre da primeira frescura, uma melodia melancólica e plangente, que se denomina o fado do conde de Vimioso..» (1) Dicc. Pop., vocab. Vimioso.			2/4	Andantino	Lá menor	20 Compassos	Intro AABB' (4+4+4+4+4)	|| (C) I || V || V || (Am) i || || i || V7 || V7 || i || (4x)

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>6</td><td>1 .Pimentel, A., A Triste Canção do Sul , Livraria Central de Gomes de Carvalho, Lisboa, 1904, p. 226

2. Neves, César das, Cancioneiro de Músicas Populares , vol.1, Typographia Occidental, Porto, 1893, p. 280</td><td>1890</td><td>Augusto Hylario</td><td>Fado Serenata</td><td>Cancioneiro, fase. 23. Fado serenata. Traz a designação de: Musica de Augusto Hylario.

Foi este que ouvimos ao próprio auctor em Espinho, e o que, de todos que elle indubitavelmente compoz, se tornou mais popular.</td><td>Fado de Coimbra. Progressão harmónica mais complexa e divergente do tipo de Ernesto Vieira.</td><td>Transcrição descritiva.</td><td>2/4</td><td>Andante</td><td>Fá maior</td><td>3 + 32 compassos</td><td>Intro AABC AABC (3 + 4+4+4+4 +4+4+4+4)</td><td>|| (F) I || V7 || I ||
	I		V7		V7		I		(2x) 		(Fm) i		V7		ii		V7	
	ii-ii0		i		(F) V7		I	
	I		V7		V7		I		(2x) 		(Fm) i		V7		ii		V7	
	ii-ii0		i		(F) V7		I		</td></tr>
<tr><td>7</td><td>1. Pimentel, A., A Triste Canção do Sul , Livraria Central de Gomes de Carvalho, Lisboa, 1904, p. 2282. Neves, César das, Cancioneiro de Músicas Populares , vol.2, Empresa Editora, Porto, 1895, pp. 102-103</td><td>1895</td><td>Augusto Hylario</td><td>O último Fado</td><td>Classificado como Serenata em sub-título. Cancioneiro, fase. 34, «O Ultimo Fado», com a designação de Musica de Augusto Hylario e a seguinte nota: «Quando nas férias de 1895, Hylario se hospedou em uma dependência do escriptorio da nossa Empreza, offereceu-nos esta composição dizendo-nos que era o seu ultimo fado, mas que tencionava addicionar-lhe algumas variações, e que reservássemos a publicação para quando elle as tivesse composto definitivamente.»</td><td>Fado de Coimbra. Progressão harmónica mais complexa que o tipo de Ernesto Vieira.</td><td>Na fonte, é omisso o bemol no Ré ao 28º compasso, e no Mi ao 29º compasso.</td><td>2/4</td><td>Andante Expressivo</td><td>Ré menor - Fá Maior - Sib menor</td><td>2 + 32 compassos</td><td>Intro AA BB CC DD (2+ 4+4 +4+4 +4+4+4+4)</td><td>		(Dm) i-V7		i	
	i || iv || V7 || i || (2x) || (F) #iv07 || I || ii-V7 || I || (2x) || (Bbm) i || V7 || V7 || i || (2x) || i || vii07 || V7 || i || (2x)</td></tr>
<tr><td>8</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.1, Typographia Occidental, Porto, 1893, pp.30-31</td><td>1868</td><td>João Maria dos Anjos</td><td>Fado das Salas</td><td>A música do fado já não é hoje, como foi outr ora, considerada musica torpe e obscena, propria só das viellas e dos antros de vício, onde a maruja e soldadesca embriagada, tangiam brutalmente em banzas immundas, acompanhando-a com indecorosos versos e batiam com danças lascivas. Ha quarenta annos já se faziam fados especiaes, ou para narrar crimes ou algum escandalo amoroso, satyrizar homens celebres ou políticos importantes, ou para rebaixar homens altamente collocados, ou para ridicularizar corporações respeitaveis, ou para descompor qualquer sujeito. Eis um exemplo: o fallecido jornalista e poeta satyrico Urbano Loureiro, comparando um dia no jornal a Lucta os versos d um escriptor nosso contemporaneo, aos fados do Marcolino (um pobre musico ambulante, improvisador de fados), este sabendo da comparação, procurou o jornalista n um estabelecimento da rua de Santo Antonio, que elle costumava frequentar e deixou-lhe o seguinte recado: - «Diga a esse snr. Urbanes Loureiro que se me torna, na sua gazeta, a comparar a esse outro snr. poeta, eu faço-lhe um fado que o... arrazo.» Publicada na agua lustral da civilisação, a monotona musica dos fados, alegre ou sentimental, ingenua ou luxuriante, já não ofende os castos ouvidos do bello sexo, que a perfuma sob seus dedos sem se roborisar de pudor, porque essas simples melodias não maculam as candidas rosas da sua alma pura. É que a ideia do seu ponto de partida tem sido substituida pela assimilaçao do serio e pelo sentimento artístico que despreza a materialidade da sua primitiva aplicação e a propria poesia sensualista. O grande numero de fados, quasi todos variantes uns dos outros, que se improvisam todos os dias, não são mais que uma espécie de passa-calle, lento, de musica caracteristicamente portugueza: a muitos d elles nunca os seus auctores applicaram lettra.</td><td>O termo passa-calle aqui utilizado pelo autor para descrever o fado refere-se provavelmente à acepção de passacaglia no século XIX: isto é, uma harmonia no baixo e voz grave em ostinato que se repete indefinidamente durante a peça inteira, complementada com uma melodia na voz aguda, mais ou menos livre, em secções regulares de quatro, seis ou oito compassos.</td><td></td><td>2/4</td><td>Andante</td><td>Sol menor</td><td>32 + 2 compassos.</td><td>A A A B Coda(8+8+8+8+ 2)</td><td>		i		V7		V7		i	
	i		V7		i-V7		i		(3x) 		i		V7		V7		i	
	i		ii0		i-V7		i	
	i		i		</td></tr>
<tr><td>9</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.1, Typographia Occidental, Porto, 1893, pp.58-59</td><td>1860</td><td>José Maria dos Cavalinhos</td><td>Melodia Popular D Anadia</td><td>Esta musica é vulgarmente conhecida pelo nome de Fado de Anadia; é uma das musicas no estylo moderno do genero mais distincta e nao monotona. A poesia que lhe applicamos, por nao conhecermos lettra propria, é antiga mas merece aceitação, por ser conceituisissima.</td><td>Primeiro fado recolhido escrito em 2/2.Variante irregular de 12 compassos por repetição de uma célula de 4 compassos do tema A.É curioso o autor classificá-la como mais distinta e não monótona por comparação já que harmonicamente o fado apenas se sustém com 2 acordes sempre iguais, sem cambiantes rítmicas ou melódicas.</td><td></td><td>2/2</td><td>Andante</td><td>Fá menor</td><td>28 compassos</td><td>A A B(8+12+8)</td><td>		(Bb) i		V7		V7		i	
	i		V7		i-V7		i	
	i		V7		V7		i		(2x) 		i		V7		i-V7		i		(3x)</td></tr>
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<tr><td>10</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.1, Typographia Occidental, Porto, 1893, pp.152-153</td><td>1885</td><td></td><td>Hija del Gudalquivir</td><td>Recolhida em Alcobaça em 1885, por F. Pinto Nogueira.

Os fados novos teem actualmente a designação de Nocturnos.

Esta melodia tem a suavidade germanica. Parece que a musica teutonica inspirara o melodista, que não temos o gosto de saber quem é. Tambem não conhecemos o author da poesia que, sobre um antigo mote portuguez, glosou esse gracioso mixto das linguas hespanhola e portugueza, em doce união ibérica.

Esta melodia está muito divulgada em todo o paiz porém com innumeras variantes.</td><td>Não soa nada a fado.Atentar no desenho da figura harmónica: arpejo ascendente em vez de quebrado.</td><td>As ligaduras no primeiro, terceiro e sétimo compassos nos agudos são omissas na fonte. No entanto, tal não é consentâneo com o que se passa ao quinto compasso nem com a lógica da escrita melódia e optei por colocá-las.</td><td>4/4</td><td>Andante</td><td>Sib maior</td><td>28 compassos</td><td>AAB(8+8+12)</td><td>|| (Bb) I || ii || V7 || I || (4x)
|| I || V7 || V7 || I || (3x)</td></tr>
<tr><td>11</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.1, Typographia Occidental, Porto, 1893, pp.120-121</td><td>1852</td><td></td><td>O Atroador</td><td>Esta cantiga, assim como quasi todas as suas congeneres, da nova musa popular dos fados, não tem lettra propria. Applicam-lhe diversas poesias; nós dámos preferencia á presente, não só por estar mais em relação com o titulo e rythmo da musica, mas ainda por ser uma engraçada hyperbole, excellentemente glosada. É vagamente conhecida, apesar de ser antiga.</td><td>- Ocorrência de ritmo arpejado e ritmo marchado em simultâneo.

- Intermezzo desestruturante. Não se percebe o porquê do compasso extra.</td><td>Não se compreende a indicação FIM na fonte, um compasso antes do final, pelo que optei por omiti-la.</td><td>2/4</td><td>Andante</td><td>Ré Maior</td><td>30 compassos</td><td>AB Int AAA BB Coda
(4+4 + 1 + 4+4+4 + 4+4 + 1)</td><td>|| (D) I || V7 || V7 || I || (partes A)
|| I || ii || V7 || I || (partes B)</td></tr>
<tr><td>12</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.1, Typographia Occidental, Porto, 1893, pp.192-193</td><td>1890</td><td>Augusto Hylario</td><td>Às Estrellas</td><td>Recolhida em Coimbra em 1890, pelo Exmo. Snr. Dr. Manuel Maria de Castro Corte Real.

Primeiro Fado de Augusto Hylario.</td><td>Fado de Coimbra.Progressão harmónica complexa nas partes B e D, com uma Dominante secundária.</td><td>Ao 8º compasso a fonte tem sustenido ao invés de bequadro, o que é ilógico visto o sustenido já estar na armação de clave e na repetição do gesto, ao 12º compasso, se verificar um bequadro.</td><td>2/4</td><td>Andante</td><td>Sol Maior</td><td>32 Compassos</td><td>A B C D(8+8+8+8)</td><td>|| (G) I || V7 || V7 || I ||(2x)
|| V7/ii || ii || V7 || I || (2x)
|| I || V7 || V7 || I || (2x)
|| V7/ii || ii || V7 || I || (2x)</td></tr>
<tr><td>13</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.1, Typographia Occidental, Porto, 1893, p. 208</td><td>1887</td><td>Reynaldo Varella</td><td>Canção da Noite</td><td>Esta serenata é vulgarmente conhecida pela denominação de Fado das tres horas nome com que seu auctor primeiro a baptisara por ser àquella hora da noite que elle a improvisou. É a musica d este genero, de mais actualidade.</td><td>Soa mais às serenatas do Hylario. Fado de Coimbra?

Progressão harmónica complexa com inflexão a dominantes secundárias.</td><td>É omisso o sustenido no Fa, no compasso décimo.</td><td>2/4</td><td>Andante</td><td>Mib Maior</td><td>2 + 16 compassos</td><td>Intro A B
(2 + 8 + 8)</td><td>|| (Eb) I || V7-I ||
|| V7 || V7 || I || (2x)
|| V7/vi || vi || V7/V || V ||
|| V7 || I || V7 || I ||</td></tr>
<tr><td>14</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.1, Typographia Occidental, Porto, 1893, p. 254</td><td>1892</td><td></td><td>O Engeitado</td><td>Fado como subtítulo.

Recolhida em Vizella em 1892, por F. P. Nogueira</td><td>A transcrição parece-me duvidosa e com erros de estrutura (na forma de abordar a anacruza) e de harmonia (no 2º tempo do compasso 18).</td><td></td><td>2/4</td><td>Andante</td><td>Ré menor - Fá maior</td><td>5 + 16 + 2 compassos</td><td>Intro A B Coda
(5 + 8 + 8 + 2)</td><td>|| (Dm) i || i || V7 || V7 || i ||
|| i || V7 || V7 || i || (2x)
|| (F) I || V7 || V7 || I ||
|| I || vi-ii || I-V7 || I ||</td></tr>
<tr><td>15</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.1, Typographia Occidental, Porto, 1893, pp. 266-267</td><td>1870</td><td>João Maria dos Anjos</td><td>O Lisbonense</td><td>Recolhida em Lisboa em 1870.</td><td>Tom marcial. Centro tonal oscilante.</td><td>Na fonte, no penúltimo compasso, na mão esquerda no 2º acorde aparece uma semínima, que não cabe no compasso. Por coerência coloquei uma colcheia.</td><td>2/2</td><td>Andante</td><td>Lá Maior - Mi Maior</td><td>28 compassos</td><td>A A B A A B
B(4+4+4+4+4+4+4)</td><td>|| (E) IV || IV || IV || I ||
|| IV || IV || V || I ||
|| I || V || V || I || (2x)
|| I || V || I-V7 || I ||</td></tr>
<tr><td>16</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.1, Typographia Occidental, Porto, 1893, pp. 288-289</td><td>1894</td><td></td><td>Saudades da Aldeia (Descante)</td><td>Recolhida em Alijó por F. P. Nogueira, em 1894.

Este descante pode ser classificado na ordem dos fados modernos, tanto pelo seu estylo musical, como pela ideia poetica.</td><td>Opção de 4/4 ao dobro do andamento habitual. Poderia perfeitamente ter sido escrito como 2/4 em Andante.</td><td>Na fonte, na segunda metade do 4º compasso aparece uma pausa de semínima que não cabe no mesmo. Optei por omiti-la.</td><td>4/4</td><td>Allegro vivo</td><td>Ré Maior</td><td>4 + 16 compassos</td><td>Intro AA BB
(4 + 4+4 + 4+4)</td><td>|| (D) I || ii || V7 || I ||
|| I || V7 || V7 || I || (2x)
|| I || ii || V7 || I || (2x)</td></tr>
<tr><td>17</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.2, Empresa Editora, Porto, 1895, pp.20-21</td><td>1895</td><td>F. P. Nogueira</td><td>Fado Madrugada</td><td></td><td>Não se percebe muito bem a existência dos 2 compassos extra entre a introdução e o início do fado.</td><td></td><td>2/4</td><td>Andantino</td><td>Si Maior</td><td>12+2+32 compassos</td><td>Intro A A B B
(12+2+8+8+8+8)</td><td>|| (B) I || I || ii || ii || V7 || V7 || I ||
|| I || V7 || V7 || I || (2x)
|| I || ii || V7 || I || (2x)</td></tr>
<tr><td>18</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.2, Empresa Editora, Porto, 1895, pp.34-35</td><td>1852</td><td></td><td>Fado da Figueira da Foz</td><td></td><td></td><td>O compasso na fonte aparece 2/4 mas depois as figuras todas, bem como o andamento, estão adequados para um compasso de 4/4.Não se entende a semínima ao compasso 16, 1º tempo. A reparar pela lógica da melodia deveria ser colcheia e pausa de colcheia.</td><td>4/4</td><td>Moderato</td><td>Mi menor</td><td>2+24 compassos</td><td>Intro A B C
(2+8+8+8)</td><td>|| (Em) i || i ||
|| i || V7 || V7 || i || (2x)
|| i || i || V || i || (2x)
|| i || V || V || i || (2x)</td></tr>
<tr><td>19</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.2, Empresa Editora, Porto, 1895, p. 46</td><td>1875</td><td>Ambrósio Fernandes Maia</td><td>Fado de Coimbra</td><td></td><td>Primeiro fado no compasso 3/4, algo bizarro.</td><td></td><td>3/4</td><td>Andantino</td><td>Mib Maior</td><td>4 + 16 compassos</td><td>Intro AABB
(4+ 4+4+4+4)</td><td>|| (Eb) I || V7 || V7 || I || (5x)</td></tr>
<tr><td>20</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.2, Empresa Editora, Porto, 1895, p. 49</td><td>1895</td><td></td><td>A Cantadeira</td><td>Descante.</td><td>Classificado como Descante mas com todas as características do tipo definido por Ernesto Vieira e muito semelhante a outras ocorrências classificadas como Fado.</td><td></td><td>2/4</td><td>Gracioso</td><td>Ré Maior</td><td>12 compassos</td><td>ABB4+4+4</td><td>|| I || V7 || V7 || I || (3x)</td></tr>
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21	Neves, César das, Cancioneiro de Músicas Populares , vol.2, Empresa Editora, Porto, 1895, p. 84	1895		A Menina dos Olhos Negros				4/4	Moderato	Ré Maior	1+16 compassos	Intro AABB(1+ 4+4+4+4)	|| I || V7 || V7 || I || (2x) || IV || I || V7 || I || (2x)
22	Neves, César das, Cancioneiro de Músicas Populares , vol.2, Empresa Editora, Porto, 1895, p. 96	1870		Fado Campestre	Recolhida no Porto em 1870.		Na fonte ao 2º,4º,6º e 8º compassos, o primeiro tempo aparece com duas semi-colcheias ao invés de colcheias, o que não bate certo com o espaçamento utilizado nem com a coerência da frase musical, como se comprova depois pelo seguimento da obra.	2/4	Andante	Dó Maior	16 compassos	AABB(4+4+4+4)	|| I || V7 || V7 || I || (4x)
23	Neves, César das, Cancioneiro de Músicas Populares , vol.2, Empresa Editora, Porto, 1895, pp. 126-127	1850		A Nau Affonso			- O andamento é demasiado rápido. O midi foi gravado em Andante à semelhança dos outros fados do tipo definido por Ernesto Vieira.- Não se compreende a frase musical do penúltimo compasso ter Fa# e a sua imitação quatro compassos antes não ter.	2/4	Moderato	Lá menor	32 compassos	AABC(8+8+8+8)	|| i || V7 || V7 || i || (4x) || i || i || V7 || i || (2x) || i || V7 || V7 || i || (2x)
24	Neves, César das, Cancioneiro de Músicas Populares , vol.2, Empresa Editora, Porto, 1895, pp. 142-143	1850		Canção do Marítimo	Fado em subtítulo.		- Não se compreende o baixo em Fá ao terceiro compasso. Atendendo ao resto da canção deveria ser Ré. - Na fonte, no penúltimo compasso, no segundo tempo a colcheia de Ré aparece pontuada, o que não cabe no compasso. - Na fonte, no último compasso não aparece a pausa de semi-colheia antes da barra cheia.	2/4	Andantino	Sol menor	32 compassos	AAAB(8+8+8+8)	|| i || V7 || V7 || i || (8x)
25	Neves, César das, Cancioneiro de Músicas Populares , vol.2, Empresa Editora, Porto, 1895, p. 190	1894		O que é amor	Fado em subtítulo. Esta musica é antiga e commum a muitas poesias sentimentaes; com a presente lettra data de 1894, a qual é do apreciado escriptor e jornalista o Exmo Snr. Sousa Rocha.		- Na fonte, na introdução, apenas as notas de cima do baixo aparecem ligadas. - Na fonte, ao quarto compasso, na fonte, aparece uma semínima ao invés de uma colcheia. Não cabe no compasso. - Na fonte, na repetição da primeira frase do fado, ao décimo compasso, o bequadro de precaução aparece apenas ao segundo dó. - Na fonte, ao oitavo e ao décimo segundo compassos aparecem ligados os primeiros sis ao invés do segundo para o terceiro. - Na fonte, no último compasso falta o sinal de marcação que orienta a repetição.	2/4	Andante	Sol Maior	4 + 16 compassos	Intro AABB (4+ 4+4+4+4)	|| I || ii || V7 || I || || I || V7 || V7 || I || (2x) || I || ii || V7 || I || (2x)
26	Neves, César das, Cancioneiro de Músicas Populares , vol.2, Empresa Editora, Porto, 1895, p. 277	1849		Fado Amphiguri	Este amphiguri cantava-se em Lisboa ha cincoenta annos, aproximadamente, mas é mais antigo.	Variante das partes A e B do fado 003.		2/4	Andantino	Ré menor	8 compassos	AB(4+4)	|| i || V7 || V7 || i || (2x)
27	Neves, César das, Cancioneiro de Músicas Populares , vol.2, Empresa Editora, Porto, 1895, pp. 292-293	1870	Maggiolli	Fado Maggiolli	A musica deste fado foi recolhida em 1870. O nome provém-lhe do appellido do author, que era, segundo nos consta, um bohemio da fina roda de Lisboa.	Harmonia mais complexa, como a de Hylario ou Varella. Andamento Moderato, parece um pouco rápido.		2/4	Moderato	Sol Maior - Mi menor	2 + 32 compassos	Intro AA BB (2 + 8+8+8+8)	|| (G) I || || I || V7 || V7 || i || || i || V7 || V7-#iv07 || (Em) V7 || || i || iv || V7 || i-V7 || || i || vii07 || V7 || i-V7 || i ||
28	Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, p. 26	1875		Serenata à Morena	Esta musica que recolhemos na Praia da Granja em 1875, quando era simplesmente executada em guitarras (instrumento predominante naquella epocha), por um grupo de academicos acaba de reapparecer mas agora cantada com a bellissima poesia do Exmo. Snr. Conde de Monssarraz.	Andamento de Moderato, parece um pouco rápido.		2/4	Moderato	Sol Maior	1+16 compassos	Intro ABCD (1+ 4+4+4+4)	|| I || || I || V7 || V7 || I || || V7/ii || ii || V7 || I || || I || V7 || V7 || I || || I || V7 || I-ii-V7 || I ||

<table>
<tr><td>29</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, pp. 43-45</td><td>1870</td><td></td><td>Fado Nacional</td><td>Este fado foi recolhido em 1870 n uma edição da casa Sassetti & C.ª, de Lisboa, porém sem lettra, que a não tem propria, addiccionando-lhe os cantadores, trovas populares.</td><td>Fado em 2/4 mas com duração das figuras rítmicas dobradas em relação ao que tem aparecido. O Andamento andante , pois, não faz sentido, entendendo-se aqui como algo na ordem das 108-120 bpm.

A estrutura aparece algo confusa, parecendo um rondó com um tema recorrente, mas depois há secções coxas e outras com compassos a mais, dando números não-múltiplos de 4 como espectável. A ligação entre secções parece ser o principal problema do transcritor.</td><td>Na penúltima repetição do tema recorrente (13º compasso a contar do fim), ao primeiro compasso do mesmo, a fonte tem o acorde errado (Gm), conforme se atesta por todas as outras ocorrências do tema, onde este compasso aparece com D7. No segundo compasso dessa mesma repetição a primeira nota da fonte também aparece trocada - lá ao invés de sol.</td><td>2/4</td><td>Andante</td><td>Sol menor</td><td>16+8+41+17 compassos</td><td>ABCD A B C C C C C D A B C D EDED</td><td>|| i || V7 || vii0-V7/bIII || bIII ||
	V7		i-V7		i	
	i		V7		V7		i	
	i || i-V7 || V7 || V7-i || i || (2x) || i || i-V7 || V7-i || V7-i	
	i		i-V7		V7		V7-i	
	i || i-V7 || V7 || i-V7 || i	
	i		V7		V7		i		(2x)</td></tr>
<tr><td>30</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, p. 54</td><td>1898</td><td>Henrique Carneiro</td><td>Fado do Sofrimento</td><td>Este fado que tende a popularisar-se vem publicado no Missal d um crente , poema lyrico de Mariano Gracías.</td><td>Progressão harmónica mais acelerada, Síncopas no acompanhamento, mais expressividade. A suspensão perto da cadência final. Resquícios de contra-canto no acompanhamento.</td><td></td><td>2/4</td><td>Andante</td><td>Ré menor</td><td>24 compassos</td><td>ABC(8+8+8)</td><td>		V7		i		V7		i	
	V7		i		ii07-V7		i	
	i		ii07		V7		i	
	i		ii07		i-V7		i	
	V7		i		iv-V7/V		V7	
	i-V7/iv || iv-ii07 || i || V7 || i ||</td></tr>
<tr><td>31</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, p. 63</td><td>1870</td><td>Ambrósio Fernandes da Maia</td><td>Fado de Cascaes</td><td></td><td></td><td>Ao 3º e 7º compassos a fonte apresenta pausa de semicolcheia que não cabe no compasso.</td><td>2/4</td><td>Andante</td><td>Ré Maior</td><td>2 + 20 compassos</td><td>Intro AA BBB (2+ 4+4 +4+4+4)</td><td>		I		I	
	I		V7		V7		I		(5x)</td></tr>
<tr><td>32</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, p. 66</td><td>1871</td><td></td><td>Fado dos Estudantes</td><td>Este fado é dos estudantes açorianos; foi recolhido em 1871.</td><td></td><td></td><td>2/4</td><td>Andantino</td><td>Sol Maior</td><td>16 compassos</td><td>ABAB(4+4+4+4)</td><td>		I		V7		V7		I	
	I		ii		V7		I		(2x)</td></tr>
<tr><td>33</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, pp. 76-77</td><td>1879</td><td>Robles</td><td>Fado Robles</td><td>Recolhido no Porto em 1895. A designação de Robles provém-lhe do nome do author da musica.</td><td></td><td>Ao 13</td><td>2/4</td><td>Andante</td><td>Dó Maior - Dó menor</td><td>5 + 32 compassos</td><td>Intro AA BB (5 + 8+8 +8+8)</td><td>|| (C) I || iv || I || V || I	
	I || V7 || V7 || I || (2x) || (Cm) iv || i || V || i || (2x)</td></tr>
<tr><td>34</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, pp. 88</td><td>1898</td><td></td><td>Ora Toma Mariquinhas</td><td></td><td></td><td></td><td>2/4</td><td>Allegretto</td><td>Sib maior</td><td>16 compassos</td><td>AABB(4+4+4+4)</td><td>|| (Bb) I || V7 || V7 || I || (2x) || I-V7/ii || ii || V7 || I || (2x)</td></tr>
<tr><td>35</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, pp. 106-107</td><td>1872</td><td>Eduardo Pereira Baptista Leça</td><td>Fado do Leça</td><td>A musica d este fado é antiga e não tem lettra propria: a que lhe addicionamos é do Ex.mo Snr. J. Nunes Ponte.</td><td></td><td>Depois da introdução, ao quarto compasso do fado propriamente dito, a fonte não tem os sustenidos no ré, no acompanhamento. O que não é coerente com a harmonia, nem com a repetição do mesmo tema, quatro compassos à frente, onde eles aparecem.</td><td>2/4</td><td>Moderato</td><td>Mi menor</td><td>8 + 24 compassos</td><td>Intro AABCCC (8+ 4+4+4+4+4+4)</td><td>		i		iv-vii07		iv		V7	
	i-V7/iv		iv		V7		i	
	i		iv		iv		V7	
	i		iv-vii07		iv		V7	
	i-V7/iv		iv		V7		i	
	V7		i		V7		i		(3x)</td></tr>
<tr><td>36</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, p. 114</td><td>1898</td><td></td><td>Ao Hylario</td><td>Recolhido pelo Ex.mo Snr. Eduardo da Fonseca. Este fado acha-se vulgarisado por todo o paiz com diversa lettra.</td><td></td><td></td><td>2/4</td><td>Allegretto</td><td>Dó menor</td><td>16 compassos</td><td>AABB(4+4+4+4)</td><td>|| i || iv || V7 || i || (2x) || iv || i || V7 || i || (2x)</td></tr>
<tr><td>37</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, p. 141</td><td>1872</td><td></td><td>Fado Carmona</td><td>Recolhida em Lisboa em 1874.</td><td>Fado com ritmo de Tango.Possível parelha com o 039.</td><td></td><td>2/4</td><td>Andante</td><td>Lá menor</td><td>16 compassos</td><td>ABCC(4+4+4+4)</td><td>		i		V7		V7		i		(4x)</td></tr>
<tr><td>38</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, p. 153</td><td>1898</td><td></td><td>Fado Visconti</td><td>Este fado apparecey no Porto na presente decada, trazido por um palhaço portuguez, d uma companhia equestre, por appelido Visconti.</td><td></td><td></td><td>2/4</td><td>Allegretto</td><td>Sol Maior - Ré Maior</td><td>16 Compassos</td><td>AABB(4+4+4+4)</td><td>|| (G) I || V7 || V7 || I || (2x) || (D) I-V7/ii || V7 || V7 || I || (2x)</td></tr>
<tr><td>39</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, p. 155</td><td>1898</td><td></td><td>Fado do Gato</td><td>Vulgo do Taborda, em subtítulo.</td><td>Fado com ritmo de Tango.Possível parelha com o 037.</td><td></td><td>2/4</td><td>Andante</td><td>Lá menor</td><td>12 compassos</td><td>ABB(4+4+4)</td><td>		i		V7		V7		i		(4x)</td></tr>
<tr><td>40</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, p. 197</td><td>1898</td><td></td><td>Canção das Morenas</td><td>Este fado foi recolhido em Avanca pelo Ex.mo Snr. Dr. M. M. de Castro Corte Real.</td><td></td><td></td><td>2/4</td><td>Andante</td><td>Mib Maior - Sib Maior</td><td>4 + 16 Compassos</td><td>Intr AABB (4 + 4+4+4+4)</td><td>		(Eb) I		ii		V7		I	
	I || V7 || V7 || I || (2x) || (Bb) V7 || I || V7 || I || (2x)</td></tr>
</table>

<table>
<tr><td>41</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, p. 208</td><td>1898</td><td>Augusto Hylario</td><td>Fado Posthumo do Hylario</td><td>Este fado foi recolhido em Sinfães pelo Ex.mo Snr. Dr. M. M. Castro Côrte Real, que nol-o enviou com a seguinte nota: «Fado do Hylario (ultimo). O fado que vem no Cancioneiro com a designação de ultimo é anterior a este. Este é que é geralmente conhecido pelo ultimo; sempre assim o ouvi designar oas estudantes coevos do grande bohemio.» A lettra é do Ex.mo Snr. Luiz Osorio. A primeira estrophe que vae na musica canta-se tambem no fim.</td><td></td><td></td><td>2/4</td><td>Andante</td><td>Fá maior</td><td>12 compassos</td><td>ABA(4+4+4)</td><td>|| (F) I || V7 || V7 || I (2x)
|| V7/vi || vi || 6G || V/vi ||
|| I || V7 || V7 || I ||</td></tr>
<tr><td>42</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, p. 212</td><td>1850</td><td></td><td>O Marinheiro</td><td></td><td></td><td></td><td>2/4</td><td>Andante</td><td>Dó Maior</td><td>20 compassos</td><td>ABA B
B(4+4+4+4+4)</td><td>|| I || V7 || V7 || I || (partes A)
|| V7/ii || ii || V7 || I || (partes B)</td></tr>
<tr><td>43</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, p. 223</td><td>1896</td><td>Leandro</td><td>Fado Leandro</td><td>Recolhido em Sinfães em 1896, pelo Ex.mo Snr. Dr. M. M. Castro Corte Real. O author chama-se Leandro, musico ambulante que acompanha um cego.</td><td></td><td></td><td>2/4</td><td>Andante</td><td>Dó maior</td><td>4 + 16 compassos</td><td>Intro AABB
(4+ 4+4+4+4)</td><td>|| I || ii || V7 || I ||
|| I || V7 || V7 || I || (2x)
|| I || ii || V7 || I || (2x)</td></tr>
<tr><td>44</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, p. 234</td><td>1866</td><td></td><td>Fado de Tancos</td><td>Este fado data da installação do campo de manobras em Tancos.</td><td>Segundo pesquisa, o Campo de Manobras de Tancos foi instalado em 1866.</td><td></td><td>2/4</td><td>Andante</td><td>Láb Maior - Mib Maior</td><td>1 + 16 Compassos</td><td>Intro AABB
(1 + 4+4+4+4)</td><td>|| (Eb) IV ||
|| IV || IV || IV || I || (2x)
|| V7 || V7 || I-V7 || I ||(2x)</td></tr>
<tr><td>45</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, p. 246</td><td>1850</td><td></td><td>Canto do Suicida</td><td>A musica d este fado foi recolhida em 1874 e não tinha lettra propria; a presente poesia foi-lhe posteriormente applicada.</td><td></td><td>Ao 14º compasso a fonte tem pausa de colcheia que não cabe no compasso.</td><td>2/4</td><td>Andante</td><td>Láb maior - Fá menor</td><td>8 + 16 compassos</td><td>Intro AABB
(8+ 4+4+4+4)</td><td>|| I || V || vi || V7/vi ||
	ii		I		V7		I	
	I		V7		V7		I	
	I		V7		(Fm) V7		i	
	iv		i		V7		i		(2x)</td></tr>
<tr><td>46</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, p. 256</td><td>1880</td><td>Francisco Alvarenga</td><td>Fado do Zé Povinho</td><td>A lettra que ouvimos cantar com este fado pertence a um poemasinho Auto da Lavradora de Ayré publicado em 1678; vem nas Poesias de Antonio de Villaboas e Sampaio, impressas em Coimbra em 1841.</td><td></td><td></td><td>2/4</td><td>Andante</td><td>Sol maior</td><td>16 compassos</td><td>AABB(4+4+4+4)</td><td>|| I || V7 || V7 || I || (2x) || V7/ii || ii || V7 || I || (2x)</td></tr>
<tr><td>47</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, p. 260</td><td>1898</td><td></td><td>Fado do Celta</td><td>Esta canção deve ser cantada a duo por uma senhora e um homem (fazendo de mãe e filho como indica a poesia)</td><td></td><td>Na fonte, ao quinto compasso, no segundo lá do segundo tempo aparece um ponto de aumentação que não cabe no compasso.</td><td>2/4</td><td>Andante</td><td>Dó maior - Lá menor</td><td>12 compassos</td><td>ABB(4+4+4)</td><td>|| (C) I || V7 || V7 || I || (2x) || (Am) i || V7 || V7 || i || (2x)</td></tr>
<tr><td>48</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, pp. 268-269</td><td>1858</td><td></td><td>Fado Lazarista</td><td>À amabilidade do Ex.mo Snr. L. Sollari e Allegro, distincto paleographo da Camara Municipal do Porto, devemos o presente fado Lazarista que foi publicado em Lisboa no Asmodeu de Setembro de 1858. Este fado conservou uma excessiva popularidade durante uma dezena d annos e para isso concorreram os factos que lhe deram origem. Em 1856 foram introduzidas em Portugal as Irmãs da Caridade vindas de França, para o serviço dos hospitaes e das escholas. Esta novidade no nosso paiz excitou em muitas senhoras de todas as classes sociaes, ou por sugestão ou por capricho, o desejo de se filiarem n aquella instituição. Isto provocou uma corrente de opinião opposta que se levantou por todo o paiz. A imprensa liberal e os comicios, combatendo com as armas desdo o mais serio ao mais ridiculo, fizeram com que um dia as Irmãs da Caridade abandonassem precepitadamente os hospitaes e os azylos. Foi devido a este sucesso que o grande tribuno José Estevão Coelho de Magalhães instituiu em Lisboa o primeiro asylo de S. João; achando na rua as creanças que as irmãs da caridade haviam abandonado, foi com ellas mendigar donativos, para crear aquelle asylo. Este fado resume as manifestações populares d aquella epocha.</td><td>Graus harmónicos complexos, como a Sexta Alemã ou a substituição Tritónica.</td><td></td><td>2/4</td><td>Allegro</td><td>Sol menor</td><td>6 + 32 compassos</td><td>Intro ABCB (6+ 8+8+8+8)</td><td>		(Bb) V7		I		ii-6G	
	(Gm) V7		V7		V7	
	i		i		i		V7	
	V7		i		i-V7		i	
	bII7-V7 || i || bII7-V7 || i || (2x) || (Bb) V7 || I || ii-6G	
	(Gm) V7		i		bII7		i-V7		i	
	bII7-V7		i		bII7-V7		6G/III	
	V7		bVI		i		</td></tr>
<tr><td>49</td><td>Neves, César das, Cancioneiro de Músicas Populares , vol.3, Empresa Editora, Porto, 1898, p. 273</td><td>1898</td><td>João de Deus</td><td>Fado João de Deus</td><td>O author da musica inspirando-se na poesia do grande lyrico, baptisou-a com o seu nome. Lettra d este fado João de Deus.</td><td></td><td></td><td>2/4</td><td>Andante</td><td>Sol menor</td><td>12 compassos</td><td>Intro AB (4+4+4)</td><td>		i		ii		i-V7		i	
	i || V7 || V7 || i || (2x) || V/iv || iv || i-V7 || i || (2x)</td></tr>
<tr><td>50</td><td>MNTPRT008 - A. Moraes Lda. Editores</td><td>1918</td><td>H. Rubiales</td><td>Fadinho da Nita</td><td>Os grandes sucessos do Salão Foz Creação da notável e gentil Cancionista Nita Ibañez Letra de Pedro Bandeira</td><td></td><td></td><td>4/4</td><td>Moderato</td><td>Lá menor/Lá maior</td><td>9 + 16 + 1 + 8 Compassos</td><td>Intro ABAC interm. DE (4+4+1 +4+4+4+4 +1 +4+4)</td><td>|| (Am) i-V7/iv || iv || V7 || i || (2x) || i || ii0 || V7 || i	
	V7/iv		iv		V7		i	
	i		V7		V7		i	
	V7/iv		iv		V7		i		i	
	(A) I		V7		V7		I	
	V7/ii		ii-ii07		V7		I		</td></tr>
<tr><td>51</td><td>MNTPRT014 - Sassetti Editores</td><td>1927</td><td>António Menano</td><td>O meu menino</td><td></td><td>Segundo Octávio Sérgio, o original é de Alexandre Augusto de Rezende Mendes de 1915, sob a égide o meu menino d oiro . Menano ter-se-á apropriado da música com outra letra em 1927.</td><td></td><td>4/4</td><td>S/indica</td><td>Láb Maior</td><td>3 + 16 + 9 + 16 compassos</td><td>Intro AABC Intermezzo AABC (3 + 4+4+4+4 +1+4+4 +4+4+4+4)</td><td>		I		V7		I	
	I		V7		V7		I		(10x)</td></tr>
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<table>
<tr><td>52</td><td>MNTPRT016 - Sassetti Editores</td><td>1927</td><td>António Menano</td><td>Phases da Lua</td><td></td><td>Octávio Sérgio sugere a data de 1927 para este fado, dizendo que é de autor desconhecido, apesar de gravado por António Menano.</td><td></td><td>2/4</td><td>Muito Vagamente</td><td>Fá maior</td><td>5 + 16 + 4 compassos</td><td>Intro AABC Coda
(5 + 4+4+4+4 + 4)</td><td>|| I || V7 || I || V7 || I ||
|| I || V7 || V7 || I || (2x)
|| V7/ii || ii || V7/iii || iii ||
|| ii-#iv07 || I-bvi0 || V7 || I ||
|| V7 || I || V7 || I ||</td></tr>
<tr><td>53</td><td>MNTPRT027 - Canções Populares Portuguesas , nº18, Tip. A. Pinto de Campos</td><td>1940</td><td>Armando Machado</td><td>Fado Araceli</td><td>Letra de: João de Freitas</td><td></td><td>Na partitura original falta uma pausa de colcheia ao 6º, 10º e 14º compassos e há uma pausa de colcheia a mais no penúltimo compasso.</td><td>4/4</td><td>S/indica</td><td>Dó Maior</td><td>2 + 16 compassos</td><td>Intro ABAB
(2 + 4+4+4+4)</td><td>|| ii || V7 || I || I ||
	I		I-#i07		V7		V7	
	ii		V7		I		I	
	vi		V		V7		V7	
	V7		V7		I		I		(2x)</td></tr>
<tr><td>54</td><td>MNTPRT034 - Sassetti Editores</td><td>1927</td><td>Alexandre de Resende</td><td>Fado da Mentira</td><td></td><td>Oct</td><td></td><td>4/4</td><td>Moderato</td><td>Sol Maior</td><td>9 + 16 + 4 compassos</td><td>Intro AABB Coda (9 + 4+4+4+4 + 4)</td><td>		I		I		V7		V7		I	
	I		V7		V7		I	
	I || V7 || V7 || I || (2x) || V7/vi || vi || V7 || I || (2x) || I || V7 || V7 || I ||</td></tr>
<tr><td>55</td><td>MNTPRT038 - Irmãos Vitale Editores, São Paulo , Brasil</td><td>1953</td><td>Artur Ribeiro</td><td>Maria da Graça</td><td></td><td></td><td>A partitura da fonte era para acordeão, só se escrevendo a tónica do acorde e a cifra, assim sendo eu completei os acordes com as notas em falta.</td><td>2/4</td><td>S/indica</td><td>Ré menor</td><td>4 + 32 compassos</td><td>A BB B C AA DA(4+ 4+4+4+4+ 4+4+4+4)</td><td>		i		V7		i-V7		i	
	i		i		i		iv	
	V7		V7		V7		i	
	i		i		V7/iv		iv	
	iv		iv		V7		V7-i	
	i		V7		i-V7		i-V7	
	iv		iv		V7/III		III-V7/iv	
	iv		V7		iv		V7	
	i		V7		i-V7		i		</td></tr>
<tr><td>56</td><td>MNTPRT040 - Valentim de Carvalho Editor</td><td>1920</td><td>Alves Coelho</td><td>Fado de Portugal</td><td>Versos de Acácio de Paiva</td><td></td><td></td><td>4/4</td><td>S/indica</td><td>Lá Maior/Lá menor</td><td>4 + 16 + 12 + 4 compassos</td><td>Intro ABAC DD Intro (4 + 4+4+4+4 +6+6 +4)</td><td>		I		V7		V7		I	
	i-V7		i		ii0		i	
	V7 || i || V7 || V7 || (2x) || I || I || V7 || V7 || V7 || I ||</td></tr>
<tr><td>57</td><td>MNTPRT063 - Sassetti Editores</td><td>1925</td><td>César Magliano</td><td>Fado das Quatro Estações</td><td>Letra de Salema Vaz.Repertório da notável cantora Manuela Pinto Basto.</td><td></td><td>Uniformizaram-se as articulações: amiúde faltavam staccatos ou arpeggios em repetições onde se previa que estivessem.</td><td>4/4</td><td>Allegretto</td><td>Lá Maior/Lá menor</td><td>8 + 32 compassos</td><td>Intro ABAC DED F (8 + 4+4+4+4 +4+4+4+4)</td><td>|| I || V7 || V7 || I || (2x) || (Am) i || i || iv || i	
	V7		i		VI-iv-6G		V7	
	i		i		iv		i	
	V7/III		III		V7		I	
	(A) I		I		I		V7	
	V7		V7		V7		I	
	I		I		V7/ii		ii	
	ii-iv		I		V7		I		</td></tr>
<tr><td>58</td><td>MNTPRT069 - Sassetti Editores</td><td>1960</td><td>Fernando de Carvalho</td><td>O Fado foi a Paris</td><td>Versos de Amadeu do Vale</td><td>Uso de acordes estendidos nada usuais, bem como linha melódica bastante cromática. Não o enquadro nos fados castiços, claramente já uma inovação.</td><td>Falta um bemol ao mi do segundo compasso na fonte.</td><td>2/2</td><td>Fox Medium</td><td>Fá maior – Fá menor</td><td>2 + 32 compassos</td><td>Intro ABAC DEDF (2 + 4+4+4+4 +4+4+4+4)</td><td>		V9/V		V7		i	
	i || V7 || V7 || i || (3x) || V7/iv || iv || V7 || I	
	(F)I-V9/V		V7		V7-#ii07		I	
	I-i		V7		ii		I	
	I-V9/V		V7		V7-#ii07		I	
	ii07		I-V9/V		V7		i		</td></tr>
<tr><td>59</td><td>MNTPRT071 - Lith. Universal, E. do Carmo, 17</td><td>1900</td><td>Guido Fábio</td><td>Não chores, que também vais</td><td></td><td></td><td></td><td>2/4</td><td>Moderato</td><td>Ré menor- Ré Maior</td><td>1+8+16+8 compassos</td><td>Intro AB CD Intro (1+ 4+4 +4+4 +4+4 +4+4)</td><td>		(Dm) i		V7		i		V7		i	
	V7		i		V7		i	
	i		V7		V7		i	
	i-bVII		iv		V7		i-I	
	(D) I		I		I		V7	
	V7		V7		V7		I	
	(Dm) V7		i		V7		i		(2x)</td></tr>
<tr><td>60</td><td>MNTPRT092 - Sassetti Editores</td><td>1946</td><td>José de Oliveira Cosme</td><td>Dedicação</td><td>Criação de Lídia Nunes nas emissões do Rádio Club Português</td><td></td><td></td><td>2/2</td><td>S/Indica</td><td>Ré menor/Ré Maior</td><td>8 + 32 compassos</td><td>Intro AA BC DD EF (4+4 +4+4+4+4+4+4+4+ 4)</td><td>		i		i		V7		V7	
	V7		V7		i		i	
	i		i		(F) ii		ii	
	V7		V7		I		I	
	(Dm) i		i		iv		iv	
	i		V7		i		i	
	(D) I		#iv07		V7		V7	
	V7		V7		I		I	
	(Dm) i		i		V7		V7	
	V7		V7		i		i		</td></tr>
<tr><td>61</td><td>MNTPRT112 - Edições Sassetti</td><td>1947</td><td>João Nobre</td><td>Canção Portuguesa</td><td>Fado Slow. Um grande êxito de Maria Clara ao microfone da Emissora Nacional.</td><td>Estranha aparição de um acorde aumentado ao sétimo compasso.</td><td></td><td>2/2</td><td>s/indica</td><td>Dó Maior</td><td>4 + 24 compassos</td><td>Intro ABAC DE (4 +4+4+4+4 +4+4)</td><td>		V7/ii		ii-vii07		I-V7		I	
	I || V7 || V7 || I || (2x) || I || V7 || V7 || V7/(V/V)	
	V7/V		I-#i07		V7/V-V7		I	
	I-V7/ii		ii		V7		V7-I	
	V7/ii		ii-vii07		I-V7		I		</td></tr>
<tr><td>62</td><td>MNTPRT116 - Edições Sassetti</td><td>1920</td><td>Luiz de La Cruz Quesada</td><td>Despedida</td><td>Versos de José Coelho da Cunha</td><td>Bizarra secção central com dísticos encaixados em sete compassos.</td><td>Ao 19º compasso a última nota da fonte aparece como semínima ao invés decolcheia. Foram acrescentados dois piano na dinâmica por motivos de audível rendição do ficheiro midi.</td><td>4/4</td><td>Lento</td><td>Ré menor/Ré maior</td><td>8 + 16 + 3 + 14 + 7 + 4 compassos</td><td>Intro ABCD Intermezzo EF G Outro (4+4 +4+4+4+4 + 3+ 7+7 +7 +4)</td><td>		(Dm) i		i-iv		iv-V7		V7-i	
	V7/III		i		V7		i	
	i-V7/III		V7		V7		i	
	V7/III		III		iv-V7		V7	
	iv-V7		i		V7/III		III	
	V7		i		V7		i	
	i		V7		V7		I	
	(D) V7		V7		I		V7	
	V7		I		V7		V7		I	
	I		V7		V7		i	
	(Dm) i		V7		V7		V7	
	V7		V7		i-iv		iv-V7		i-V7		i		</td></tr>
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<table>
<tr><td>63</td><td>MNTPRT121 - Casa Moreira de Sá Editora, Porto</td><td>1914</td><td>Nicolino Milano</td><td>Lu Lu Fado</td><td>Versos de Guedes d Oliveira</td><td>Datação pouco segura, proveniente de uma listagem num cache de um sítio da internet.</td><td>Figuração errada ao 43º compasso da fonte. Depreende-se que seja uma síncopa e não três colcheias.</td><td>2/4</td><td>Moderato</td><td>Dó Maior</td><td>5 + 15 + 16 + 16 + 5 compassos</td><td>Intro AA BCBC DEDF Coda
(5 + 6+9 +4+4+4+4 +4+4+4+4 +5)</td><td>|| I || I || V7 || V7 || I ||
	(Cm) i		6F		V7		i		iv-V7		i	
	(Eb) V7		V7		I		(Cm) vii0-6F		V7-i	
	V7-i		V7		V7		(C) I	
	V7		I		I		I	
	V7/V		V7		I		V7		I	
	I-V7/(V/V)		V7/V		V7		I	
	I		V7		V7		I		(3x) 		V7/(V/V)		V7/V		I-V7		I	
	I		I		V7		V7		I		</td></tr>
<tr><td>64</td><td>MNTPRT130 - Sassetti Editores</td><td>1937</td><td>Raúl Portela</td><td>Lisboa Antiga</td><td>Fado Marcha. Letra de José Galhardo e Amadeu do Vale.</td><td>Estranha divisão das frases melódicas em números de compassos ímpares.</td><td>Foi decidido por questão de coerência transformar o primeiro compasso que estava escrito completo na fonte, em anacruze. Ao 22º compasso da fonte aparecem semi-colheias de tercina quando são colcheias. Ao 10º compasso a fonte apresenta o sustenido no lá ao invés de dó, no acorde de la7. Ao 29º compasso o sustenido do dó é omisso na mão esquerda, no mesmo acorde de la7.</td><td>2/4</td><td>s/indica</td><td>Ré menor/Ré maior</td><td>8 + 22 + 29 compassos</td><td>Intro ABC DEFG (8 + 8+8+6 + 8+7+7+7)</td><td>		(D) #iv07		V		ii-#iv0		V7	
	V7		I		I		I	
	(Dm) i		V7		V7		V7	
	V7		iv-V7		i		i-V7		i	
	i		bVII		bVII		bVI	
	bVI		V7		V7		V7	
	i		iv		iv		i		V7		I	
	(D) V7/ii		ii		ii		V7	
	V7		I		I		I	
	#iv07		V7		V7		V7	
	V7		I		I		IV		ii		ii		V7		I	
	I		I		#iv07		V7	
	ii-#iv07		V7		V7		I		I		</td></tr>
<tr><td>65</td><td>MNTPRT131 - Livraria Neves Editora, Coimbra</td><td>1916</td><td>Raul de Campos</td><td>Serenata ao Luar</td><td>Letra de Americo S. d Oliveira</td><td></td><td></td><td>4/4</td><td>Allegro Animato</td><td>Mi Maior/Mi menor</td><td>16 + 32 Compassos</td><td>Intro ABCD EFE G (16 +4+4+4+4 +4+4+4+4)</td><td>		(E) I		V7		V7		I		(3x) 		V7/ii		ii		V7		I	
	(Em) i-V7		i		iv		iv	
	V7		V7		V7		V7	
	i-#ii0-iv		iv		V7		i	
	iv		i		V7		i	
	(E) I		I		i		V7	
	V7		V7		V7		I	
	I		V7/ii		V7/ii		ii	
	iv		I		V7		I		</td></tr>
<tr><td>66</td><td>MNTPRT135 - A. Moraes, Lda. Editores</td><td>1940</td><td>Raúl Ferrão</td><td>Fado da Malva</td><td></td><td></td><td>Ao compasso 23, na fonte, falta o sustenido no fá, no acorde da mão esquerda.</td><td>4/4</td><td>s/Indicação</td><td>Si Bemol/Sol Maior</td><td>5 + 24 + 4 compassos</td><td>Intro AABB CC Intermezzo (5 + 4+4+4+4 +4+4 +4)</td><td>		(Bb) I		I		V7		V7		I	
	I || V7 || V7 || I || (2x) || V7/ii || ii || V7 || I || (2x) || (Gm) i || V7 || V7 || i	
	iv		i		V7		i		V7		V7		i		</td></tr>
<tr><td>67</td><td>MNTPRT138 - Tipografia da Empresa Diário de Notícias, Lisboa</td><td>1927</td><td>Ruy Coelho</td><td>Fado Miss Portugal</td><td>Versos de Rocha Júnior</td><td></td><td>Na fonte faltam os pontos de aumentação na mão direita aos compassos 10 e 19.</td><td>4/4</td><td>Muito devagar</td><td>Sol Maior</td><td>1+12+10+1+12 compassos</td><td>Intro AABCD inter AAB (1+ 4+4+4 +6+4 +1+4+4+4)</td><td>		(G) I		I		V7		V7				I	
	I		V7		V7		I	
	vi		V7		V7		I	
	V7/vi		vi		V7		I	
	V7		I	
	(Em) V7/iv		iv		V7		i		</td></tr>
<tr><td>68</td><td>MNTPRT144 – Raul Venancio, Editor de Música, Lisboa</td><td>1925</td><td>Vasco Rocha</td><td>Fado Ballada</td><td></td><td></td><td></td><td>2/4</td><td>S/indicação</td><td>Mi Maior</td><td>5 + 16 + 8 + 8 + 4 compassos</td><td>Intro AA' B A Coda</td><td>		(E) I		I-V7		I		I-V7		I	
	I-V7		I		IV-V7		I	
	V7		V7		V7		I	
	I-V7		I		IV-V7/vi		i/vi	
	ii-#iv07		I		I-V7		I	
	(C) I		V7		V7		I	
	V7-I		iii-I		V7/III	
	(E) I-V7		I		IV-V7/vi		i/vi	
	ii-#iv07		I		I-V7		I	
	IV-V7		I		IV-V7		I		</td></tr>
<tr><td>69</td><td>MNTPRT165 – Cruz e Sousa, Ponta Delgada</td><td>1934</td><td>Cruz e Sousa</td><td>Terras de Portugal</td><td>Ao célebre cantor ligeiro Guilherme Kjölner Fado Marcha.</td><td></td><td></td><td>2/4</td><td>Tempo de Marcha</td><td>Fá Maior</td><td>16 +32 + 32 compassos</td><td>Intro ABAC DEDF</td><td>		(F) V7		V7		I		I		(4x) 		(Fm) i		i		V7		V7	
	V7		V7		i		i	
	IV/V		ii0/V		V7		IV	
	IV/V		V7		i	
	i		V7		V7		V7		V7		i	
	i		vii07/IV		V7/IV		I/IV	
	I/IV		i		V7		I		I	
	(F) I		I		V7		V7-I	
	IV		V7		V7		I	
	#ii07		V7		V7		V7		V7		</td></tr>
<tr><td>70</td><td>MNTPRT166 – Sassetti & Cª. Editores</td><td>1925</td><td>Filipe Duarte</td><td>Mulher de Portugal</td><td>A Aldina de Souza, distincta actriz cantora Fado Canção Letra de D. José Paulo da Câmara.</td><td></td><td>Não se compreende a função harmónica ao compasso 14, dentro do contexto. Talvez um Mi menor em lugar de um Sol.</td><td>4/4</td><td>Lento</td><td>Ré Maior</td><td>4 + 16 + 8 + 8 compassos</td><td>Intro AA'BB' CC' Coda</td><td>		(D) I		V7		I		V7	
	I		I		I		V7	
	V7		V7		ii7-V7		I	
	(Em) V7/V		i7		V7		i (D) ii	
	I		V7		I		(D)I	
	I		V7/ii		ii		IV	
	I		ii-V7		I		bVI	
	I		bVI		I		I		I		I		I		</td></tr>
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<tr><td>71</td><td>MNTPRT167 – Edições Sassetti Lisboa</td><td>1936</td><td>Marques Dias (arr.)</td><td>Torre de Santa Cruz</td><td>Do repertório da orquestra Almeida CruzArranjo de Marques Dias</td><td></td><td></td><td>2/4</td><td>S/indicação</td><td>Ré Maior/Mi Maior</td><td>32 + 32 compassos</td><td>ABAB CDCD ABAB CDCD</td><td>|| (D) I || I || ii || ii ||
	V7		V7		I		I		(2x) 		(Bm) i		i		V7		V7	
	iv		iv		V7		V7	
	i		i		V7		V7	
	iv		V7		I (E) i07-V7	
	(E) I		I-V/ii		ii		ii	
	V7		V7		I		I	
	I		I-V/ii		ii		ii	
	V7		V7		I		V7/vi	
	(C#m) i		i		V7		V7	
	V7		V7		i		i		(2x)</td></tr>
<tr><td>72</td><td>MNTPRT168 - A. Moraes Lda. Editores</td><td>1918</td><td>L. Serra e Moura</td><td>Amor Eterno</td><td>Do repertório do barítono Alberto Reis Dedicado à Exma. Sra. Dna. Elvira Adelaide Duarte Versos de L. P. Luz</td><td></td><td></td><td>4/4</td><td>S/indicação</td><td>Sol menor/Sol Maior</td><td>4 + 16 + 16 + 4 compassos</td><td>Intro AABB' CCDD' Coda</td><td>		(Gm) i		ii0		V7		i	
	i		iv		V7		i	
	i		iv		V7		i	
	ii0		i		V7		i	
	ii0		i		V7		I	
	(G) I		V7		V7		I	
	I-i		V7		V7		I	
	I		V7		V7		I-V7/IV	
	IV		V7		I	
	(Gm) i		ii0		V7		i		</td></tr>
<tr><td>73</td><td>MNTPRT182 – Manuscrito original, Alter do Chã</td><td>1909</td><td>Thomaz António Camoezas (arr.)</td><td>Fado da Severa</td><td>Extraído da revista “Ó da Guarda”</td><td></td><td></td><td>2/4</td><td>Tempo de Fado</td><td>Lá menor</td><td>8 + 16 + 8 compassos</td><td>AB A'CDD' AB</td><td>(Am) i || V7 || V7 || i || i-V7/ii || ii || i-V7 || i (A) I || V7 || V7 || I || I || V7 || (F#m) V7 || i || iv || i || V7 || i || iv || i || V7 || i (Am) i || V7 || V7 || i || i-V7/ii || ii || i-V7 || i</td></tr>
<tr><td>74</td><td>MNTPRT183 – Manuscrito original, Belém do Pará, Brazil</td><td>1916</td><td>Raffaello Segre (arr.)</td><td>Fado do Ganga</td><td></td><td>A fonte é uma partitura manuscrita com arranjo orquestral e respectivas partes. O original deste fado foi interpretado por Estêvão Amarante na revista "O Novo Mundo" (1916), sendo um original de Ernesto Rodrigues, Felix Bermudes e João Bastos.</td><td></td><td>4/4</td><td>S/indicação</td><td>Lá menor</td><td>4 + 8 + 4 + 24 compassos</td><td>Intro AB intermezzo CCDEED</td><td>		(Am) i		V7		V7		i	
	i		V7		V7		i	
	i		V7		V7		i	
	(A) I		V7		V7		I	
	I		V7		V7		I	
	I		V7		V7		I	
	I		V7		V7		I	
	ii		I		V7		I	
	ii		I		V7		I	
	I		V7		V7		I		</td></tr>
<tr><td>75</td><td>MNTPRT191 – Custódio Cardoso Pereira e C.ª</td><td>1920</td><td>João F. Victoria</td><td>Fado dos Cabelos Lindos</td><td>Versos do livro “Rimas” de Emílio Ernesto.</td><td></td><td>Na fonte o acorde do V7 aparece muitas vezes com a fundamental omitida.</td><td>4/4</td><td>Allegretto</td><td>Lá Maior</td><td>8 + 16 + 12 compassos</td><td>Intro AABB CC'D</td><td>(A) I || V7 || V7 || I || I || IV || I-V7 || II || V7 || V7 || I || I || V7 || V7 || I || I || IV || I-V7 || I || I || IV || I-V7 || I(Fm) V7 || i || V7 || i (E) V7 || I || V7 || I(A)V7 || I || V7 || I</td></tr>
<tr><td>76</td><td>MNTPRT192 – Proprietaria-Editora Musica e Theatros, Typ. A Publicidade</td><td>1915</td><td>Manuel Benjamin</td><td>Fado dos Adeantamentos</td><td>Homenagem ao jornal “O Mundo”. Versos de Pedro Bandeira. Ultima cantiga popular (com um novo rytmo).</td><td>O novo ritmo refere-se certamente a este arranjo em ternário, completamente incomum nos fados. Especulamos que o ritmo originário seria um binário convencional, com divisão ternária.</td><td></td><td>3/4</td><td>Lento</td><td>Dó Maior</td><td>1 + 16 compassos</td><td>Intro AABC</td><td>		(C) I		I		V7		V7		I	
	I		V7		V7		I		(2x)</td></tr>
<tr><td>77</td><td>MNTPRT193 – J. Heliodoro d'Oliveira</td><td>1910</td><td>Luiz Pinto</td><td>Meu Lindo Amor</td><td>Distinto artista dramático e societário do Teatro Nacional “Almeida Garrett”.</td><td></td><td>A primeira secção do fado tem uma transcrição errónea porque apresenta nove compassos em vez de oito. Tal acontece devido ao terceiro verso ser estendido sobre uma nota longa e uma ornamentação do piano (cp. 10-11): em vez de o autor ter escrito uma suspensão e uma cadenza instrumental preferiu uma transcrição literal e logo, isso traduz-se num enxerto de um compasso extra que pouco sentido faz na estrutura. A evidência interna mostra-nos também a incongruência, já que na respectiva segunda secção maior, no penúltimo verso (cp. 27), a sílaba longa é prolongada “correctamente” com uma suspensão e sem adenda de compasso extra.</td><td>4/4</td><td>Andante</td><td>Sol menor</td><td>4 + 9 + 16 +4 compassos</td><td>Intro AA' BCBC Coda</td><td>		(Gm) i		V7		V7		i	
	i		iv		V7		i	
	i		iv		iv		V7		i	
	(G) I		V7		V7		I	
	I		V7		V7		I	
	I		V7		V7		I	
	I		IV		I-V7		I	
	(Gm) i		V7		V7		i		</td></tr>
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<tr><td>78</td><td>MNTPRT194 – Sassetti & Cª. Editores</td><td>1934</td><td>Duarte Machado</td><td>Fado Maria Albertina</td><td>Creação da actriz cantora Maria Albertina
Letra de Luiz da Silva Gouveia</td><td>Percurso harmónico pouco convencional e com a progressão a metade da velocidade.</td><td></td><td>2/4</td><td>S/indicação</td><td>Sol Maior</td><td>8 + 16 + 16 compassos</td><td>Intro ABA'B'
A''B''CD</td><td>|| (G) ii07/i || I || I || ii ||
	V7		I		I		I	
	I		I		I		V7	
	I		V7		V7		V7	
	ii		V7		V7		V7	
	V7		I		I		I	
	I-(Am) VII7		V7		V7		V7	
	V7		i		i		i	
	(G)ii07/i		I		I-(A)V7		I	
	(G)V7		I		I		I		</td></tr>
<tr><td>79</td><td>MNTPRT195 – Valentim de Carvalho</td><td>1924</td><td>Manuel de Figueiredo</td><td>Toada Singela</td><td>Último fado de Manuel de Figueiredo. Creação de Aldina Sousa.</td><td>Fado com secções bem delineadas, em que os contracantos da guitarra estão escritos, o que não é habitual.Também estão escritas secções intermédias, puramente instrumentais.</td><td>O primeiro compasso é na realidade uma anacruza com três tempos.</td><td>4/4</td><td>S/indicação</td><td>Lá menor/Lá Maior</td><td>8 + 16 + 8 + 16 + 4 + 8 + 8 compassos</td><td>Intro ABAB Intermezzo CDCD Intermezzo EE' Coda</td><td>		(Am) i-V7-i		V7		V7		VI	
	VI-iv-6F		i		V7		I	
	(A) I		V7		V7		I	
	I		V7		V7		I	
	I		V7		V7		vi	
	V7/V		iv/V-6F/V		V7		I	
	I		V7		V7		i	
	(Am) i		V7		V7		i	
	i		V7		V7		i	
	i || iv || V7 || i || (2x) || i-V7-i || V7 || V7 || i	
	i		V7		V7		i	
	i		V7		V7		i	
	i-V7-i		V7		V7		VI	
	VI-iv-6F		i		V7		i		</td></tr>
<tr><td>80</td><td>MNTPRT196 – Custódio Cardoso Pereira & Cª.</td><td>1920</td><td>João F. Victoria</td><td>Fado dos Aviadores</td><td>Música e versos de João Victoria</td><td></td><td></td><td>4/4</td><td>Vagaroso</td><td>Ré menor/Ré Maior</td><td>8 + 16 compassos</td><td>Intro AA BB</td><td>		(Dm) i		V7		V7		i	
	i		iv		i-V7		i	
	(D) I		IV		V7		I	
	I		IV		V7		I	
	IV		I		V7		I	
	IV		I		V7		I		</td></tr>
<tr><td>81</td><td>MNTPRT204 – Edições Sassetti</td><td>1942</td><td>Frederico de Freitas</td><td>O pâteo das Cantigas – Primeiro Fado</td><td>Versos de António Lopes RibeiroCuriosa ambiguidade entre o modo maior e menor na secção B e D em que a própria tonalidade notada não parece ser coerente.</td><td>Curiosa ambiguidade entre o modo maior e menor na secção B e D em que a própria tonalidade notada não parece ser coerente.</td><td></td><td>4/4</td><td>Vagaroso</td><td>Ré menor</td><td>4 + 16 + 4 + 4 compassos</td><td>Intro AABB C D</td><td>		(Dm) iv		i		V7		i	
	i		V7		V7		i	
	i		V7		V7		i	
	I		iv		V7		i	
	I		iv		i-V7		I	
	(D) I		V7		V7		I	
	(Dm) iv		i		V7		i		</td></tr>
<tr><td>82</td><td>MNTPRT206 – Edições Sassetti e Cª.</td><td>1933</td><td>Frederico de Freitas</td><td>Fado da Espera de Toiros</td><td>Versos do Dr Júlio DantasCriação de Dina TeresaDo Fonofilme “A Severa”</td><td></td><td>A “Coda” é na realidade a repetição reforçada do último verso sobre o tema “B”.</td><td>4/4</td><td>S/indicação</td><td>Sol Maior</td><td>2 + 36 compassos</td><td>Intro ABAB CD ABB</td><td>		(G) I		I	
	I		V7		V7		I	
	I || V7 || V7 || I || (2x) || (Em) i || V7 || V7 || i	
	iv		V7		V7		i-(G) V7	
	I		V7		V7		I	
	I		V7		V7		I	
	I		V7		V7		I		</td></tr>
<tr><td>83</td><td>MNTPRT207 – Edição de Eduardo Roza</td><td>1905</td><td>Reynaldo Varella</td><td>Fado da Rosa</td><td>Versos de Reynaldo Varella À distinta actriz cantora Maria Vitória</td><td></td><td>Na fonte, ao compasso dois, a mão direita apresenta uma semínima em vez de uma colcheia. Na fonte, ao compasso treze, a mão direita apresenta um fá a mais no baixo, que não faz sentido, em conjugação com o mi bemol.</td><td>2/4</td><td>Allegretto Moderato</td><td>Fá menor</td><td>2 + 16 compassos</td><td>Intro AA' BC</td><td>		(Fm) i		V7	
	i		V7		V7		i	
	i		V7		V7		i	
	(Ab) V7		I		(Fm) V7		i	
	iv		i		V7		i		</td></tr>
<tr><td>84</td><td>MNTPRT208 – Cruz e Sousa, Ponta Delgada</td><td>1950</td><td>Cruz e Sousa</td><td>Saudades sem fim</td><td>Letra de José PatrícioDedicada pelos autores a Amália Rodrigues</td><td>A fonte ao compasso dezassete apresenta fá no baixo. Dado o contexto harmónico de quarto grau, por decisão pessoal e de coerência decidi substituir por sol, sendo a nota que faz mais sentido.Constante alternância entre o modo maior e menor. A fonte apresenta uma detalhe rico em termos de transcrição de ornamentos vocais e dos contracantos, bem como da linha do baixo, sendo claramente escrita com quatro vozes em mente e não na típica estrutura de melodia e acompanhamento.</td><td>Na fonte ao compasso três, falta a tercina na mão direita.Na fonte ao compasso dezanove faltam as tercinas na ornamentação da mão direita.Na fonte ao compasso vinte e sete falta um tempo de pausa na mão esquerda.</td><td>4/4</td><td>S/indicação</td><td>Ré Maior/Ré menor</td><td>4 + 16 + 16 compassos</td><td>Intro ABAC DEDE</td><td>		(D) I-vi07		ii		V7		I	
	(Dm) i		V7		V7		i	
	I		V7		V7		I-i	
	i		V7		V7		i	
	iv		i		V7		i	
	(D) I		V7		V7		I	
	I-vi07		ii		V7		I		(2x)</td></tr>
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<tr><td>85</td><td>MNTPRT230 – Tip. A. Pinto de Campos</td><td>1946</td><td>Fernando de Carvalho</td><td>Guitarras da Sé</td><td>Letra de Arnaldo Leite e Campos Monteiro
Grande sucesso da opereta “A bonequinha do Porto”
Criação dos simpáticos artistas Alberto Reis e Saluquia Rentini.</td><td>Na fonte antes dos últimos dois compassos a armação de clave é alterada para dó menor. Optei por manter a armação em Fá maior porque o final faz sentido com a cadência perfeita e não com a cadência ao modo menor de fá que não pertence ao contexto da peça e da tradição em causa.O ritmo harmónico neste fado está dobrado, devido à escolha de compasso 2/4.</td><td>Na fonte, ao compasso décimo falta o bequadro no si, na mão esquerda.</td><td>2/4</td><td>Fado Marcha</td><td>Fá Maior/Dó menor</td><td>4 + 32 + 16 compassos</td><td>Intro ABAC DE</td><td>|| (F) I || V7 || I || V7/v ||
	(Cm) i		i		V7/V		V7/V	
	V7		V7		i		i	
	(Eb) I		I		V7		V7	
	V7		V7		I		V7/iii	
	(Cm) i		i		V7/V		V7/V	
	V7		V7		i		i	
	iv		iv		i		i	
	V7/V		V7		I		I	
	(F) I		I		V7		V7	
	V7		V7		I		I	
	V7/ii		V7/ii		ii		ii	
	I		V7		I-V7		I		</td></tr>
<tr><td>86</td><td>MNTPRT233 – Edições Sassetti</td><td>1941</td><td>Raúl Ferrão</td><td>O Colete Encarnado</td><td>Letra de José Galhardo Criação de Mirita Casimiro Da Opereta “O colete Encarnado”</td><td>Estranha repartição de compassos na forma.</td><td>Na fonte ao compasso dezoito é omisso um dos fás do acorde na mão esquerda. Na fonte ao compasso décimo é omisso o “a tempo” para contrariar o ralentando da introdução.</td><td>2/4</td><td>Moderato</td><td>Ré menor/Ré Maior</td><td>9 + 15 + 18 + 16 + 2 compassos</td><td>Intro AA' BB' CD Coda</td><td>		(Dm) i		iv		V7		i	
	i		iv		V7		i	
	(D) I		I-i0		V7		V7	
	V7 || V7 || I || I || (2x) || (F) V7 || V7 || I (D)	
	I		V7		V7		I	
	(F) V7		V7		I	
	I		V7		V7		I	
	(Dm)V7		i		i		i	
	i		V7		V7		V7	
	V7		i		i		(A) bII	
	bII		V		i#07	
	I (D)		V7		I-V7		I		</td></tr>
<tr><td>87</td><td>MNTPRT234 – Edições Valentim de Carvalho</td><td>1943</td><td>Fernando de Carvalho</td><td>Um adeus que me esqueceu</td><td>Letra de Arnaldo Leite e Campos Monteiro Criação da novel actriz Maria Clara Da Opereta “A costureirinha da Sé”</td><td>Curioso uso de dominantes terciárias. Fado sem entrada em anacruze no canto, isto é altamente invulgar.</td><td></td><td>2/4</td><td>Fado Marcha</td><td>Sol menor/Sol Maior</td><td>8 + 32 + 16 compassos</td><td>Intro ABAC DE</td><td>		(G) (V7/V)/V		(V7/V)/V		V7/V		V7/V	
	V7		V7		I-V7		I	
	(Gm) i		i		iv		iv	
	V7		V7		i		i	
	i		i		V7		V7	
	V7		V7		i		i-V7	
	i		i		iv		iv	
	V7		V7		i		i	
	iv		iv		i		i	
	V7		V7		I		I	
	(G) I		I		ii		ii-vi	
	V7		V7		I		I	
	(V7/V)V		(V7/V)/V		V7/V		V7/V
		V7		V7		I		I		</td></tr>
<tr><td>88</td><td>MNTPRT236 – Lit. Monteiro T. Pedras Negras</td><td>1930</td><td>Alfredo Mantua</td><td>A canção do Sul</td><td>Letra de Acácio Antunes e Machado CorreiaFado canção da revista “De ponta a ponta”Cantado pelo tenor Alves da Silva</td><td>Fado com arranjo extremamente completo e complexo. Várias vozes e camadas detalhadas.Muitas indicações de dinâmicas, ornamentos e expressões.Grande ambiguidade entre o modo maior e menor. Inclusão de acordes complexos, como sendo o quarto grau com a sexta agregada.</td><td></td><td>4/4</td><td>Allegretto Moderato</td><td>Ré menor/Ré Maior</td><td>9 + 8 + 12 compassos</td><td>Intro AB CDE</td><td>		(Dm) i		i		V7		i-V7	
	i		i		ii		i	
	V7		i		i-#iv07-ii07		i-V7/iv	
	iv-V7		i		iv6		i		V7		I	
	(D) I		V7		V7		I	
	(Dm) iv6		i		(D)V7/V		V7-I	
	(Dm) V7/iv		iv6		i-V7		i		</td></tr>
<tr><td>89</td><td>MNTPRT237 – Depósito Praça de D Pedro 57</td><td>1900</td><td></td><td>Fado Amoroso (Figueira da Foz)</td><td>Canções Populares do Norte nº2</td><td>Separata sem qualquer indicação de autor, editora ou data.</td><td></td><td>2/4</td><td>S/indicação</td><td>Lá menor/Dó Maior</td><td>32 compassos</td><td>ABAB' CDCD'</td><td>		(Am) i		V7		V7		i	
	i		V7		V7		i	
	(C) I		V7		V7		I	
	I		V7		V7		I	
	(Am) i		iv		V7		i	
	i		iv		V7		i	
	(C) I		V7		V7		I	
	I		V7		V7		I		</td></tr>
<tr><td>90</td><td>MNTPRT238</td><td>1915</td><td>António Marques da Silva</td><td>Fado da Elegância e da rua</td><td>Da revista “À última hora”</td><td>Separata sem qualquer indicação de editora ou data Segundo o Arquivo distrital do Porto a revista foi performada em 1915 ou 1916 no Teatro Apolo no Porto, em Lisboa, com libreto de Augusto Veras e Simões de Castro música de Manuel de Figueiredo e Vasco de Macedo.</td><td>A fonte não contém indicação de compasso.Na fonte, ao compasso vinte, falta o ponto de aumentação e uma ligadura na 2ª voz da mão direita.Na fonte, ao compasso vinte e cinco, a mão direita apresenta uma semínima ao invés de uma mínima.</td><td>4/4</td><td>Allegretto Moderato</td><td>Lá menor/Lá Maior</td><td>4 + 16 + 8 + 4 compassos</td><td>Intro ABCD EF Coda</td><td>		(A) I		V7		V7		I	
	(Am) i-V7		i		iv		i-V7	
	i-V7		i-(C) IV		I-V7		I	
	V7		i		V7		i	
	iv		i		V7		I	
	(A) I		V7		V7		I	
	I-V7/ii		ii		I-V7		I	
	I		V7		V7		I		</td></tr>
<tr><td>91</td><td>MNTPRT239 – Valentim de Carvalho</td><td>1967</td><td>Carlos Dias</td><td>Fado do Cacilheiro</td><td>Letra de Paulo da Fonseca.Criação de José Viana.Gravação Columbia.</td><td>A fonte apresenta uma primeira secção com 31 compassos o que não faz sentido. Quanto a mim a última frase é deficitária de um compasso e nota-se a sua falta.A estrutura da fonte aparece algo confusa e a progressão harmónica aparece com ritmo dobrado.</td><td>Na transcrição foi eliminada uma redundância de dois compassos na fonte (cp. 54-55 no original), quanto à última repetição.</td><td>2/4</td><td>Fado Marcha, Não Depressa</td><td>Sol menor/Sol Maior</td><td>4 + 31 + 16 + 2 compassos</td><td>Intro ABA'C DD' Coda</td><td>		(G) V		I		I		I	
	(Gm) n.c.		i		i		i	
	i-#vi07		V7		V7		V7	
	n.c.		iv		iv		V7	
	V7		i		V7		i	
	n.c.		i		i		i	
	i		iv		iv		iv	
	iv || i || i || V/V || V || I || I	
	(G) I		I		I		I		I	
	I-i07		ii		ii		ii		iv	
	I		I-i07		ii		V		I-V		I		</td></tr>
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<tr><td>92</td><td>MNTPRT246 – Salão Neuparth – Neuparth e Carneiro</td><td>1905</td><td>Filipe Duarte</td><td>Canção de Belphogor</td><td>Da Revista “O Cabo da Caçarola Mágica”F. A. Oliveira e S. Marques</td><td>Este fado tem uma forma pouco vulgar na medida em que apresenta um pequeno côro de dois compassos no final de cada frase. Por vezes esse próprio côro repete-se a si mesmo, causando um apêndice de quatro compassos aos versos.</td><td>Sistematicamente são omissas ligaduras de expressão na mão esquerda que foram acrescentadas de acordo com o evidência interna.</td><td>2/4</td><td>Allegro Moderato</td><td>Fá Maior</td><td>7 + 12 + 14 + 12 + 12 + 2 compassos</td><td>Intro AcA'c BcB'cc CcC'c DD'cc Coda
*c = pequeno côro de 2 compassos.</td><td>|| (F) I || V7 || I || V7 ||
	I		V7		II		I		V7	
	I		V7		I		I (Am) i		V7		i	
	V7		i (F) V7		I		V7	
	I		V7		I		V7	
	I		V7		I		V7	
	I		V7		I (Dm) V7		i		V7	
	i		V7		i		(C) V7	
	I-V7		I-V7		I		V7	
	I-(F) V7		I		V7		I		V7	
	I		V7		I		V7	
	I		V7		I		I		</td></tr>
<tr><td>93</td><td>MNTPRT247 – Sassetti & Cª Editores</td><td>1927</td><td>Venceslau Pinto, Alves Coelho, Raúl Portela</td><td>Fado das Iscas</td><td>Da Opereta “Bairro Alto”Letra de Avelino de SousaCriação dos distintos actores Vasco Santana e Aurélio Ribeiro</td><td></td><td>Na fonte, o compasso 31, na mão esquerda apresenta o acorde errado, tal como é comprovado por evidência interna ao compasso 35. Em lugar do segundo grau é a tónica.</td><td>4/4</td><td>Moderato</td><td>Fá Maior</td><td>5 + 20 + 12 compassos</td><td>Intro ABABB' CC'C''</td><td>		(F) I		V7		V7		I	
	I		V7		V7		I	
	(Dm) i || V7 || V7 || i || (2x) || (Dm) iv || i || V7 || i	
	(D) I		V7		V7		I	
	V7/ii		ii		I-V7		I	
	V7/ii		ii		I-V7		I		</td></tr>
<tr><td>94</td><td>MNTPRT248 – s/indicação</td><td>1927</td><td>Venceslau Pinto, Alves Coelho, Raúl Portela</td><td>Fado do Bairro Alto</td><td>Da Opereta “Bairro Alto”</td><td>Este fado apresenta uma dinâmica de ff no início e uma dinâmica de pp ao quarto compasso. Isto causa um desequilíbrio notável pelo que me parece uma decisão pouco feliz. Optei por homogeneizar o fado como meio-forte. A transcrição parece-me duvidosa na estrutura na forma de abordar a nota longa na última secção, acrescentando-lhe um compasso e tornando-a assimétrica. Este fado apresenta alguma curiosidade harmónica na introdução do III e do bVI em compassos esporádicos no seu interior.</td><td>A fonte é omissa no acompanhamento limitando-se a apresentar melodia e posições. Optei por escrever as posições indicadas sob a forma de acordes em semínimas.Na fonte ao compasso catorze falta o sustenido no sol da mão direita.A fonte ao compasso trinta e três apresenta pausa de semi-colcheia ao invés de pausa de colcheia.</td><td>4/4</td><td>S/indicação</td><td>Lá Maior/Lá menor</td><td>4 + 8 + 4 + 16 + 9* compassos</td><td>Intro AA' Intermezzo BCB'D EE'</td><td>		(A) I		V7		V7		I	
	I		I		V7		V7	
	V7		V7		V7		i	
	(Am) i		V7		V7		i	
	i		V7		V7		i	
	III		iv-V7		i		V	
	i		V7		V7		i	
	iv		V7		iv		V7	
	(A) I		V7		V7		I	
	bVI		I		V7		V7		I		</td></tr>
<tr><td>95</td><td>MNTPRT249 – E. Bevilacqua & C., Rio de Janeiro MNTPRT252 – Neuparth & Carneiro, Lisboa</td><td>1911</td><td>Filipe Duarte</td><td>Fado do Colete Encarnado</td><td>Da Opereta “O Fado”Letra de Bento Faria</td><td></td><td></td><td>2/4</td><td>Moderato</td><td>Lá menor/Lá Maior</td><td>5 + 16 + 16 + 2 compassos</td><td>Intro ABAB' CDCD' Coda</td><td>		(Am) i		V7		i		V7		i	
	i		V/III		IV/III		I/III	
	iv		V7		iv		V7	
	i		V/III		IV/III		I/III	
	iv		V7		V7		I	
	(A) I		V7		V7		I	
	I		V7		V7		I		(2x) 		V7		I		</td></tr>
<tr><td>96</td><td>MNTPRT250 – Sassetti & Cª. Editores</td><td>1920</td><td>Coutinho de Oliveira</td><td>Fado Triste</td><td>Da opereta “O casal da Margarida”Ao João da Câmara</td><td></td><td></td><td>4/4</td><td>S/indicação</td><td>Ré Maior/Ré menor</td><td>8 + 16 compassos</td><td>Intro AABB'</td><td>		(D) I		V7		V7		I	
	I		ii		I-V7		I	
	(Dm) i		V7		V7		i	
	i		V7		V7		i	
	(D) IV		I		V7		I	
	IV		I		V7		I		</td></tr>
<tr><td>97</td><td>MNTPRT251 – Lit. Salles, Lda.</td><td>1920</td><td>Filipe Duarte</td><td>Fado</td><td>Da Opereta “A leiteira de Entre-Arroios” Versos de Penha Coutinho Cantado pela actriz Ausenda de Oliveira e Sales Ribeiro</td><td>Harmonia mais complexa, com encadeamentos sucessivos de dominantes sobre dominantes.</td><td>Na fonte ao 9º compasso é omissa a indicação de tercina na mão esquerda. Na fonte ao 14º e 18º compassos é omisso o ponto de aumentação na mão esquerda. Na fonte ao 20º compasso a mão direita apresenta semi-colcheias ao invés de colcheias. Na fonte ao 34º compasso é omisso o ponto de aumentação na mão direita Na fonte ao 34º compasso a mão esquerda apresenta colcheias e não semi-colcheias no ostinato. Na fonte ao 48º compasso é omisso o bequadro no dó da mão direita.</td><td>4/4</td><td>Allegretto</td><td>Ré Maior/Si menor</td><td>6 + 40 + 6 compassos</td><td>Intro AA BB</td><td>		(D) V7		I		ii		I		V7		I-V7-I	
	I		ii		V7		I	
	I		ii		V7		I	
	I		vi07		V7		I	
	bVI		I		ii-V7		I	
	(Bm) i		vii07		V7		i	
	(D) vii07		vi		IV		[(V7/V)/V]/V	
	(V7/V)/V		V7/V		V7		I	
	(Bm) ii07		i		V7		i	
	(D) i		ii		V7		i	
	bVI		I		ii-V7		I	
	V7		I		ii		I		V7		I-V7-I		</td></tr>
</table>

<table>
<tr><td>98</td><td>MNTPRT253 – Tip. A. Pinto de Campos</td><td>1945</td><td>Raúl Ferrão</td><td>Lisboa não sejas Francesa</td><td>Letra de José Galhardo
Criação da actriz Mirita Casimiro
Da Opereta “A Invasão”</td><td>A única referência a fado nesta obra é a indicação de tempo.</td><td></td><td>2/2</td><td>Tempo de Fado Slow</td><td>Lá menor/Lá Maior</td><td>4 + 16 + 16 compassos</td><td>Intro AA'BA' CDCD'</td><td>|| (Am) V7 || i || V7 || i ||
	i		V7		V7		i	
	i		V7		V7		i	
	i-(C) V7		I-V7/ii		ii-V7		I-(Am) V7	
	I		V7		V7		I	
	(A) I		I		I		ii	
	ii		V7		V7		I	
	I		I		I		ii	
	ii-ii0		I		V7/V-V7		I		</td></tr>
<tr><td>99</td><td>MNTPRT259 – A Editora, Lisboa</td><td>1911</td><td>Filipe Duarte</td><td>Fado das Educandas</td><td>Da Opereta “O Fado”</td><td>Não há indicação do autor da letra. A estrutura formal parece-nos muito peculiar. O autor ao invés de entrar em anacruze, inicia o verso no tempo forte do compasso prolongando-o. Conservando esta estranha opção, obriga-o a prolongar também a última sílaba. Tal escolha traduz-se numa frase de 3 compassos, seguida de uma de quatro. Quanto a mim este fado poderia ser rescrito num molde mais tradicional com frases de 2+2 compassos em anacruze, e sem prolongamentos internos.</td><td>Na fonte, ao 1º compasso é omisso o bequadro no si, do acorde do V7.</td><td>4/4</td><td>Allegretto Agitato</td><td>Dó menor/Dó maior</td><td>2 + 14 + 16 + 4 compassos</td><td>Intro ABAB CDCD Coda</td><td>		(Cm) i-V7		i-V7i-V7		i-V7/bIII		bIII-V7	
	i-V7 || i-V7 || i-V7 || i-V7 || (2x) || (C) I-V7 || I-V7 || I-V7 || I-V7	
	I-V7		I-V7		I-V7		I-V7	
	I-V7		I-V7		I-V		I-V7	
	I-V7		I-V7		i-V7		i-V7	
	I		I		I		I		</td></tr>
<tr><td>100</td><td>MNTPRT260 – Edições Populares Portuguesas, Tip. A. Pinto de Campos</td><td>1945</td><td>Fernando de Carvalho</td><td>Fado das Caravelas</td><td>Letra de Arnaldo Leite e Campos Monteiroda Opereta “O Gaiato da Rua”Criação da notável artista Irene Isidro</td><td></td><td></td><td>2/4</td><td>Tempo de Fado Marcha</td><td>Dó Maior/Dó menor</td><td>8 + 16 + 1 +16 compassos</td><td>Intro ABA'C DEFG</td><td>		(C) IV		IV-#iv07		V7		I	
	V7		V7		I		i	
	(Cm) i		i		i		V7	
	V7		V7		V7		i	
	i		i		V/iv		iv	
	iv		i		V7		I		I	
	(C) I		I		ii		ii	
	V7		V7		I		I	
	IV		IV-#iv07		I		I	
	V7		V7		I-V7		I		</td></tr>
</table>

001

002

Andante


25
29
33
37
41

003

004

005

006

007

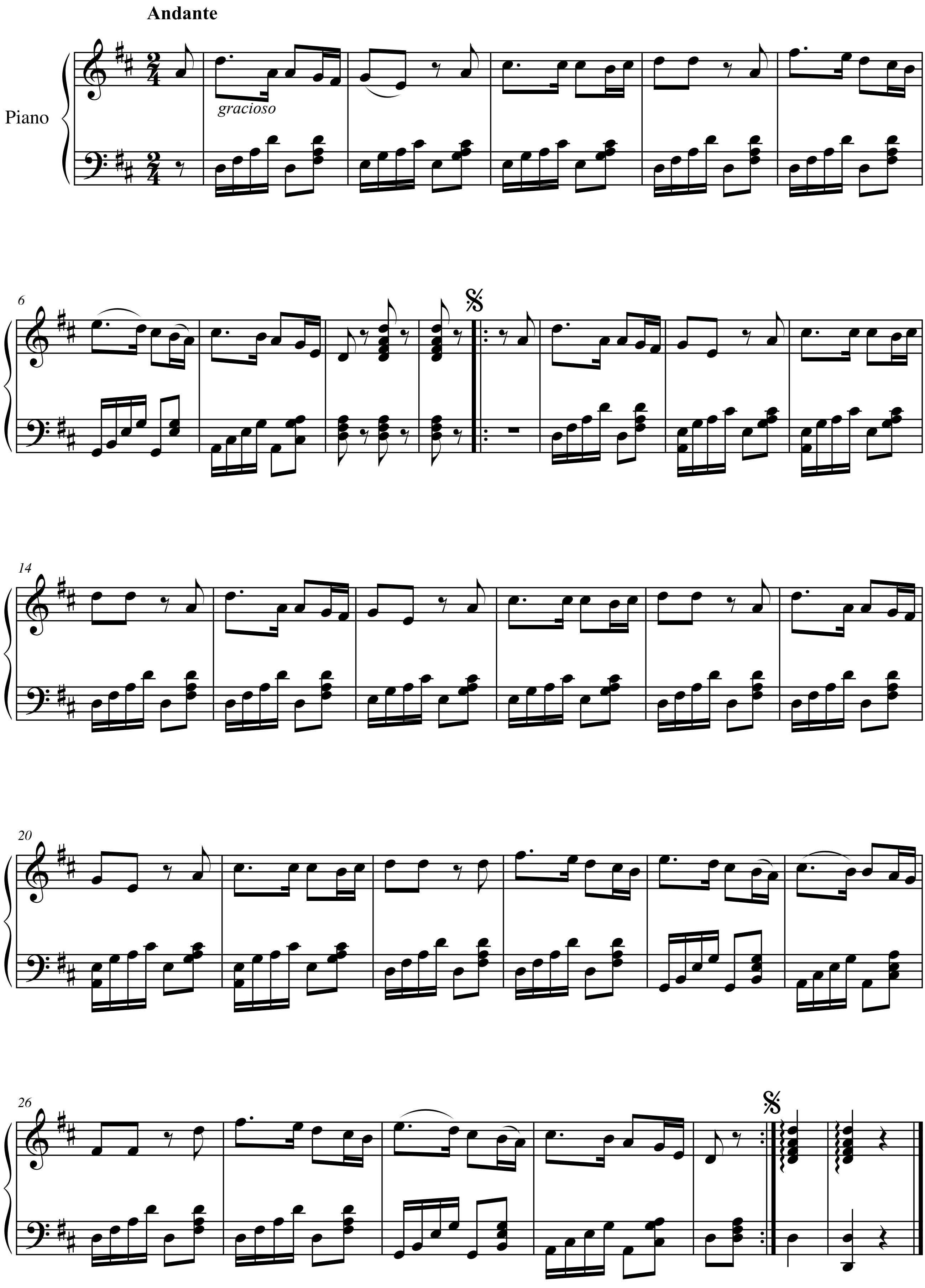
Augusto Hylario

008

009

010

011



012

013

Reynaldo Varella

014

015

016

017

018

019

020

021

022

023

024

025

026

027

028

029

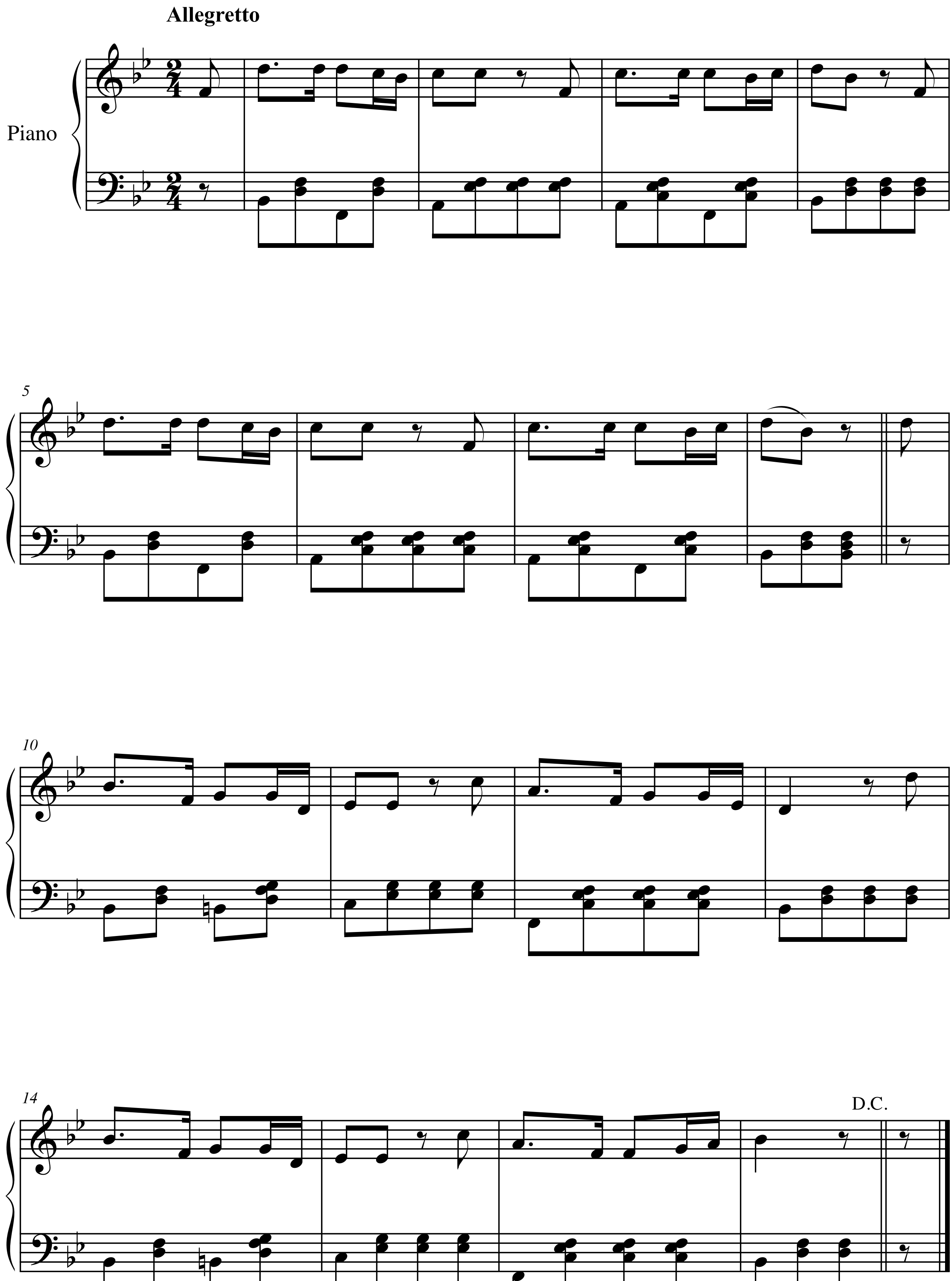
030

031

032

033

034



035

036

037

038

039

040

041

042

043

044

045

046

047

048

049

050

Score

050


20
rit.
24
f
f
accel.
27
a tempo
accel.
a tempo
accel.
31
rit.
34
1, 2.
3.
Ao sinal duas vezes

051


22
26
30
34
38
42
smorzando
pp
3
pp

052

053

054

055

056

057


poco più
allarg.
D.S. al Fine

058

059

060


A060
Coro ao A e 3ª vez
Do
ao

061

062


062
Piu Lento
pp
p

063

Moderato (♩ = 75)
Piano
ff
com animação
Não depressa, bem ritmado
mf
rit.
a tempo
f
mf
f

063

064

065

Allegro animato
Piano
rit.
a tempo
rit.
a tempo
Fine
Cantabile suavissimo
cresc.
cresc.


a tempo
fff
mf
dim.
p
fff
mf
p
Piu mosso
a tempo
mf
rit.
a tempo
rit.

066

067

068

069

069

070

071

071

072


21
25
29
33
pp
37
ppp
ppp
pizz.

073

074

075

076

077

078

079


rit.
ff
a tempo
pp
Lento


49
53
58
61
pp
62
65
f
Ped.
68
ff

080

081


Tempo de fado vagaroso
Piano
Estribilho
Mais Depressa
Vagaroso
1.
2.

082

083


Allegretto Moderato
Piano
Com sentimento
5
10
cresc.
f
15
dim.

084

085

086

087

088

089

090


Allegretto Moderato
Piano
p
f
p
f
p
m.d.
p
com sentimento
rall.
a tempo
f
p
p
Fim

091

Score

092

093

094


Piano
mf
mosso
menos
rit.
a tempo
apress.
a tempo
più vivo
menos
rall.
a tempo
vivo
1.
2.
Fim

095

096

097


f

098

099


20
24
28
1.
32
2.
35

100

001

002

002

003

004

005

006


20
24
28
dolce
32

007

Augusto Hylario

Andante expressivo


19
dolce
23
27
31

008


17
21
25
29
D.C. ao

009


17
21
25
D.C.

010


17
21
24

011


18
22
26

012


17
21
25
29
D.C.

013

Reynaldo Varella

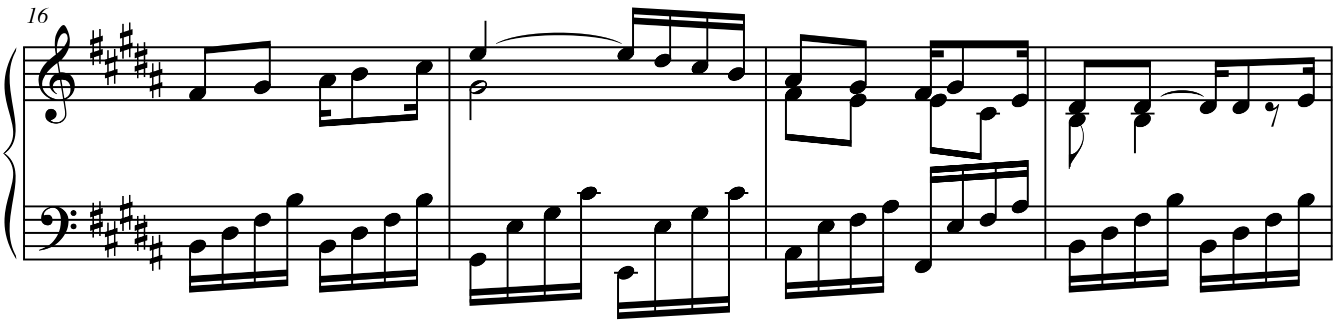
014

015


17
21
25

016

017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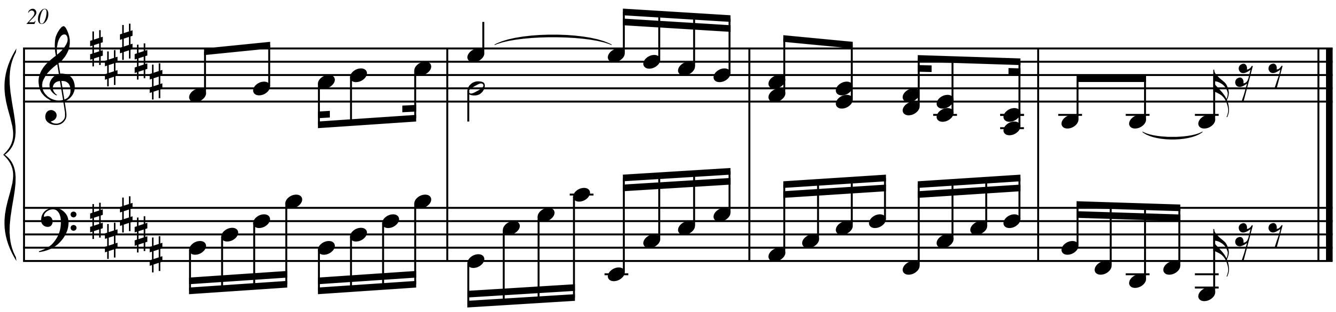

20

018


15
19
23

019

020

021

022

023

024


17
21
25
29

025

026

027

Moderato

028

029


21
25
29
34
38

030


17
cresc.
21
p

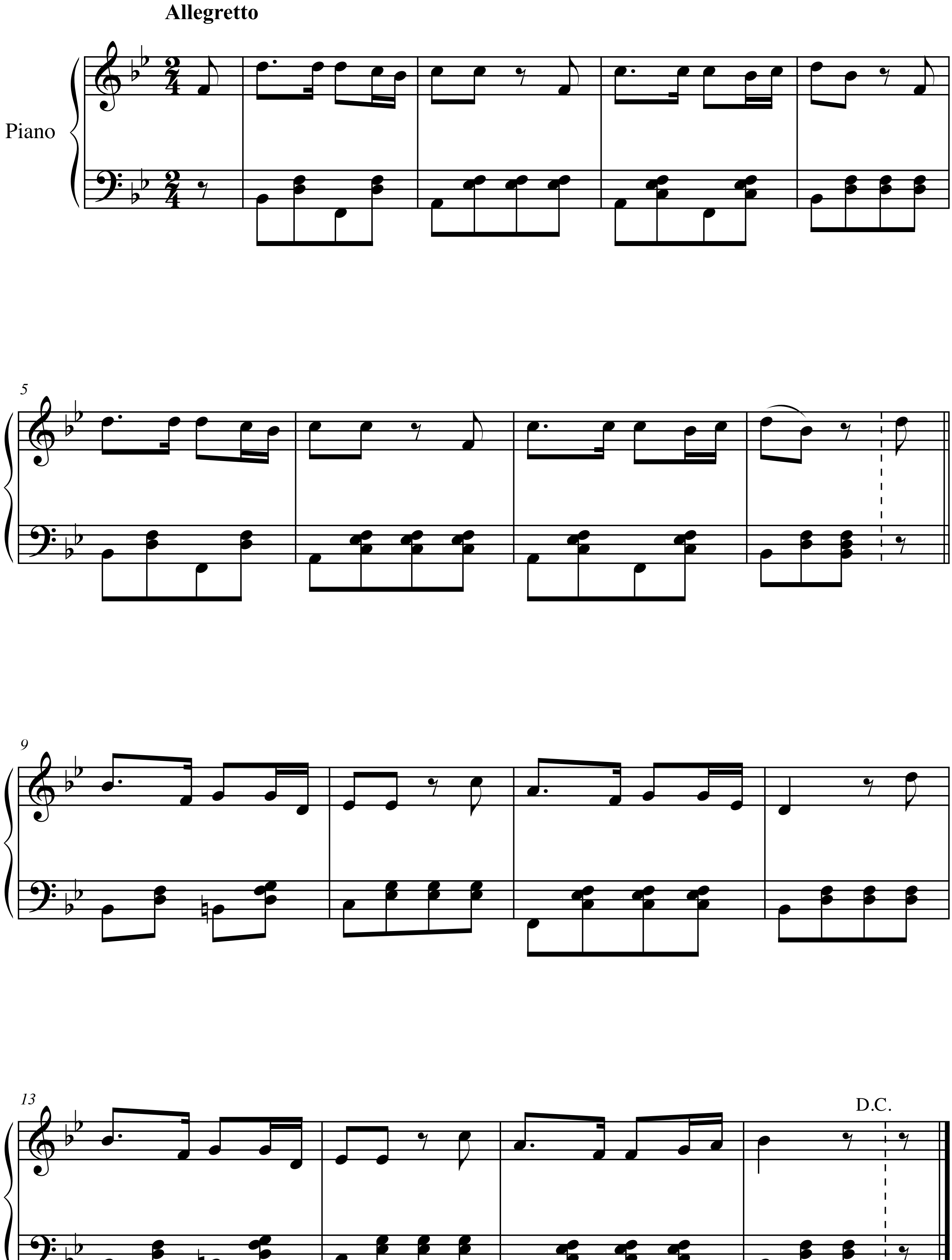
031

032

Andantino

033

034



035


17
21
25
29

036

037

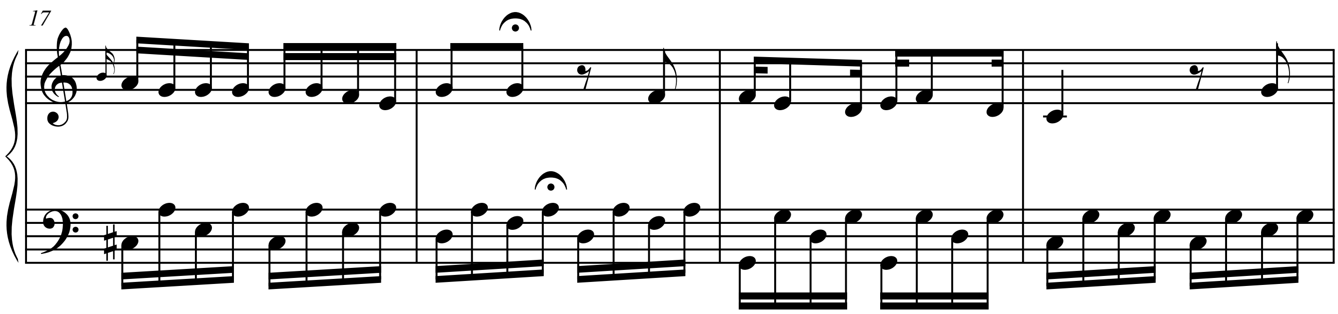
038

039

040

041

042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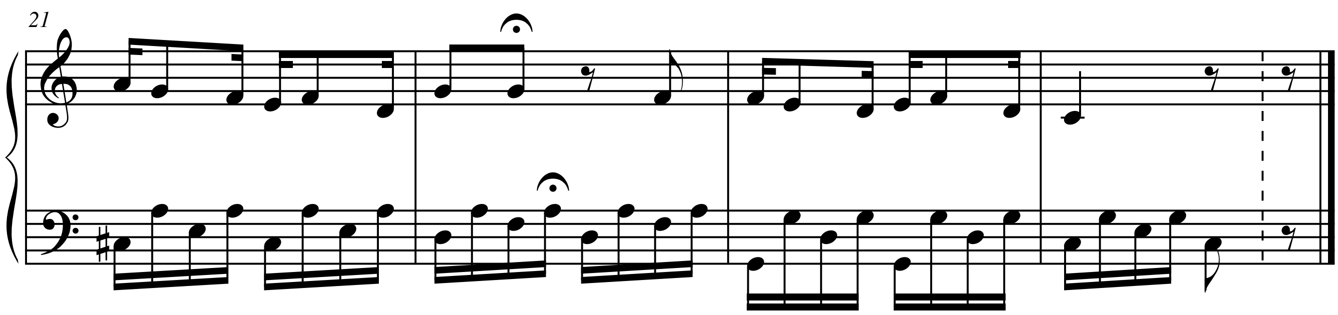
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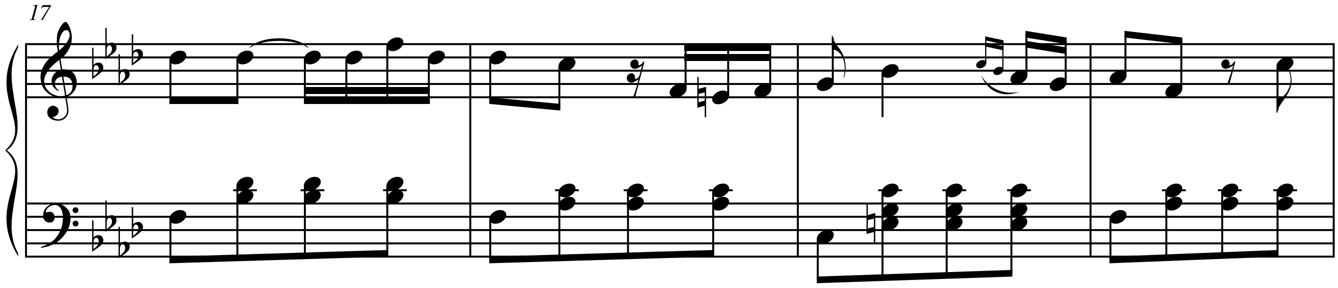
043

044

045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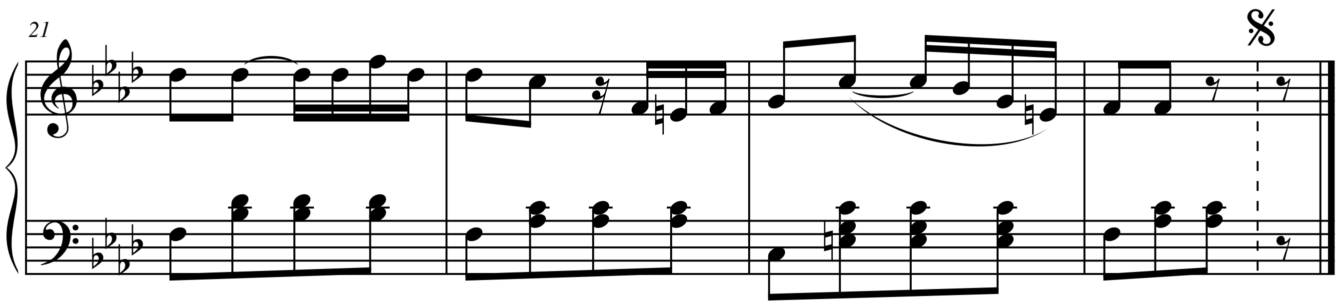

21

046

047

048

Allegro


19
p
23
27
3
f
31
35
f

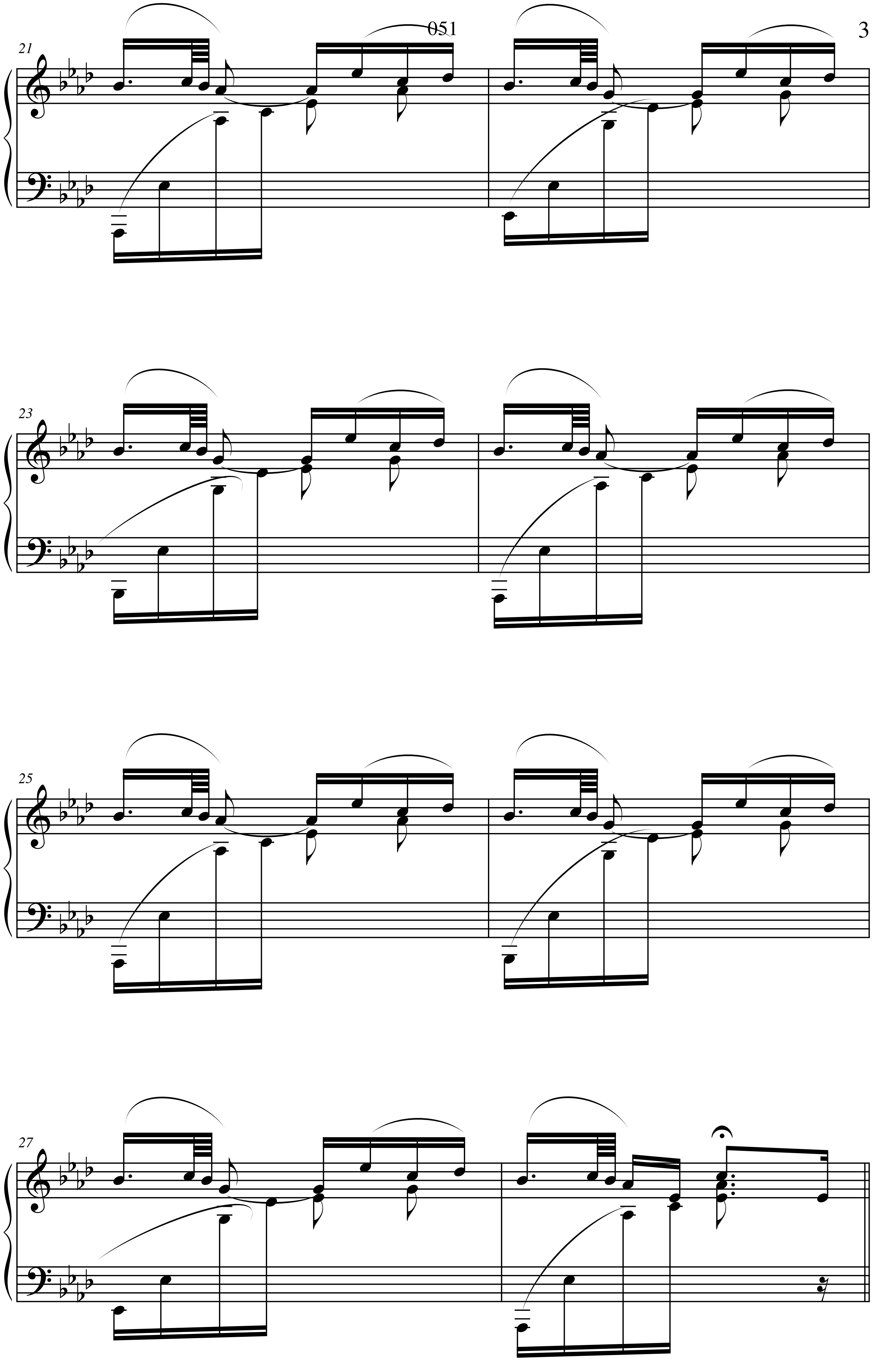
049

050


18
cresc.
22
rit.
f
26
f
accel.
a tempo
accel.
a tempo
accel.
31
rit.
1, 2.
3.
Ao sinal duas vezes

051

051


21
23
25
27


29
31
33
35


37
39
41
43
pp
3
pp

052


18
pp
rit.
22
rit.
Fim

053

053

054


18
22
f
26

055


17
21
25
29
33
1.
2.

056


17
rit.
21
Vagaroso
25
3
1.
rit.
3
2.
D.C. al Fine


057
Allegretto
Piano
mf
Fine
Meno
p
5
9
13
17

057

058


038
15
19
23
27
31
1.
2.
sf
sf

059


18
22
26
mf
30

060


060
A
Coro ao A e 3ª vez
Do ao

061


17
21
25
rit.
1.
a tempo
29
FIM

062


17
p
21
pp
25
dolce
29


33
37
1.
42
2.
Piu Lento
46
3
pp
50
p

063


Moderato (♩ = 75)
Piano
ff
com animação
6
Não depressa, bem ritmado
mf
10
14
rit.
a tempo


37
marcato
f
41
ff
45
49
tr
fz
fz
D.C.
53
ff

064


43
46
50
54
58
1.
2.
D.S. al Fine

065

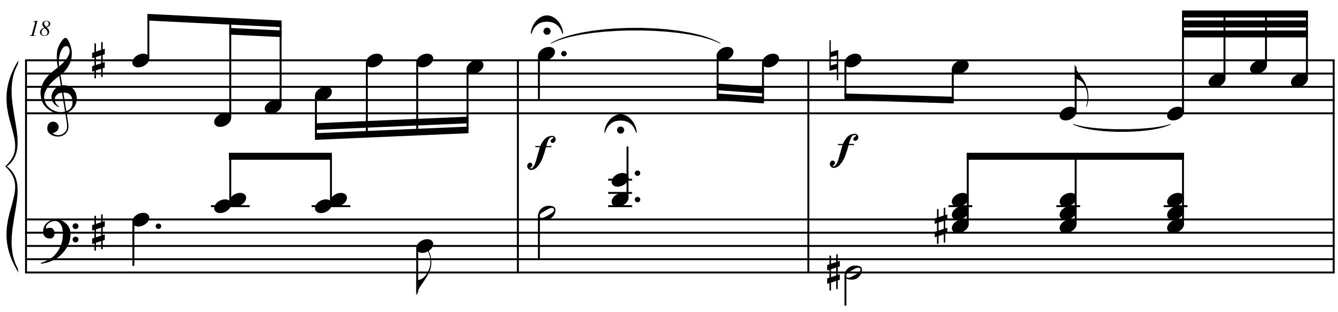

Cantabile suavissimo
cresc.
cresc.
a tempo
a tempo
dim.

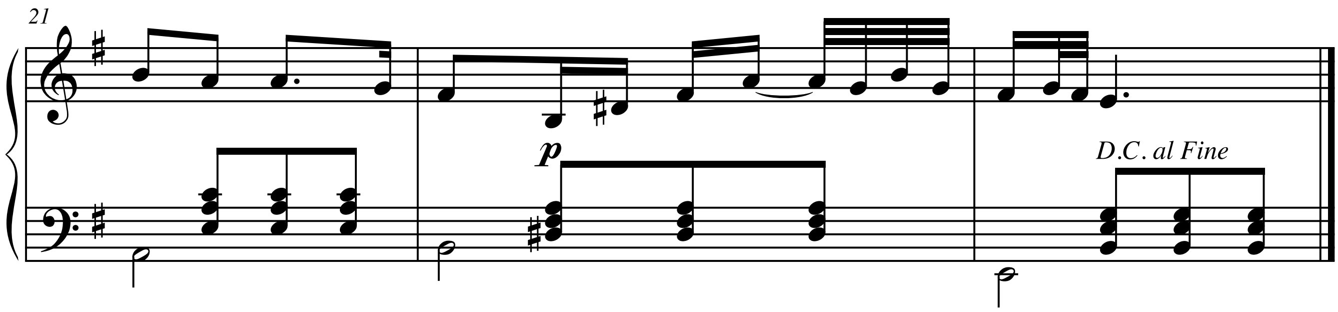

Piu mosso
33
mf
37
41
45
rit.
a tempo
rit.

066


18
22
accel.
a tempo
26
30
1
34
2.

067


18
f
f


21
p
D.C. al Fine

068


22
p
a tempo
26
rit.
f
30
a tempo
f
34
rit.
38
morr. poco a poco
ppp

069


21
25
29
33
37


41
45
p
49
53
57


61
mf
65
69
73
f
77
1.
2.
f
ff

071


39
071
1.
2.
45
3
49
3
53
3
57
FIM

070


16
20
24
1.
29
2.
rit.
34
animando

072


21
25
29
33
37
pp
ppp
ppp
pizz.

073

073

074


21
25
29
f
33
37
1, 2.
3.

075


espress.

076


9
11
13
15
rit.
a tempo
f

077


D.S. al O
rit.
dim.
pp

078


21
25
29
33
37
1.
2.
f

079


rit.
a tempo
ff
pp


Lento
34
38
42
46
50

079

080


17
21

081

Tempo de fado vagaroso


Estribilho
17
Mais Depressa
Vagaroso
21
25
1.
2.

082


19
23
27
31
35
f

083


Allegretto Moderato
Piano
Com sentimento
3
7
11
cresc.
f
15
dim.

084


19
p
21
23
25
27


29
31
33
35
1.
36
37
2.
3

085


17
3
p
21
3
25
29
33
3


37
3
41
3
45
49
3
1.
f
53
2.
sf
sf

086


21
25
3
29
3
33
rit.
37
a tempo


41
46
50
54
1.
58

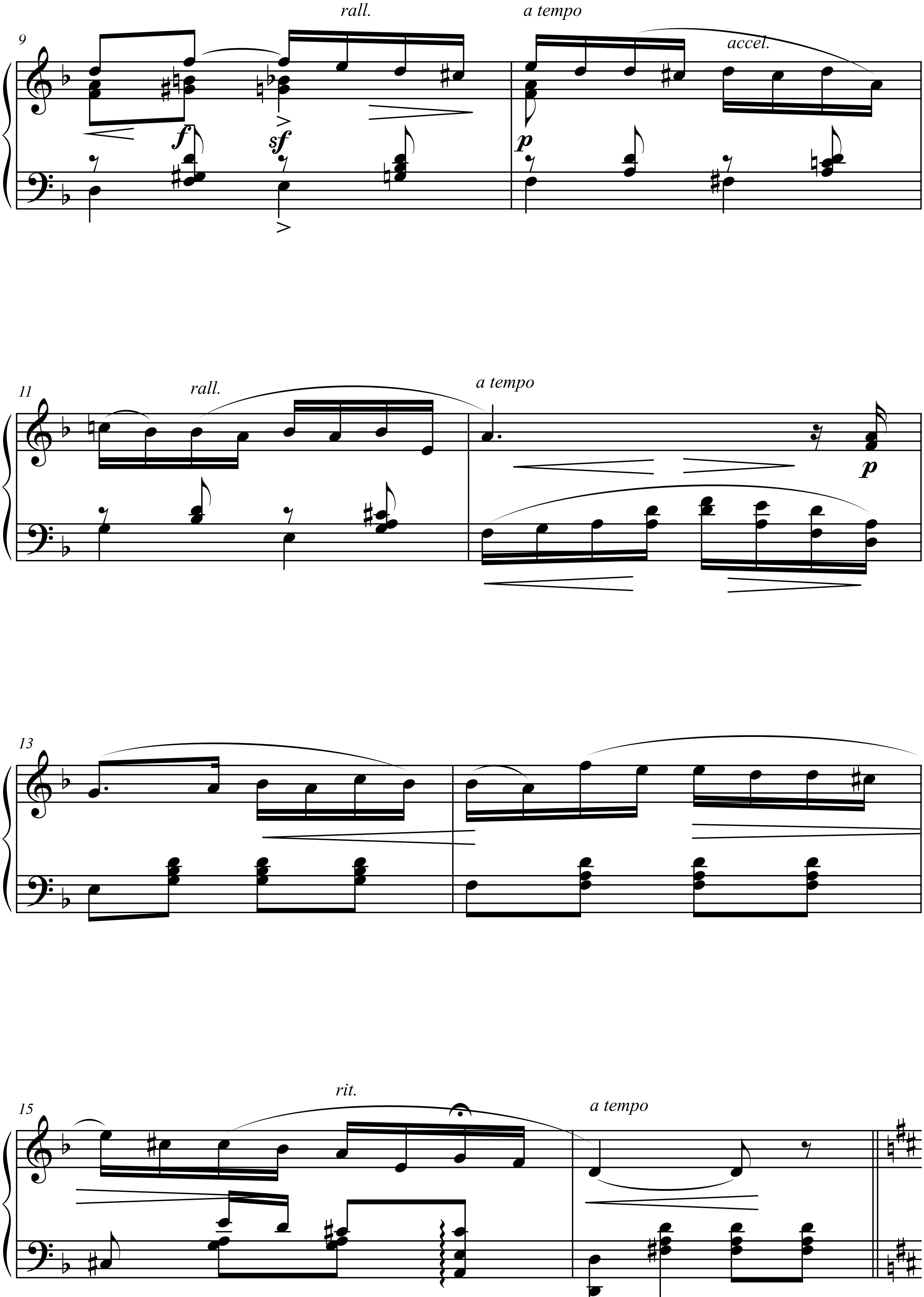
087

Fado Marcha


21
3
25
3
29
33
37


41
3
45
49
53
1.
f
57
2.
sfz
sfz

088


9
rall.
a tempo
accel.
11
rall.
a tempo
13
15
rit.
a tempo


17
p
sf
19
sf
ff
21
p
23
sf
ff
p


25
cresc.
1.
27
f
dim.
p
pp
pp
29
2.
f
ff
D.S. ao Fim
31
p
pp
pp

089


Fim

090

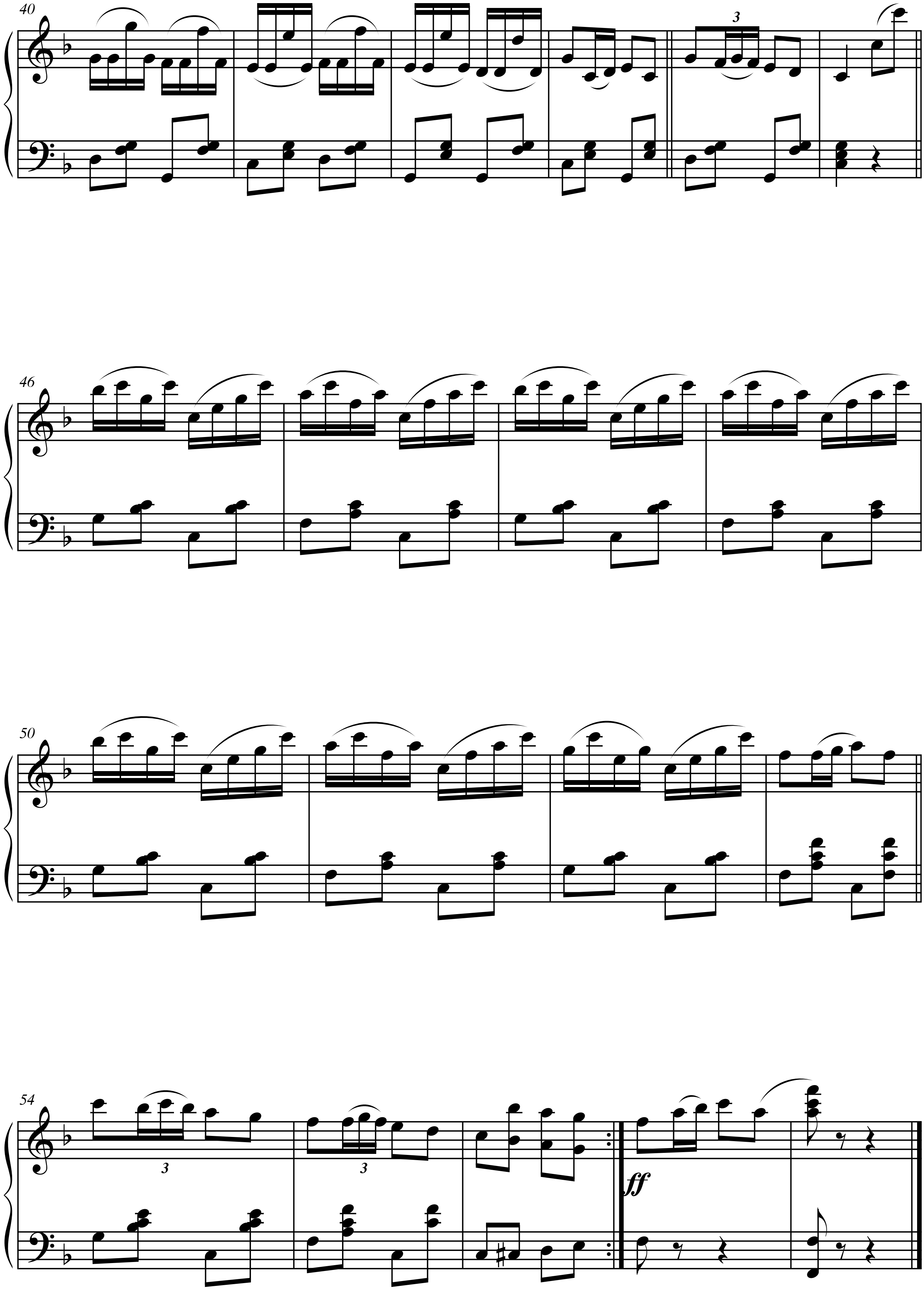

17
21
com sentimento
25
rall.
a tempo
29
Fim

091


17
21
25
29
33


36
40
44
rall.
a tempo
48
1.
52
2.

092


40
3
46
50
54
3
3
ff

093


10
12
sf
p
14
18


21
25
27
3
29
3


31
33
35
1.
37
2.

094


11
mosso
13
15
menos
17
3
21
rit.
a tempo


25
apress.
a tempo
29
più vivo
33
menos
37
rall.
a tempo
vivo
41
1.
2.
Fim

095

095

096


9
p
13
17
21
D.S. ao fim

097


7
9
11
13


15
17
19
21


23
25
27
29


31
33
35
37


39
3
3
41
3
3
43
45
f

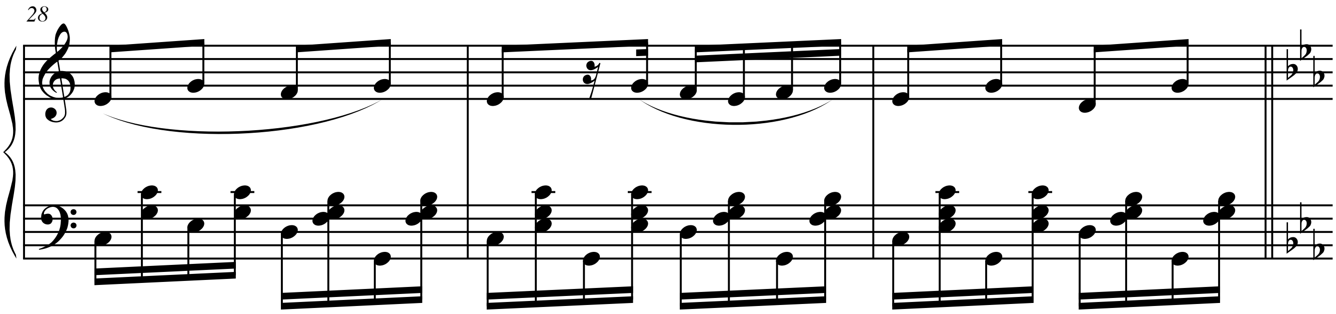

47
3
3
3
3
49
51

098


a tempo
17
21
25
29
33
1.
2.
Fim

099


14
17
21
24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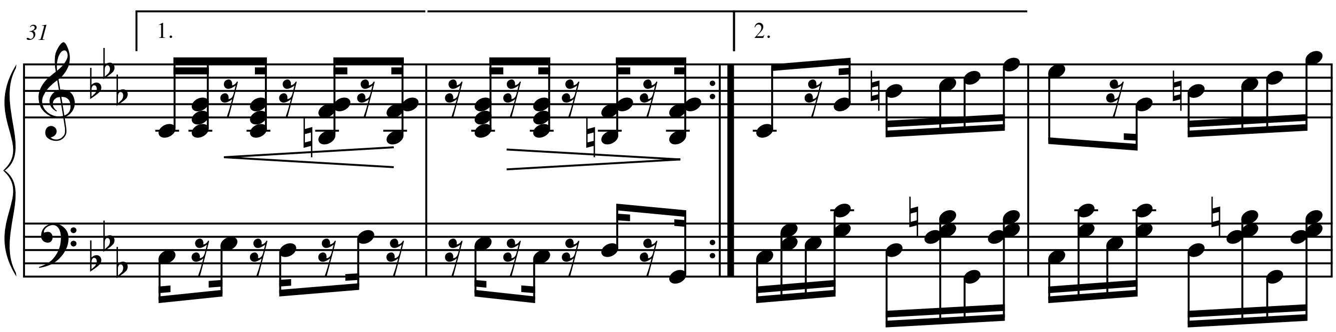
31
1.
2.


35

100

100

General Statistics on Fado

Fado Edition	Date	Corpus	Tonality	Quality	Tonality B	Tonality Final	Quality final	Form
1	1840	0	Dm	minor	Dm	Dm	minor	AA'BB'
2	1845	0	F	Major	F	F	Major	I1I2 AA B CC' D O
3	1845	0	Dm	minor	Dm	Dm	minor	AABBCCDD
4	1848	0	Am	minor	Am	Am	minor	I ABAB
5	1864	0	Am	minor	Am	Am	minor	I AABB'
6	1890	0	F	Major	F	F	Major	I AABC AABC
7	1895	0	Dm	minor	F	Bbm	minor	I AA'BB' CCDD
8	1868	0	Gm	minor	Gm	Gm	minor	I(AB) ABAB CD O(AB)
9	1860	0	Fm	minor	Fm	Fm	minor	I(Ab1c2) AAB CC O(Ab1c2)
10	1885	0	Bb	Major	Bb	Bb	Major	I(AA) AA BB'B' O(AA)'
11	1852	0	D	Major	D	D	Major	I(AA) AAA BB'
12	1890	0	G	Major	G	G	Major	AABBCCDD
13	1887	0	Eb	Major	Bb	Eb	Major	I AA BC
14	1892	0	Dm	minor	F	F	Major	I AA BC
15	1870	0	E	Major	E	E	Major	ABC ABDD
16	1894	0	D	Major	D	D	Major	I AABB AABB
17	1895	0	B	Major	B	B	Major	I AABB'
18	1852	0	Em	minor	Em	Em	minor	I AA'BB'CC'
19	1875	0	Eb	Major	Eb	Eb	Major	I AABB
20	1895	0	D	Major	D	D	Major	ABB ABB
21	1895	0	D	Major	D	D	Major	AABB
22	1870	0	C	Major	C	C	Major	AABB
23	1850	0	Am	minor	Am	Am	minor	I(AA) AABBCC
24	1850	0	Gm	minor	Gm	Gm	minor	I(AA') AA'AA' BB
25	1894	0	G	Major	G	G	Major	I AABB AABB
26	1849	0	Dm	minor	Dm	Dm	minor	ABAB
27	1870	0	G	Major	Em	Em	minor	I (a1a2a1b1) (c1c2d1c2)
28	1875	0	G	Major	G	G	Major	I ABCD ABCD
29	1870	0	Gm	minor	Gm	Gm	minor	(a1a2b1b2) (c1c1'c2c2'c2"c2'''c2"b2) (d1d1'd1b2) (d2b2d2b2)
30	1898	0	Dm	minor	Dm	Dm	minor	AA'BB'CD AA'BB'CD
31	1870	0	D	Major	D	D	Major	I AA'BB'B' AA'BB'B'
32	1871	0	G	Major	G	G	Major	ABA'B' ABA'B'
33	1879	0	C	Major	Cm	Cm	minor	I AABB X AABB
34	1898	0	Bb	Major	Bb	Bb	Major	AABB AABB
35	1872	0	Em	minor	Em	Em	minor	I(AA) AABCCC
36	1898	0	Cm	minor	Cm	Cm	minor	AABB
37	1872	0	Am	minor	Am	Am	minor	ABCC
38	1898	0	G	Major	D	G	Major	AABB AABB
39	1898	0	Am	minor	Am	Am	minor	AABB
40	1898	0	Eb	Major	Bb	Bb	Major	I AABB AABB
41	1898	0	F	Major	Dm	F	Major	AABA'
42	1850	0	C	Major	C	C	Major	ABB A'B'B"
43	1896	0	C	Major	C	C	Major	I AABB'
44	1866	0	Eb	Major	Eb	Eb	Major	AABB
45	1850	0	Ab	Major	Fm	Fm	minor	I(A'C') ABCC ABCC
46	1880	0	G	Major	G	G	Major	AABB
47	1898	0	C	Major	Am	Am	minor	AABB AABB
48	1858	0	Gm	minor	Gm	Gm	minor	I(D) ABCC D(a1b2)C O
49	1898	0	Gm	minor	Gm	Gm	minor	I AABB
50	1918	1	Am	minor	A	A	Major	I ABA'B' CD X ABA'B' CD X ABA'B'CD
51	1927	1	Ab	Major	Ab	Ab	Major	I AABC X AABC
52	1927	1	F	Major	F	F	Major	I AABC X AABC O
53	1940	1	C	Major	C	C	Major	I ABAB ABAB
54	1927	1	G	Major	G	G	Major	I AABB' O
55	1953	1	Dm	minor	Dm	Dm	minor	I ABCD ABCD
56	1920	1	Am	minor	A	A	Major	I AABC (d1d2d3) O
57	1925	1	Am	minor	A	A	Major	I ABAC DEDE O
58	1960	1	Fm	minor	F	F	Major	I ABAC DEDF ABAC DEDF
59	1900	1	Dm	minor	D	Dm	minor	AA'BCDE AA'BCDE AA'
60	1946	1	F	Major	Dm	Dm	minor	I ABB' CC'DD' CD ABB' CC'DD' O
61	1947	1	C	Major	C	C	Major	I ABA'C DEDE ABA'C DEDE O
62	1920	1	Dm	minor	Dm	Dm	minor	I ABCD Z (e1e2e3) O
63	1914	1	Cm	minor	Cm	Cm	minor	I AB Z CDCD' EFEG I AB Z CDCD' EFEG O
64	1937	1	Dm	minor	Dm	D	Major	I ABCDE FGH IJ FGHIJ ABCDE FGHIJ O
65	1916	1	E	Major	Em	E	Major	ABAC DEFG HIJK ABAC
66	1940	1	Bb	Major	Gm	Gm	minor	I AABB' CDE AABB' CDE'
67	1927	1	G	Major	Em	G	Major	AAB CD AAB
68	1925	1	E	Major	C	E	Major	I ABA'C DE A'C O
69	1934	1	F	Major	F	F	Major	AA' BCBD EFE'F' EFE'F' AA'
70	1925	1	D	Major	D	D	Major	I ABCD EF ABCD EF O
71	1936	1	D	Major	Bm	C#m	minor	AABB' AABB" (t2) AABB
72	1918	1	Gm	minor	G	Gm	minor	I AA'BB' CDCD' O
73	1909	1	Am	minor	F#m	Am	minor	ABCC'DD' ABCC'DD' AB
74	1916	1	Am	minor	A	A	Major	I ABCDD EFF'E ABCDD EFF'E
75	1920	1	A	Major	E	A	Major	I AABB (c1c1c2c2) D O
76	1915	1	C	Major	C	C	Major	AABC AABC
77	1910	1	Gm	minor	G	Gm	minor	I AB CDCE AB O
78	1934	1	G	Major	Am	G	Major	I ABCD ABCD
79	1924	1	A	Major	Am	Am	minor	I ABA' Z CDCD Z EE' I
80	1920	1	D	Major	D	D	Major	I AABB O
81	1942	1	Dm	minor	D	D	Major	I AABB'C I AABB'C
82	1933	1	G	Major	Em	G	Major	I ABAB CD AB B'
83	1905	1	Fm	minor	Fm	Fm	minor	I AA'BC
84	1950	1	Dm	minor	D	D	Major	I ABAC DEDE ABAC DEDE
85	1946	1	Cm	minor	Eb	F	Major	I ABAC DE ABAC DE O
86	1941	1	D	Major	Dm	D	Major	I AABC DEDE Z AABC DEDE O
87	1943	1	Gm	minor	G	G	Major	I ABA'C DEDE ABA'C DEDE O
88	1930	1	Dm	minor	D	Dm	minor	I ABCDE I ABCDE O
89	1900	1	Am	minor	C	C	Major	AABB' CCDD' AABB' CCDD'
90	1915	1	Am	minor	C	A	Major	I ABCDEF O ABCDEF O
91	1967	1	Gm	minor	Gm	Gm	minor	I ABA'C DEDE ABA'C DEDE O
92	1905	1	F	Major	Am	F	Major	I AZBZCZCZ DZEZFFZ AZBZCZCZ DZEZFFZ O
93	1927	1	F	Major	Dm	D	Major	I ABAB CDEE' ABAB CDEE' O
94	1927	1	Am	minor	Am	Am	minor	IZ ABCB' DEFF' BCB' DEFF' O
95	1911	1	C	Major	Am	A	Major	I ABAB' I ABAB' CDCD O
96	1920	1	Dm	minor	D	D	Major	I AABB' O
97	1920	1	D	Major	Bm	D	Major	I ABA'C DEFG A'C I ABA'C DEFG A'C O
98	1945	1	A	Major	C	A	Major	I ABCB DEDF DEDF ABCB DEDF DEDF
99	1911	1	Cm	minor	C	C	Major	I ABAB CDCD Z ABAB CDCD O
100	1945	1	Cm	minor	C	C	Major	I ABCDCD ABCDCD

<table>
<tr><th>Fado Edition</th><th>Simplified Form</th><th>Prog01</th><th>Prog02</th><th>Prog03</th><th>Prog04</th><th>Huron Contour</th><th>Ostinati</th></tr>
<tr><td>1</td><td>AABB</td><td>i|V7|V7|i</td><td>i|V7|V7|i</td><td></td><td></td><td>convex</td><td>corridinho</td></tr>
<tr><td>2</td><td>AAB CCD</td><td>I|V7|V7|I</td><td>ii|V7|I-V7|I</td><td>I|V7|V7|I</td><td>I|V7|V7|I</td><td>convex</td><td>corridinho</td></tr>
<tr><td>3</td><td>AABB CCDD</td><td>i|V7|V7|i</td><td>i|iv|V7|i</td><td>i|V7|V7|i</td><td>i|V7|V7|i</td><td>convex</td><td>alberti</td></tr>
<tr><td>4</td><td>ABAB</td><td>i|V7|V7|i</td><td>i|V7|i-V7|i</td><td></td><td></td><td>convex</td><td>hybrid</td></tr>
<tr><td>5</td><td>AABB</td><td>i|V7|V7|i</td><td>i|V7|V7|i</td><td></td><td></td><td>desc</td><td>alberti</td></tr>
<tr><td>6</td><td>AABC</td><td>I|V7|V7|I</td><td>i|V|ii|V</td><td>ii-ii0|I|V7|I</td><td></td><td>convex</td><td>alberti</td></tr>
<tr><td>7</td><td>AABB CCDD</td><td>i|iv|V7|i</td><td>#iv07|I|ii-V7|I</td><td>i|V7|V7|i</td><td>i|vii07|V7|i</td><td>convex</td><td>corridinho</td></tr>
<tr><td>8</td><td>ABAB CD</td><td>i|V7|V7|i</td><td>i|V7|i-V7|i</td><td>i|V7|V7|i</td><td>i|ii|i-V7|i</td><td>desc</td><td>alberti</td></tr>
<tr><td>9</td><td>(Ab1c2) AAB CC (Ab1c2)</td><td>i|V7|V7|i</td><td>i|V7|i-V7|i</td><td>i|V7|i-V7|i</td><td></td><td>convex</td><td>alberti</td></tr>
<tr><td>10</td><td>AABBB</td><td>I|ii|V7|I</td><td>I|V7|V7|I</td><td></td><td></td><td>convex</td><td>arpeggio</td></tr>
<tr><td>11</td><td>AAABB</td><td>I|V7|V7|I</td><td>I|IV|V7|I</td><td></td><td></td><td>convex</td><td>hybrid</td></tr>
<tr><td>12</td><td>AABB CCDD</td><td>I|V7|V7|I</td><td>V7/ii|ii|V7|I</td><td>I|V7|V7|I</td><td>V7/ii|ii|V7|I</td><td>convex</td><td>alberti</td></tr>
<tr><td>13</td><td>AABC</td><td>I|V7|V7|I</td><td>V7/ii|ii|V7|I</td><td>V7|I|V7|I</td><td></td><td>convex</td><td>corridinho</td></tr>
<tr><td>14</td><td>AABC</td><td>I|V7|V7|I</td><td>I|V7|V7|I</td><td>I|vi-ii|I-V7|I</td><td></td><td>asc</td><td>alberti</td></tr>
<tr><td>15</td><td>ABC ABDD</td><td>IV|IV|IV|I</td><td>IV|IV|V7|I</td><td>I|V7|I-V7|I</td><td>I|V7|I-V7|I</td><td>convex</td><td>corridinho</td></tr>
<tr><td>16</td><td>AABB</td><td>I|V7|V7|I</td><td>I|vii0|V7|I</td><td></td><td></td><td>convex</td><td>alberti</td></tr>
<tr><td>17</td><td>AABB</td><td>I|V7|V7|I</td><td>I|ii|V7|I</td><td></td><td></td><td>desc</td><td>arpeggio</td></tr>
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<tr><td>19</td><td>AABB</td><td>I|V7|V7|I</td><td>I|V7|V7|I</td><td></td><td></td><td>desc</td><td>fingered</td></tr>
<tr><td>20</td><td>ABB</td><td>I|V7|V7|I</td><td>I|V7|V7|I</td><td></td><td></td><td>convex</td><td>alberti</td></tr>
<tr><td>21</td><td>AABB</td><td>I|V7|V7|I</td><td>IV|I|V7|I</td><td></td><td></td><td>convex</td><td>corridinho</td></tr>
<tr><td>22</td><td>AABB</td><td>I|V7|V7|I</td><td>I|V7|V7|I</td><td></td><td></td><td>convex</td><td>alberti</td></tr>
<tr><td>23</td><td>AABBCC</td><td>i|V7|V7|i</td><td>i|i|V7|i</td><td>i|V7|V7|i</td><td></td><td>asc</td><td>alberti</td></tr>
<tr><td>24</td><td>AAAABB</td><td>i|V7|V7|i</td><td>i|V7|V7|i</td><td></td><td></td><td>desc</td><td>corridinho</td></tr>
<tr><td>25</td><td>AABB</td><td>I|V7|V7|I</td><td>I|ii|V7|I</td><td></td><td></td><td>desc</td><td>chula</td></tr>
<tr><td>26</td><td>ABAB</td><td>i|V7|V7|i</td><td>i|V7|V7|i</td><td></td><td></td><td>desc</td><td>alberti</td></tr>
<tr><td>27</td><td>(a1a2a1b1) (c1c2d1c2)</td><td>I|V7|V7|I</td><td>III|V7/III-V7/V|V7|i</td><td>IV|V|i-V7|i</td><td>vii07|V7|i-V7|i</td><td>convex</td><td>corridinho</td></tr>
<tr><td>28</td><td>ABCD</td><td>I|V7|V7|I</td><td>V7/ii|ii|V7|I</td><td>I|V7|V7|I</td><td>I|V7|I-ii-V7|I</td><td>desc</td><td>alberti</td></tr>
<tr><td>29</td><td>(a1a2b1b2) (c1c1c2c2c2c2c2b2) (d1d1d1b2) (d2b2d2b2)</td><td>i|V7|vii07-V7/III|III</td><td>III|V7|i|i</td><td>i|V7|V7|i</td><td>i|V7|V7|i</td><td>desc</td><td>alberti</td></tr>
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<tr><td>32</td><td>ABAB</td><td>I|V7|V7|I</td><td>I|ii|V7|I</td><td></td><td></td><td>convex</td><td>corridinho</td></tr>
<tr><td>33</td><td>AABB</td><td>I|V7|V7|I</td><td>iv|i|V7|i</td><td></td><td></td><td>convex</td><td>arpeggio</td></tr>
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<tr><td>35</td><td>AABCCC</td><td>i|iv|iv|V7</td><td>i-V7/iv|ii0|V7|i</td><td>V7|i|V7|i</td><td></td><td>desc</td><td>alberti</td></tr>
<tr><td>36</td><td>AABB</td><td>i|iv|V7|i</td><td>iv|i|V7|i</td><td></td><td></td><td>convex</td><td>hybrid</td></tr>
<tr><td>37</td><td>ABCC</td><td>i|V7|V7|i</td><td>i|V7|V7|i</td><td>i|V7|V7|i</td><td></td><td>desc</td><td>habanera</td></tr>
<tr><td>38</td><td>AABB</td><td>I|V7|V7|I</td><td>I-V7/ii|V7|V7|I</td><td></td><td></td><td>desc</td><td>alberti</td></tr>
<tr><td>39</td><td>AABB</td><td>i|V7|V7|i</td><td>i|V7|V7|i</td><td></td><td></td><td>desc</td><td>habanera</td></tr>
<tr><td>40</td><td>AABB</td><td>I|V7|V7|I</td><td>V7|I|V7|I</td><td></td><td></td><td>convex</td><td>corridinho</td></tr>
<tr><td>41</td><td>AABA</td><td>I|V7|V7|I</td><td>V7|i|V7/V|V</td><td></td><td></td><td>desc</td><td>corridinho</td></tr>
<tr><td>42</td><td>ABB</td><td>I|V7|V7|I</td><td>V7/ii|ii|V7|I</td><td></td><td></td><td>convex</td><td>alberti</td></tr>
<tr><td>43</td><td>AABB</td><td>I|V7|V7|I</td><td>I|ii|V7|I</td><td></td><td></td><td>convex</td><td>corridinho</td></tr>
<tr><td>44</td><td>AABB</td><td>IV|IV|IV|I</td><td>V7|V7|I-V7|I</td><td></td><td></td><td>desc</td><td>corridinho</td></tr>
<tr><td>45</td><td>ABCC</td><td>I|V7|V7|I</td><td>III|V7/III|V7|i</td><td>iv|i|V7|i</td><td></td><td>convex</td><td>corridinho</td></tr>
<tr><td>46</td><td>AABB</td><td>I|V7|V7|I</td><td>V7/ii|ii|V7|I</td><td></td><td></td><td>convex</td><td>alberti</td></tr>
<tr><td>47</td><td>AABB</td><td>I|V7|V7|I</td><td>i|V7|V7|i</td><td></td><td></td><td>asc</td><td>corridinho</td></tr>
<tr><td>48</td><td>ABCC D(a1b2)C</td><td>i|i|i|V7</td><td>V7|i|i-V7|i</td><td>ii07-V7|i|ii07-V7|i</td><td>V7/III|III|iv-VI|V7</td><td>desc</td><td>march</td></tr>
<tr><td>49</td><td>AABB</td><td>i|V7|V7|i</td><td>V7/iv|iv|V7|i</td><td></td><td></td><td>convex</td><td>alberti</td></tr>
<tr><td>50</td><td>ABAB CD</td><td>i|V7|V7|i</td><td>V7|iv|V7|i</td><td>I|V7|V7|I</td><td>I-V7/ii|ii-ii07|V7|I</td><td>convex</td><td>corridinho</td></tr>
<tr><td>51</td><td>AABC</td><td>I|V7|V7|I</td><td>I|V7|V7|I</td><td>I|V7|V7|I</td><td></td><td>convex</td><td>ballad</td></tr>
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<tr><td>53</td><td>ABAB</td><td>I-#i07|V7|ii-V7|I</td><td>vi-V|V7|V7|I</td><td></td><td></td><td>convex</td><td>march</td></tr>
<tr><td>54</td><td>AABB</td><td>I|V7|V7|I</td><td>V7/vi|vi|V7|I</td><td></td><td></td><td>desc</td><td>ballad</td></tr>
<tr><td>55</td><td>ABCD</td><td>i|i-iv|V7|V7-i</td><td>i|V7/iv-iv|V7|i-V7-i</td><td>i-V7|i-V7-i-V7/iv|iv|V7/III-III-V7/iv</td><td>iv-V7|iv-V7|i-V7|i-V7-i</td><td>desc</td><td>march</td></tr>
<tr><td>56</td><td>AABC (d1d2d3)</td><td>i-V7|i|ii0|i</td><td>V7|i|V7|V7</td><td>ii0|i|V7|I</td><td>I|I|V7|V7</td><td>convex</td><td>corridinho</td></tr>
<tr><td>57</td><td>ABAC DEDE</td><td>i|i|iv|i</td><td>V7|i|iv|V7</td><td>V7/III|III|V7|I</td><td>I|I|I|V7</td><td>desc</td><td>fingered</td></tr>
<tr><td>58</td><td>ABAC DEDF</td><td>i|V7|V7|i</td><td>i|V7|V7|i</td><td>V7/iv|iv|i-V7|i</td><td>I-V7/ii|V7|V7|I</td><td>convex</td><td>march</td></tr>
<tr><td>59</td><td>AABCDE AABCDE AA</td><td>V7|i|V7|i</td><td>i|V7|V7|i</td><td>i-VII|vi|V7|i-I</td><td>I|I|I|V7</td><td>desc</td><td>alberti</td></tr>
<tr><td>60</td><td>ABB CCDD CD</td><td>vi|ii|V7|I</td><td>i|iv|i-V7|i</td><td>I-i0|V7|V7|I</td><td>i|V7|V7|I</td><td>convex</td><td>march</td></tr>
<tr><td>61</td><td>ABAC DEDE</td><td>I|V7|V7|I</td><td>I|V7|V7|I</td><td>V7/V|IV-#i07|V7/V-V7|I</td><td>I-V7/ii|ii|V7|I</td><td>asc</td><td>march</td></tr>
<tr><td>62</td><td>ABCD (e1e2e3)</td><td>i-bVII7|V7|V7|i</td><td>V7/III|III|iv-V7|i</td><td>ii-V7/vi|vi|V7|I</td><td>V7|i|V7|i</td><td>asc</td><td>fingered</td></tr>
<tr><td>63</td><td>AB CDCD EFEG</td><td>i|V7/V|V7|i</td><td>i|V7|V7|i</td><td>i-bVI|V7|i-bVI|V7-i</td><td>i|V7/V|V7|i</td><td>convex</td><td>march</td></tr>
<tr><td>64</td><td>ABCDE FGH J FGHJ ABCDE FGHJ</td><td>i|V7|V7|i</td><td>i|V7|V7|i</td><td>(V7/V)/V|V7/V|i-V7|i</td><td></td><td>concave</td><td>march</td></tr>
<tr><td>65</td><td>ABAC DEFG HJK ABAC</td><td>i|V7|V7|i</td><td>iv-V7|i|i-V7|i</td><td>i|bVII|bVII|bVI</td><td>bVI|V7|V7|i</td><td>convex</td><td>ballad</td></tr>
<tr><td>66</td><td>AABB CDE</td><td>V7|ii|ii|V7</td><td>V7|I|I|I</td><td>i07|V7|V7|V7</td><td>IV|ii|ii|V7</td><td>convex</td><td>corridinho</td></tr>
<tr><td>67</td><td>AAB CD AAB</td><td>I|V7|V7|I</td><td>I|V7|V7|I</td><td>V7/ii|ii|V7|I</td><td>i-V7|i|iv-V7/iv|iv</td><td>convex</td><td>corridinho</td></tr>
<tr><td>68</td><td>ABAC DE AC</td><td>iv|i|V7|i</td><td>I|I|I|V7</td><td>V7|V7|V7|I</td><td>I|I-V7/ii|V7/ii|ii-iv</td><td>convex</td><td>arpeggio</td></tr>
<tr><td>69</td><td>AABCBD EFEF EFEF AA</td><td>I|V7|V7|I</td><td>V7/ii|ii|V7|I</td><td>i|V7|V7|i</td><td>iv|i|V7|i</td><td>convex</td><td>march</td></tr>
<tr><td>70</td><td>ABCD EF</td><td>I|V7|V7|I</td><td>vi|V7|V7|I</td><td>V7|i|V7|i</td><td>V7/iv|iv|V7|i</td><td>asc</td><td>corridinho</td></tr>
<tr><td>71</td><td>AABB</td><td>I-V|I|IV-V|I</td><td>V|V|V|I</td><td>IV-#iv07|I|I-V7|I</td><td>I|V7|V7|I</td><td>asc</td><td>march</td></tr>
<tr><td>72</td><td>AABB CDCD</td><td>V7|I|V7|I</td><td>I|V7|V7|I</td><td>I-#iv07|V7|IV|I-V7</td><td>I|IV|i-V7|I</td><td>convex</td><td>ballad</td></tr>
<tr><td>73</td><td>ABCCDD ABCCDD AB</td><td>I|I|I|V7</td><td>V7|V7|ii-V7|I</td><td>V7/vi|IV|V7/ii|ii</td><td>ii|I|V7|I</td><td>convex</td><td>march</td></tr>
<tr><td>74</td><td>ABCDD EFFE</td><td>I|ii|V7|I</td><td>i|V7|iv|V7</td><td>I-V7/ii|ii|V7|I</td><td>i|V7|V7|i</td><td>convex</td><td>corridinho</td></tr>
<tr><td>75</td><td>AABB (c1c1c2c2) D</td><td>i|iv|V7|I</td><td>ii0|i|V7|i</td><td>I|ii-V7/ii-ii|ii-V7|I</td><td>I-i07|ii-V7|V7|I</td><td>desc</td><td>corridinho</td></tr>
<tr><td>76</td><td>AABC</td><td>i|V7|V7|i</td><td>i-V7/iv|iv|i-V7|i</td><td>I/III|V7/III|V7/III|I/III</td><td>iv|i|V7|i</td><td>convex</td><td>waltz</td></tr>
<tr><td>77</td><td>AB CDCE AB</td><td>i|V7|V7|i</td><td>i|V7|V7|i</td><td>I|V7|V7|I</td><td>I|V7|V7|I</td><td>convex</td><td>ballad</td></tr>
<tr><td>78</td><td>ABCD</td><td>I|vii|V7|I</td><td>I|IV|I-V7|I</td><td>V7/ii|ii|V7|I</td><td>V7|I|V7|I</td><td>desc</td><td>march</td></tr>
<tr><td>79</td><td>ABA CDCD EE</td><td>I|V7|V7|I</td><td>I|V7|V7|I</td><td>I|ii|V7|I</td><td></td><td>convex</td><td>corridinho</td></tr>
<tr><td>80</td><td>AABB</td><td>i|iv|V7|i</td><td>V7/iv|iv|V7|i</td><td>I|V7|V7|I</td><td>I|V7|V7|I</td><td>convex</td><td>corridinho</td></tr>
<tr><td>81</td><td>AABBC</td><td>I|I-V7|I-V7|V7</td><td>ii-V7|V7|V7-I|I</td><td>bVII-V7|V7|V7-i|i</td><td>ii0-I|I-V/V|V7-I|I</td><td>concave</td><td>corridinho</td></tr>
<tr><td>82</td><td>ABAB CD ABB</td><td>V7|V7|I|I</td><td>V7|V7|I|I</td><td>i|V7|V7|i</td><td>i|iv|V7|i</td><td>convex</td><td>corridinho</td></tr>
<tr><td>83</td><td>AABC</td><td>I|IV|V7|I</td><td>IV|I|V7|I</td><td></td><td></td><td>convex</td><td>hybrid</td></tr>
<tr><td>84</td><td>ABAC DEDE</td><td>i|V7|V7|i</td><td>V7/iv|iv|V7|i</td><td>I|V7|V7|I</td><td></td><td>concave</td><td>march</td></tr>
<tr><td>85</td><td>ABAC DE</td><td>I|V7|V7|I</td><td>I|V7|V7|I</td><td>i|V7|V7|i</td><td>iv|V7|V7|i</td><td>convex</td><td>march</td></tr>
<tr><td>86</td><td>AABC DEDE</td><td>i|V7|V7|i</td><td>V7/III|III|V7|i</td><td>iv|i|V7|i</td><td></td><td>desc</td><td>march</td></tr>
<tr><td>87</td><td>ABAC DEDE</td><td>i|V7|V7|i</td><td>I|V7|V7|I</td><td>iv|i|V7|i</td><td>I|V7|V7|I</td><td>concave</td><td>march</td></tr>
<tr><td>88</td><td>ABCDE</td><td>i|V7/V|V7|i</td><td>I|V7|V7|I</td><td>iv|i|V7/V-V7|V7/IV</td><td>I|V7|V7|I</td><td>asc</td><td>arpeggio</td></tr>
<tr><td>89</td><td>AABB CCDD</td><td>I-i07|V7|V7|I</td><td>V7/III|III|V7|i</td><td>V7|I|V7|I</td><td>i|V7|V7|i</td><td>asc</td><td>march</td></tr>
<tr><td>90</td><td>ABCDEF</td><td>i|iv|V7|i</td><td>i|V7|i-V7|i</td><td>iv|i|V7|I</td><td>I|ii|V7|I</td><td>convex</td><td>march</td></tr>
<tr><td>91</td><td>ABAC DEDE</td><td>i07-ii07|i-V7/iv|iv-V7|i</td><td>ii7|i|V7|I</td><td>I|V7|V7|I</td><td>iv|i|V7/V|V7</td><td>concave</td><td>fox</td></tr>
<tr><td>92</td><td>ABCC DEFF</td><td>i|V7|V7|i</td><td>I|V7|V7|I</td><td>i|iv|V7|i</td><td>I|V7|V7|I</td><td>asc</td><td>march</td></tr>
<tr><td>93</td><td>ABAB CDEE</td><td>i-V7|i|iv-i|V7</td><td>vi-V7/vi|vi-IV|I-V7|I</td><td>V7|i|V7|i</td><td>iv|i|V7|i</td><td>desc</td><td>march</td></tr>
<tr><td>94</td><td>ABCB DEFF BCB DEFF</td><td>i|i|i-V7|V7</td><td>V7-iv|iv-V7|V7-i|V7-i</td><td>ii-i|i-V7/V|V7|I</td><td>I|I|I|ii</td><td>asc</td><td>corridinho</td></tr>
<tr><td>95</td><td>ABAB ABAB CDCD</td><td>I|I|V7|I</td><td>VI|VI|V7|i</td><td>V7|I|V7|I</td><td>V7|i|V7|i</td><td>asc</td><td>corridinho</td></tr>
<tr><td>96</td><td>AABB</td><td>V7|V7|I |vi</td><td>V7|V7|i|III</td><td>iv|i|V7|I</td><td>I|V7|V7|I</td><td>concave</td><td>march</td></tr>
<tr><td>97</td><td>ABAC DEFG AC</td><td>i|V7|V7|i</td><td>i|V7|V7|i</td><td>III|iv-V7|i|V7</td><td>iv|V7|iv|V7</td><td>asc</td><td>march</td></tr>
<tr><td>98</td><td>ABCB DEDF DEDF</td><td>vi|I|IV|I</td><td>iv|V7|iv|V7</td><td>I|V7|V7|I</td><td>I|ii|V7|I</td><td>asc</td><td>march</td></tr>
<tr><td>99</td><td>ABAB CDCD</td><td>i|V7|V7|i</td><td>IV|I|V7|I</td><td></td><td></td><td>asc</td><td>march</td></tr>
<tr><td>100</td><td>ABCDCD</td><td>I|ii|V7|I</td><td>I|ii|V7|I</td><td>bVI|I|ii|I</td><td>i|ii07|V7|i</td><td>convex</td><td>march</td></tr>
</table>

General Statistics on Fado

Fado Edition	Ostinati 2	Note Density	Average Note Duration	Variability of Note Duration	Maximum Note Duration	Minimum Note Duration	Staccato Incidence	Average Time Between Attacks	Variability of Time Between Attacks	Average Time Between Attacks For Each Voice	Average Variability of Time Between Attacks For Each Voice	Initial Tempo
1		7,84	0,40	0,11	0,69	0,11	0,00	0,31	0,11	0,31	0,11	64,00
2	alberti	7,64	0,35	0,12	0,95	0,12	0,00	0,25	0,06	0,25	0,06	64,00
3		6,11	0,28	0,12	0,95	0,22	0,00	0,24	0,03	0,24	0,03	64,00
4		6,82	0,30	0,22	1,38	0,22	0,00	0,24	0,06	0,24	0,06	64,00
5		5,40	0,33	0,18	1,06	0,25	0,00	0,27	0,04	0,27	0,04	56,00
6		5,75	0,35	0,27	2,41	0,20	0,00	0,26	0,21	0,26	0,21	64,00
7		7,49	0,46	0,20	2,50	0,13	0,00	0,36	0,18	0,36	0,18	64,00
8		6,41	0,29	0,20	1,87	0,19	0,00	0,25	0,10	0,25	0,10	120,00
9		7,50	0,24	0,11	0,74	0,05	0,01	0,23	0,06	0,23	0,06	64,00
10		6,71	0,29	0,17	1,90	0,19	0,00	0,25	0,13	0,25	0,13	64,00
11		6,26	0,36	0,15	1,11	0,06	0,00	0,30	0,16	0,30	0,16	64,00
12		7,17	0,28	0,11	0,53	0,10	0,00	0,23	0,11	0,23	0,11	64,00
13		5,68	0,50	0,33	3,49	0,12	0,00	0,37	0,39	0,37	0,39	64,00
14		6,11	0,31	0,18	1,38	0,22	0,00	0,25	0,09	0,25	0,09	120,00
15		7,67	0,40	0,14	1,17	0,12	0,00	0,29	0,13	0,29	0,13	64,00
16		6,64	0,26	0,11	1,38	0,22	0,00	0,24	0,03	0,24	0,03	64,00
17		5,95	0,36	0,49	3,28	0,22	0,00	0,25	0,09	0,25	0,09	64,00
18	corridinho	6,98	0,32	0,19	1,37	0,13	0,00	0,26	0,14	0,26	0,14	64,00
19		5,08	0,50	0,44	1,87	0,15	0,00	0,29	0,06	0,29	0,06	120,00
20		5,75	0,29	0,17	0,95	0,22	0,00	0,24	0,12	0,24	0,12	64,00
21		8,26	0,44	0,13	1,38	0,19	0,00	0,32	0,11	0,32	0,11	64,00
22		6,00	0,28	0,17	0,95	0,22	0,00	0,24	0,11	0,24	0,11	64,00
23		6,38	0,28	0,12	1,38	0,19	0,00	0,24	0,03	0,24	0,03	64,00
24		7,58	0,44	0,15	0,95	0,12	0,00	0,32	0,12	0,32	0,12	120,00
25		6,25	0,46	0,24	3,05	0,08	0,01	0,41	0,26	0,41	0,26	120,00
26		5,64	0,29	0,14	0,90	0,22	0,00	0,25	0,15	0,25	0,15	120,00
27		12,63	0,23	0,08	0,84	0,12	0,00	0,19	0,22	0,19	0,22	64,00
28		6,80	0,29	0,12	0,93	0,20	0,00	0,25	0,13	0,25	0,13	64,00
29		7,24	0,27	0,14	1,18	0,06	0,01	0,23	0,09	0,23	0,09	64,00
30		4,99	0,51	0,26	1,64	0,12	0,00	0,37	0,24	0,37	0,24	120,00
31		5,22	0,47	0,19	1,87	0,22	0,00	0,38	0,14	0,38	0,14	64,00
32	chula	6,83	0,48	0,27	1,87	0,22	0,00	0,40	0,18	0,40	0,18	64,00
33		6,59	0,28	0,15	0,95	0,20	0,00	0,24	0,10	0,24	0,10	64,00
34		5,71	0,44	0,11	0,95	0,22	0,00	0,38	0,17	0,38	0,17	64,00
35		6,89	0,30	0,16	0,95	0,20	0,00	0,24	0,03	0,24	0,03	64,00
36		5,07	0,40	0,14	1,23	0,20	0,00	0,32	0,11	0,32	0,11	120,00
37		4,03	0,40	0,14	0,95	0,22	0,00	0,37	0,12	0,37	0,12	120,00
38		6,61	0,27	0,14	1,03	0,19	0,00	0,22	0,07	0,22	0,07	120,00
39		4,29	0,38	0,13	0,71	0,12	0,00	0,35	0,15	0,35	0,15	64,00
40		7,28	0,46	0,16	1,41	0,22	0,00	0,37	0,13	0,37	0,13	64,00
41		5,87	0,44	0,09	0,93	0,22	0,00	0,36	0,12	0,36	0,12	64,00
42		6,14	0,28	0,20	2,02	0,12	0,00	0,25	0,17	0,25	0,17	64,00
43		6,78	0,47	0,17	1,41	0,22	0,00	0,37	0,12	0,37	0,12	120,00
44		7,10	0,38	0,13	0,95	0,12	0,00	0,29	0,12	0,29	0,12	120,00
45		6,91	0,43	0,12	0,95	0,09	0,01	0,34	0,13	0,34	0,13	64,00
46		8,32	0,32	0,20	1,38	0,09	0,00	0,23	0,04	0,23	0,04	120,00
47		7,30	0,43	0,13	1,16	0,19	0,00	0,31	0,14	0,31	0,14	120,00
48		11,21	0,28	0,12	0,56	0,07	0,04	0,22	0,13	0,22	0,13	120,00
49		6,03	0,30	0,16	1,17	0,22	0,00	0,25	0,06	0,25	0,06	120,00
50		6,83	0,44	0,40	2,39	0,05	0,08	0,27	0,29	0,27	0,29	108,00
51	arpeggio	8,26	0,30	0,32	2,40	0,05	0,11	0,19	0,26	0,19	0,26	64,00
52		5,08	0,45	0,37	3,13	0,11	0,00	0,31	0,27	0,31	0,27	64,00
53		7,46	0,31	0,25	1,67	0,09	0,02	0,24	0,07	0,24	0,07	108,00
54		7,74	0,34	0,22	1,41	0,06	0,11	0,15	0,10	0,15	0,10	64,00
55		7,34	0,45	0,27	2,38	0,19	0,00	0,32	0,19	0,32	0,19	72,00
56		7,69	0,41	0,27	2,04	0,03	0,02	0,28	0,21	0,28	0,21	64,00
57		7,79	0,32	0,26	1,88	0,09	0,23	0,22	0,16	0,22	0,16	64,00
58		6,44	0,46	0,29	1,95	0,07	0,00	0,30	0,16	0,30	0,16	64,00
59		6,72	0,28	0,17	1,41	0,22	0,00	0,23	0,00	0,23	0,00	72,00
60		9,05	0,31	0,27	1,88	0,09	0,05	0,23	0,19	0,23	0,19	108,00
61		8,32	0,42	0,32	2,04	0,15	0,00	0,27	0,24	0,27	0,24	64,00
62	corridinho	9,22	0,41	0,27	2,35	0,01	0,01	0,27	0,16	0,27	0,16	64,00
63	corridinho	9,08	0,32	0,14	1,20	0,06	0,05	0,24	0,15	0,24	0,15	74,00
64		10,20	0,32	0,30	2,11	0,02	0,00	0,24	0,09	0,24	0,09	128,00
65		8,78	0,36	0,32	1,96	0,03	0,11	0,17	0,19	0,17	0,19	120,00
66	march	8,42	0,38	0,18	1,63	0,08	0,00	0,24	0,12	0,24	0,12	64,00
67		7,07	0,57	0,58	3,57	0,07	0,02	0,31	0,26	0,31	0,26	64,00
68	march	6,55	0,44	0,29	2,09	0,08	0,00	0,27	0,17	0,27	0,17	64,00
69		8,86	0,40	0,27	2,14	0,07	0,00	0,27	0,06	0,27	0,06	108,00
70	chula	6,83	0,42	0,23	2,33	0,06	0,02	0,32	0,14	0,32	0,14	64,00
71		9,62	0,39	0,32	2,28	0,10	0,00	0,28	0,09	0,28	0,09	91,00
72	hybrid	9,10	0,37	0,28	2,09	0,07	0,04	0,20	0,18	0,20	0,18	64,00
73		5,76	0,46	0,22	1,58	0,22	0,00	0,34	0,15	0,34	0,15	64,00
74		7,83	0,37	0,16	1,87	0,09	0,05	0,29	0,17	0,29	0,17	64,00
75	hybrid	6,80	0,40	0,23	2,31	0,08	0,02	0,29	0,20	0,29	0,20	64,00
76		7,94	0,50	0,35	2,09	0,20	0,00	0,30	0,11	0,30	0,11	64,00
77	hybrid	7,70	0,35	0,24	2,03	0,03	0,05	0,22	0,17	0,22	0,17	64,00
78		7,40	0,36	0,40	3,27	0,08	0,01	0,29	0,17	0,29	0,17	91,00
79		9,79	0,32	0,22	3,05	0,02	0,02	0,25	0,13	0,25	0,13	64,00
80		6,94	0,47	0,29	2,04	0,09	0,00	0,32	0,21	0,32	0,21	64,00
81		10,22	0,38	0,21	2,05	0,07	0,00	0,26	0,16	0,26	0,16	64,00
82		9,11	0,40	0,18	2,34	0,09	0,01	0,27	0,12	0,27	0,12	64,00
83	march	6,32	0,40	0,23	1,56	0,12	0,00	0,28	0,14	0,28	0,14	64,00
84		10,53	0,29	0,23	1,87	0,05	0,05	0,19	0,11	0,19	0,11	64,00
85		10,94	0,23	0,21	1,88	0,06	0,05	0,19	0,06	0,19	0,06	128,00
86		8,73	0,30	0,20	1,58	0,06	0,01	0,26	0,13	0,26	0,13	128,00
87		10,08	0,23	0,18	1,88	0,06	0,09	0,19	0,09	0,19	0,09	128,00
88	march	13,46	0,30	0,39	2,46	0,03	0,46	0,14	0,19	0,14	0,19	64,00
89	alberti	5,83	0,38	0,17	0,95	0,19	0,00	0,30	0,11	0,30	0,11	64,00
90	alberti	7,36	0,41	0,30	1,95	0,05	0,05	0,25	0,16	0,25	0,16	64,00
91		4,73	0,71	0,59	5,00	0,10	0,00	0,35	0,22	0,35	0,22	72,00
92	hybrid	10,32	0,23	0,09	0,87	0,08	0,02	0,18	0,08	0,18	0,08	108,00
93	corridinho	8,53	0,25	0,20	1,87	0,03	0,09	0,25	0,17	0,25	0,17	64,00
94		7,82	0,41	0,25	2,21	0,06	0,01	0,28	0,19	0,28	0,19	64,00
95	alberti	10,88	0,27	0,12	0,94	0,13	0,00	0,19	0,08	0,19	0,08	95,00
96		8,00	0,34	0,34	1,87	0,03	0,13	0,26	0,17	0,26	0,17	64,00
97	arpeggio	8,69	0,24	0,21	1,41	0,06	0,09	0,18	0,15	0,18	0,15	64,00
98		8,91	0,31	0,24	2,20	0,07	0,03	0,22	0,15	0,22	0,15	91,00
99		9,90	0,27	0,30	3,75	0,06	0,03	0,23	0,08	0,23	0,08	64,00
100		8,25	0,29	0,21	1,64	0,09	0,03	0,21	0,13	0,21	0,13	91,00

General Statistics on Fado

Fado Edition	Compound Or Simple Meter	Changes of Meter	Overall Dynamic Range	Variation of Dynamics	Variation of Dynamics In Each Voice	Average Note To Note Dynamics Change	Most Common Pitch Prevalence	Most Common Pitch Class Prevalence	Relative Strength of Top Pitches	Relative Strength of Top Pitch Classes
1	0,00	0,00	20,00	6,64	6,64	5,84	0,19	0,28	0,67	0,75
2	0,00	0,00	25,00	6,09	6,09	5,30	0,21	0,34	0,49	0,46
3	0,00	0,00	17,00	5,09	5,09	3,70	0,29	0,42	0,33	0,44
4	0,00	0,00	25,00	6,52	6,52	6,92	0,29	0,37	0,31	0,50
5	0,00	0,00	13,00	5,09	5,09	3,41	0,26	0,37	0,34	0,42
6	0,00	0,00	29,00	5,83	5,83	4,19	0,27	0,35	0,37	0,50
7	0,00	1,00	63,00	14,25	14,25	9,96	0,13	0,20	0,65	0,83
8	0,00	1,00	24,00	5,55	5,55	3,69	0,23	0,40	0,39	0,39
9	0,00	1,00	17,00	4,40	4,40	3,80	0,27	0,39	0,29	0,42
10	0,00	1,00	53,00	14,61	14,61	4,88	0,11	0,23	0,72	0,88
11	0,00	1,00	30,00	6,41	6,41	5,40	0,13	0,23	0,64	0,99
12	0,00	1,00	29,00	6,29	6,29	4,93	0,21	0,31	0,37	0,41
13	0,00	1,00	55,00	7,44	7,44	5,60	0,17	0,27	0,64	0,63
14	0,00	0,00	23,00	5,66	5,66	4,06	0,24	0,33	0,42	0,48
15	0,00	1,00	19,00	6,09	6,09	5,23	0,14	0,26	0,81	0,72
16	0,00	1,00	17,00	5,40	5,40	3,27	0,24	0,36	0,36	0,45
17	0,00	0,00	29,00	5,66	5,66	4,43	0,11	0,21	0,79	0,93
18	0,00	0,00	30,00	6,40	6,40	6,35	0,21	0,32	0,56	0,63
19	1,00	0,00	19,00	6,24	6,24	6,91	0,31	0,48	0,52	0,36
20	0,00	1,00	13,00	5,07	5,07	3,45	0,17	0,32	1,00	0,86
21	0,00	0,00	30,00	7,42	7,42	7,50	0,17	0,25	0,59	0,83
22	0,00	1,00	13,00	5,01	5,01	3,41	0,33	0,43	0,35	0,51
23	0,00	1,00	48,00	12,11	12,11	3,83	0,33	0,43	0,29	0,38
24	0,00	1,00	46,00	10,70	10,70	5,91	0,20	0,32	0,52	0,61
25	0,00	1,00	29,00	7,27	7,27	6,74	0,13	0,29	0,75	0,52
26	0,00	1,00	17,00	4,89	4,89	3,47	0,32	0,37	0,33	0,59
27	0,00	0,00	39,00	6,36	6,36	5,51	0,13	0,21	0,73	0,89
28	0,00	1,00	30,00	5,99	5,99	4,78	0,13	0,24	0,95	0,94
29	0,00	0,00	28,00	5,96	5,96	4,40	0,26	0,41	0,48	0,36
30	0,00	1,00	30,00	7,46	7,46	7,31	0,13	0,26	0,94	0,86
31	0,00	1,00	26,00	6,63	6,63	7,08	0,25	0,31	0,51	0,61
32	0,00	1,00	56,00	17,19	17,19	7,87	0,13	0,22	0,89	0,83
33	0,00	0,00	43,00	11,88	11,88	5,06	0,15	0,31	0,91	0,75
34	0,00	1,00	20,00	6,82	6,82	7,04	0,19	0,27	0,65	0,63
35	0,00	1,00	29,00	5,62	5,62	4,56	0,20	0,38	0,57	0,43
36	0,00	1,00	20,00	5,96	5,96	6,61	0,16	0,27	0,61	0,77
37	0,00	0,00	17,00	5,73	5,73	5,43	0,24	0,34	0,40	0,60
38	0,00	1,00	13,00	5,05	5,05	3,58	0,18	0,31	0,91	0,84
39	0,00	1,00	20,00	5,69	5,69	5,27	0,23	0,37	0,52	0,55
40	0,00	1,00	25,00	6,72	6,72	5,87	0,15	0,24	0,68	0,69
41	0,00	1,00	20,00	6,87	6,87	6,68	0,17	0,30	0,74	0,56
42	0,00	1,00	13,00	4,95	4,95	3,19	0,20	0,34	0,52	0,45
43	0,00	1,00	25,00	6,77	6,77	6,69	0,18	0,28	0,54	0,65
44	0,00	0,00	46,00	8,24	8,24	7,28	0,14	0,23	0,80	0,96
45	0,00	1,00	25,00	7,07	7,07	5,95	0,13	0,18	0,77	0,97
46	0,00	1,00	29,00	6,30	6,30	6,63	0,19	0,29	0,67	0,64
47	0,00	1,00	20,00	6,71	6,71	6,03	0,14	0,20	0,79	0,72
48	0,00	0,00	63,00	16,98	16,98	7,63	0,10	0,22	0,85	0,95
49	0,00	1,00	21,00	5,54	5,54	3,84	0,17	0,27	0,89	0,73
50	0,00	0,00	75,00	16,65	16,65	6,78	0,10	0,20	0,99	1,00
51	0,00	0,00	51,00	7,92	7,92	5,62	0,12	0,29	0,96	0,69
52	0,00	1,00	34,00	7,71	7,71	4,42	0,12	0,30	0,77	0,47
53	0,00	0,00	31,00	6,96	6,96	8,45	0,17	0,33	0,60	0,40
54	0,00	0,00	55,00	18,19	18,19	5,59	0,16	0,30	0,82	0,65
55	0,00	0,00	33,00	7,51	7,51	6,54	0,11	0,22	0,83	0,99
56	0,00	1,00	44,00	10,71	10,71	7,54	0,10	0,25	0,85	0,68
57	0,00	1,00	56,00	13,56	13,56	7,57	0,14	0,28	0,60	0,63
58	0,00	0,00	62,00	9,04	9,04	6,86	0,11	0,29	0,82	0,48
59	0,00	0,00	71,00	12,93	12,93	11,24	0,29	0,49	0,42	0,25
60	0,00	0,00	41,00	9,67	9,67	9,26	0,13	0,23	0,68	0,70
61	0,00	0,00	25,00	7,18	7,18	8,04	0,08	0,20	0,91	0,74
62	0,00	0,00	91,00	12,42	12,42	8,29	0,11	0,22	0,71	0,83
63	0,00	0,00	57,00	15,05	15,05	7,67	0,12	0,25	0,67	0,65
64	0,00	1,00	42,00	7,37	7,37	7,91	0,12	0,21	0,85	0,78
65	0,00	1,00	82,00	17,28	17,28	7,82	0,10	0,22	0,78	0,72
66	0,00	0,00	30,00	6,97	6,97	5,69	0,09	0,16	0,93	1,00
67	0,00	1,00	74,00	17,51	17,51	7,05	0,12	0,20	0,68	0,82
68	0,00	0,00	89,00	19,75	19,75	6,86	0,09	0,24	0,98	0,82
69	0,00	1,00	88,00	19,85	19,85	9,73	0,10	0,24	0,54	0,70
70	0,00	0,00	51,00	8,10	8,10	7,49	0,10	0,19	0,92	0,90
71	0,00	0,00	58,00	12,15	12,15	7,45	0,09	0,18	0,89	0,73
72	0,00	0,00	50,00	8,17	8,17	7,15	0,09	0,21	0,80	0,85
73	0,00	0,00	20,00	6,98	6,98	6,53	0,10	0,20	0,94	0,87
74	0,00	0,00	79,00	21,72	21,72	7,32	0,16	0,27	0,60	0,58
75	0,00	1,00	68,00	17,04	17,04	6,70	0,12	0,21	0,74	0,88
76	1,00	0,00	75,00	9,20	9,20	9,66	0,15	0,25	0,67	0,73
77	0,00	0,00	73,00	8,97	8,97	5,95	0,12	0,29	0,75	0,68
78	0,00	0,00	56,00	10,22	10,22	6,88	0,10	0,22	0,85	0,75
79	0,00	0,00	91,00	26,50	26,50	7,70	0,10	0,27	0,97	0,70
80	0,00	1,00	25,00	6,74	6,74	6,58	0,13	0,24	0,98	0,93
81	0,00	0,00	85,00	17,33	17,33	7,33	0,13	0,23	0,74	1,00
82	0,00	0,00	62,00	11,84	11,84	6,43	0,12	0,19	0,83	0,99
83	0,00	0,00	51,00	10,94	10,94	7,52	0,13	0,26	0,68	0,56
84	0,00	0,00	64,00	13,44	13,44	6,87	0,10	0,21	0,88	0,70
85	0,00	0,00	51,00	13,25	13,25	7,00	0,12	0,20	0,60	0,78
86	0,00	0,00	47,00	8,46	8,46	7,60	0,13	0,26	0,63	0,58
87	0,00	0,00	70,00	15,17	15,17	7,71	0,11	0,20	0,90	0,74
88	0,00	1,00	102,00	21,99	21,99	10,81	0,11	0,23	0,73	0,85
89	0,00	0,00	58,00	8,52	8,52	6,32	0,11	0,25	1,00	0,70
90	0,00	1,00	86,00	11,89	11,89	7,26	0,15	0,29	0,44	0,65
91	0,00	0,00	61,00	10,03	10,03	8,09	0,10	0,25	0,74	0,78
92	0,00	0,00	66,00	9,03	9,03	6,86	0,10	0,29	0,89	0,64
93	0,00	0,00	73,00	15,48	15,48	6,58	0,10	0,20	0,72	0,68
94	0,00	1,00	20,00	6,23	6,23	5,33	0,12	0,18	0,84	0,88
95	0,00	0,00	49,00	6,72	6,72	6,29	0,12	0,26	0,99	0,60
96	0,00	0,00	33,00	7,40	7,40	7,25	0,11	0,27	0,55	0,65
97	0,00	0,00	58,00	11,82	11,82	4,67	0,08	0,17	0,93	0,85
98	0,00	0,00	61,00	9,62	9,62	7,18	0,09	0,21	0,91	0,97
99	0,00	0,00	75,00	9,77	9,77	7,73	0,15	0,30	0,74	0,73
100	0,00	0,00	70,00	13,66	13,66	6,79	0,14	0,24	0,63	0,63

General Statistics on Fado

Fado Edition	Interval Between Strongest Pitches	Interval Between Strongest Pitch Classes	Number of Common Pitches	Pitch Variety	Pitch Class Variety	Range	Most Common Pitch	Primary Register	Importance of Bass Register	Importance of Middle Register	Importance of High Register	Most Common Pitch Class
1	5,00	7,00	5,00	18,00	8,00	41,00	0,45	63,00	0,26	0,40	0,34	9,00
2	12,00	5,00	2,00	27,00	11,00	41,00	0,47	63,00	0,12	0,70	0,19	0,00
3	7,00	7,00	3,00	27,00	8,00	46,00	0,45	61,00	0,28	0,49	0,24	9,00
4	7,00	5,00	1,00	17,00	8,00	39,00	0,41	56,00	0,60	0,29	0,12	4,00
5	24,00	5,00	1,00	17,00	8,00	39,00	0,41	58,00	0,55	0,29	0,16	4,00
6	2,00	5,00	3,00	21,00	9,00	36,00	0,47	59,00	0,16	0,84	0,00	0,00
7	4,00	4,00	1,00	34,00	12,00	51,00	0,41	60,00	0,35	0,51	0,14	5,00
8	12,00	8,00	2,00	23,00	9,00	41,00	0,48	62,00	0,13	0,74	0,13	2,00
9	7,00	5,00	1,00	21,00	10,00	38,00	0,38	55,00	0,55	0,37	0,08	0,00
10	7,00	5,00	1,00	31,00	7,00	55,00	0,41	60,00	0,46	0,28	0,25	5,00
11	7,00	7,00	1,00	21,00	7,00	40,00	0,45	60,00	0,32	0,52	0,16	9,00
12	12,00	2,00	1,00	26,00	11,00	34,00	0,48	65,00	0,05	0,73	0,22	2,00
13	5,00	3,00	3,00	31,00	10,00	46,00	0,45	60,00	0,27	0,62	0,12	10,00
14	3,00	9,00	3,00	26,00	9,00	38,00	0,45	60,00	0,25	0,64	0,11	9,00
15	7,00	7,00	2,00	22,00	9,00	38,00	0,41	59,00	0,36	0,50	0,13	4,00
16	2,00	2,00	1,00	27,00	7,00	49,00	0,45	60,00	0,28	0,57	0,14	9,00
17	5,00	5,00	1,00	26,00	7,00	45,00	0,42	58,00	0,41	0,49	0,09	6,00
18	5,00	7,00	2,00	17,00	8,00	34,00	0,46	61,00	0,20	0,79	0,01	11,00
19	12,00	7,00	2,00	18,00	7,00	41,00	0,45	61,00	0,13	0,81	0,06	10,00
20	1,00	7,00	4,00	14,00	7,00	29,00	0,48	61,00	0,17	0,78	0,05	9,00
21	3,00	7,00	3,00	21,00	7,00	45,00	0,45	59,00	0,29	0,63	0,09	9,00
22	17,00	7,00	2,00	15,00	7,00	34,00	0,43	58,00	0,33	0,61	0,05	7,00
23	7,00	4,00	3,00	21,00	10,00	36,00	0,41	55,00	0,66	0,29	0,05	4,00
24	10,00	5,00	4,00	21,00	9,00	37,00	0,39	58,00	0,30	0,61	0,09	2,00
25	24,00	5,00	2,00	23,00	8,00	42,00	0,39	60,00	0,29	0,58	0,13	2,00
26	17,00	7,00	2,00	18,00	8,00	32,00	0,45	60,00	0,25	0,54	0,22	9,00
27	5,00	4,00	3,00	26,00	10,00	40,00	0,46	59,00	0,31	0,66	0,03	11,00
28	5,00	5,00	3,00	27,00	11,00	38,00	0,39	57,00	0,44	0,51	0,05	2,00
29	12,00	5,00	2,00	37,00	11,00	55,00	0,48	66,00	0,04	0,65	0,31	2,00
30	5,00	7,00	2,00	28,00	11,00	43,00	0,45	61,00	0,20	0,67	0,14	9,00
31	3,00	3,00	4,00	20,00	7,00	41,00	0,45	60,00	0,26	0,53	0,21	9,00
32	21,00	5,00	2,00	24,00	9,00	40,00	0,39	60,00	0,29	0,60	0,11	2,00
33	5,00	7,00	3,00	24,00	10,00	39,00	0,43	58,00	0,32	0,66	0,03	0,00
34	2,00	5,00	3,00	17,00	8,00	33,00	0,41	56,00	0,61	0,33	0,06	5,00
35	12,00	2,00	2,00	28,00	9,00	42,00	0,46	62,00	0,21	0,69	0,11	11,00
36	5,00	7,00	3,00	19,00	7,00	34,00	0,43	59,00	0,23	0,71	0,06	7,00
37	22,00	5,00	2,00	17,00	7,00	36,00	0,41	61,00	0,37	0,48	0,15	4,00
38	5,00	7,00	3,00	18,00	9,00	29,00	0,45	61,00	0,18	0,77	0,05	9,00
39	20,00	5,00	4,00	14,00	7,00	37,00	0,41	61,00	0,37	0,41	0,23	4,00
40	5,00	7,00	3,00	28,00	8,00	45,00	0,45	60,00	0,16	0,73	0,10	10,00
41	3,00	9,00	3,00	25,00	10,00	32,00	0,47	61,00	0,16	0,75	0,09	0,00
42	2,00	2,00	3,00	17,00	8,00	31,00	0,43	58,00	0,31	0,68	0,01	7,00
43	3,00	7,00	4,00	26,00	8,00	50,00	0,43	59,00	0,28	0,65	0,08	7,00
44	5,00	2,00	5,00	21,00	10,00	35,00	0,44	60,00	0,27	0,68	0,05	8,00
45	4,00	8,00	2,00	31,00	8,00	50,00	0,47	61,00	0,19	0,69	0,12	0,00
46	9,00	9,00	3,00	16,00	8,00	26,00	0,48	65,00	0,05	0,84	0,12	2,00
47	7,00	7,00	3,00	21,00	8,00	34,00	0,41	58,00	0,27	0,73	0,01	4,00
48	19,00	5,00	1,00	32,00	9,00	48,00	0,43	62,00	0,24	0,55	0,21	7,00
49	7,00	5,00	2,00	20,00	10,00	32,00	0,48	61,00	0,17	0,72	0,11	2,00
50	5,00	5,00	2,00	47,00	12,00	58,00	0,41	62,00	0,24	0,55	0,21	4,00
51	12,00	5,00	2,00	24,00	7,00	53,00	0,49	59,00	0,25	0,67	0,09	3,00
52	24,00	5,00	2,00	32,00	11,00	41,00	0,38	56,00	0,50	0,43	0,07	0,00
53	2,00	2,00	2,00	26,00	9,00	48,00	0,43	56,00	0,45	0,54	0,01	7,00
54	9,00	5,00	3,00	23,00	8,00	36,00	0,39	57,00	0,35	0,61	0,04	2,00
55	5,00	7,00	2,00	32,00	9,00	48,00	0,45	62,00	0,27	0,40	0,33	9,00
56	7,00	2,00	1,00	30,00	9,00	46,00	0,50	65,00	0,13	0,62	0,25	4,00
57	5,00	5,00	1,00	43,00	12,00	46,00	0,41	61,00	0,27	0,51	0,22	4,00
58	12,00	5,00	2,00	39,00	12,00	44,00	0,47	65,00	0,13	0,57	0,29	0,00
59	12,00	2,00	2,00	25,00	11,00	32,00	0,45	59,00	0,24	0,71	0,05	9,00
60	2,00	7,00	1,00	33,00	11,00	41,00	0,45	56,00	0,37	0,60	0,03	9,00
61	10,00	3,00	0,00	40,00	12,00	53,00	0,51	60,00	0,27	0,66	0,07	7,00
62	12,00	7,00	1,00	43,00	10,00	55,00	0,45	58,00	0,33	0,53	0,14	9,00
63	5,00	7,00	1,00	43,00	12,00	53,00	0,43	62,00	0,21	0,62	0,17	7,00
64	2,00	7,00	2,00	44,00	12,00	53,00	0,45	59,00	0,27	0,66	0,07	9,00
65	2,00	2,00	1,00	48,00	12,00	60,00	0,46	64,00	0,19	0,51	0,30	11,00
66	14,00	5,00	1,00	32,00	11,00	41,00	0,41	61,00	0,20	0,68	0,11	2,00
67	5,00	5,00	1,00	31,00	12,00	48,00	0,39	59,00	0,29	0,63	0,07	2,00
68	7,00	7,00	0,00	39,00	12,00	46,00	0,46	61,00	0,30	0,55	0,15	11,00
69	7,00	5,00	1,00	49,00	12,00	60,00	0,47	62,00	0,24	0,58	0,18	0,00
70	5,00	7,00	2,00	36,00	12,00	48,00	0,45	60,00	0,24	0,66	0,11	2,00
71	12,00	5,00	0,00	41,00	12,00	50,00	0,42	59,00	0,31	0,62	0,07	6,00
72	5,00	5,00	1,00	40,00	12,00	50,00	0,48	61,00	0,21	0,69	0,10	2,00
73	5,00	5,00	2,00	32,00	10,00	41,00	0,41	61,00	0,26	0,59	0,15	9,00
74	12,00	5,00	2,00	27,00	10,00	41,00	0,41	57,00	0,40	0,58	0,01	4,00
75	16,00	8,00	1,00	29,00	10,00	48,00	0,57	62,00	0,23	0,53	0,24	1,00
76	10,00	2,00	2,00	24,00	9,00	41,00	0,52	72,00	0,00	0,49	0,51	7,00
77	12,00	5,00	1,00	40,00	12,00	65,00	0,48	60,00	0,26	0,62	0,12	2,00
78	3,00	9,00	1,00	35,00	11,00	44,00	0,48	58,00	0,31	0,65	0,04	2,00
79	12,00	5,00	2,00	46,00	12,00	55,00	0,50	63,00	0,20	0,61	0,20	4,00
80	5,00	7,00	2,00	31,00	10,00	41,00	0,48	61,00	0,21	0,66	0,13	9,00
81	7,00	7,00	2,00	30,00	9,00	48,00	0,45	59,00	0,31	0,62	0,06	2,00
82	9,00	5,00	2,00	35,00	8,00	60,00	0,39	58,00	0,33	0,62	0,04	7,00
83	2,00	8,00	1,00	31,00	9,00	44,00	0,47	60,00	0,26	0,61	0,12	0,00
84	2,00	7,00	1,00	35,00	11,00	48,00	0,52	61,00	0,20	0,74	0,06	9,00
85	5,00	7,00	1,00	43,00	11,00	52,00	0,47	57,00	0,37	0,54	0,09	0,00
86	5,00	2,00	1,00	40,00	11,00	45,00	0,45	57,00	0,36	0,60	0,04	9,00
87	5,00	5,00	2,00	37,00	12,00	48,00	0,43	57,00	0,31	0,68	0,01	7,00
88	7,00	7,00	1,00	48,00	12,00	67,00	0,58	68,00	0,12	0,40	0,48	9,00
89	9,00	3,00	2,00	28,00	8,00	48,00	0,43	60,00	0,26	0,63	0,11	4,00
90	5,00	5,00	1,00	39,00	12,00	45,00	0,41	60,00	0,33	0,51	0,15	4,00
91	24,00	5,00	1,00	50,00	12,00	63,00	0,52	59,00	0,36	0,51	0,13	7,00
92	12,00	5,00	1,00	33,00	10,00	53,00	0,38	61,00	0,29	0,53	0,18	0,00
93	12,00	7,00	1,00	44,00	12,00	50,00	0,45	62,00	0,23	0,60	0,16	9,00
94	3,00	5,00	4,00	31,00	12,00	37,00	0,48	61,00	0,15	0,77	0,08	4,00
95	12,00	5,00	2,00	32,00	11,00	40,00	0,50	59,00	0,30	0,68	0,02	4,00
96	17,00	7,00	1,00	29,00	9,00	48,00	0,45	65,00	0,20	0,45	0,36	9,00
97	5,00	7,00	0,00	45,00	12,00	50,00	0,45	59,00	0,30	0,60	0,10	9,00
98	10,00	5,00	0,00	40,00	12,00	46,00	0,41	57,00	0,34	0,62	0,04	4,00
99	12,00	7,00	3,00	31,00	10,00	43,00	0,43	57,00	0,34	0,65	0,01	7,00
100	2,00	7,00	2,00	33,00	12,00	38,00	0,43	57,00	0,34	0,66	0,00	7,00

General Statistics on Fado

Fado Edition	Dominant Spread	Strong Tonal Centres	Average Melodic Interval	Most Common Melodic Interval	Distance Between Most Common Melodic Intervals	Most Common Melodic Interval Prevalence	Relative Strength of Most Common Intervals	Number of Common Melodic Intervals	Amount of Arpeggiation	Repeated Notes	Chromatic Motion	Stepwise Motion	Melodic Thirds
1	3,00	3,00	13,55	12,00	11,00	0,18	0,71	3,00	0,29	0,00	0,13	0,22	0,05
2	4,00	1,00	10,14	12,00	10,00	0,12	0,83	2,00	0,46	0,04	0,06	0,16	0,12
3	4,00	2,00	13,19	7,00	2,00	0,16	0,66	4,00	0,40	0,00	0,00	0,08	0,09
4	4,00	2,00	11,29	5,00	2,00	0,17	0,91	4,00	0,38	0,00	0,00	0,08	0,15
5	4,00	2,00	14,63	12,00	12,00	0,15	1,00	3,00	0,38	0,00	0,00	0,06	0,06
6	4,00	1,00	7,45	7,00	2,00	0,17	0,93	5,00	0,55	0,01	0,00	0,09	0,17
7	3,00	3,00	11,88	12,00	12,00	0,15	0,65	2,00	0,47	0,04	0,02	0,05	0,12
8	4,00	3,00	10,22	7,00	5,00	0,15	1,00	4,00	0,56	0,01	0,00	0,06	0,11
9	3,00	2,00	17,50	24,00	7,00	0,12	0,78	2,00	0,23	0,00	0,02	0,09	0,07
10	4,00	2,00	17,93	5,00	1,00	0,13	0,91	3,00	0,33	0,00	0,00	0,00	0,13
11	4,00	2,00	9,97	4,00	8,00	0,16	0,97	3,00	0,51	0,01	0,05	0,08	0,27
12	6,00	2,00	8,80	5,00	2,00	0,15	0,97	4,00	0,55	0,01	0,00	0,05	0,17
13	2,00	3,00	8,06	2,00	1,00	0,21	0,60	3,00	0,44	0,05	0,05	0,26	0,24
14	6,00	2,00	9,87	5,00	2,00	0,14	0,95	4,00	0,52	0,01	0,00	0,07	0,14
15	3,00	2,00	10,43	2,00	1,00	0,15	0,82	3,00	0,27	0,01	0,13	0,28	0,07
16	4,00	3,00	12,42	3,00	4,00	0,14	0,83	4,00	0,51	0,00	0,00	0,05	0,15
17	7,00	2,00	9,56	3,00	1,00	0,17	0,90	3,00	0,49	0,00	0,00	0,02	0,32
18	4,00	2,00	7,72	12,00	7,00	0,17	0,78	5,00	0,56	0,01	0,04	0,14	0,17
19	2,00	2,00	7,76	5,00	7,00	0,18	0,96	5,00	0,57	0,02	0,02	0,11	0,20
20	2,00	2,00	8,88	12,00	8,00	0,24	0,55	3,00	0,60	0,00	0,03	0,03	0,15
21	3,00	2,00	10,89	12,00	5,00	0,13	0,85	2,00	0,42	0,03	0,04	0,12	0,06
22	3,00	1,00	11,66	12,00	5,00	0,18	0,83	3,00	0,50	0,00	0,00	0,05	0,09
23	2,00	2,00	12,54	7,00	3,00	0,14	0,97	3,00	0,41	0,00	0,00	0,06	0,13
24	4,00	2,00	7,55	7,00	2,00	0,14	0,98	5,00	0,49	0,05	0,11	0,23	0,04
25	4,00	2,00	10,57	3,00	2,00	0,11	0,84	2,00	0,53	0,02	0,10	0,14	0,20
26	4,00	1,00	10,52	5,00	2,00	0,13	1,00	5,00	0,36	0,02	0,00	0,11	0,10
27	4,00	3,00	10,89	1,00	6,00	0,14	0,72	2,00	0,32	0,01	0,14	0,21	0,05
28	3,00	2,00	11,99	12,00	3,00	0,19	0,65	2,00	0,42	0,01	0,01	0,02	0,08
29	4,00	2,00	10,42	12,00	5,00	0,16	0,96	3,00	0,51	0,00	0,04	0,11	0,13
30	3,00	2,00	11,05	12,00	9,00	0,13	0,88	3,00	0,53	0,02	0,05	0,10	0,15
31	3,00	2,00	12,12	3,00	9,00	0,12	0,92	3,00	0,44	0,00	0,05	0,15	0,18
32	4,00	2,00	9,77	2,00	5,00	0,12	1,00	3,00	0,42	0,03	0,04	0,16	0,08
33	2,00	2,00	10,82	7,00	1,00	0,15	0,91	4,00	0,47	0,01	0,01	0,02	0,03
34	4,00	3,00	11,17	4,00	2,00	0,11	0,89	3,00	0,45	0,06	0,05	0,15	0,18
35	3,00	2,00	9,19	7,00	5,00	0,17	1,00	5,00	0,56	0,00	0,00	0,02	0,13
36	4,00	2,00	10,52	7,00	12,00	0,16	0,62	2,00	0,46	0,00	0,02	0,09	0,14
37	4,00	3,00	14,92	17,00	13,00	0,10	0,88	1,00	0,27	0,01	0,04	0,09	0,12
38	3,00	2,00	8,96	12,00	5,00	0,15	0,84	4,00	0,56	0,03	0,00	0,08	0,17
39	4,00	2,00	16,48	19,00	17,00	0,13	0,73	3,00	0,19	0,00	0,06	0,16	0,06
40	4,00	2,00	11,19	9,00	3,00	0,12	0,91	3,00	0,32	0,00	0,07	0,17	0,06
41	3,00	2,00	12,10	12,00	11,00	0,11	0,78	1,00	0,41	0,02	0,09	0,12	0,05
42	5,00	2,00	10,26	7,00	2,00	0,16	0,74	3,00	0,52	0,00	0,01	0,04	0,12
43	3,00	2,00	11,55	7,00	5,00	0,11	1,00	2,00	0,45	0,01	0,06	0,09	0,13
44	3,00	3,00	10,00	1,00	1,00	0,23	0,38	1,00	0,34	0,05	0,23	0,31	0,09
45	4,00	3,00	9,09	2,00	1,00	0,13	0,90	3,00	0,34	0,02	0,12	0,25	0,14
46	6,00	3,00	7,25	9,00	2,00	0,19	0,83	4,00	0,56	0,00	0,00	0,06	0,22
47	7,00	2,00	7,34	2,00	2,00	0,13	0,85	4,00	0,49	0,11	0,04	0,18	0,11
48	4,00	2,00	10,53	2,00	1,00	0,14	0,96	3,00	0,33	0,02	0,14	0,28	0,07
49	3,00	2,00	9,34	7,00	1,00	0,20	0,97	3,00	0,51	0,03	0,00	0,04	0,12
50	4,00	2,00	9,79	2,00	1,00	0,16	0,72	2,00	0,32	0,07	0,11	0,27	0,10
51	3,00	2,00	8,72	12,00	10,00	0,16	0,88	3,00	0,57	0,04	0,02	0,16	0,20
52	3,00	2,00	10,76	5,00	7,00	0,12	0,92	3,00	0,43	0,03	0,04	0,11	0,18
53	3,00	3,00	10,88	12,00	10,00	0,18	0,64	2,00	0,43	0,00	0,04	0,16	0,08
54	4,00	2,00	7,67	5,00	1,00	0,15	0,94	4,00	0,52	0,02	0,03	0,08	0,24
55	4,00	3,00	13,57	12,00	9,00	0,14	0,71	2,00	0,39	0,03	0,07	0,16	0,13
56	4,00	3,00	7,39	12,00	10,00	0,10	0,92	4,00	0,48	0,09	0,07	0,16	0,14
57	3,00	2,00	9,73	4,00	3,00	0,11	0,85	2,00	0,46	0,04	0,04	0,09	0,17
58	3,00	1,00	10,95	1,00	2,00	0,19	0,53	2,00	0,34	0,01	0,19	0,24	0,15
59	3,00	2,00	9,91	12,00	5,00	0,27	0,42	2,00	0,60	0,00	0,00	0,06	0,09
60	4,00	2,00	8,30	12,00	9,00	0,15	0,77	3,00	0,58	0,04	0,04	0,11	0,23
61	7,00	3,00	8,22	2,00	1,00	0,11	0,94	4,00	0,41	0,05	0,05	0,17	0,20
62	4,00	3,00	9,84	0,00	3,00	0,13	0,87	2,00	0,57	0,13	0,02	0,09	0,19
63	3,00	2,00	10,74	12,00	10,00	0,13	0,68	1,00	0,48	0,06	0,05	0,14	0,12
64	4,00	2,00	10,00	3,00	1,00	0,09	0,96	0,00	0,38	0,01	0,03	0,11	0,16
65	3,00	3,00	10,18	3,00	1,00	0,17	0,71	3,00	0,47	0,01	0,02	0,12	0,29
66	6,00	1,00	7,38	1,00	2,00	0,20	0,42	1,00	0,40	0,08	0,20	0,26	0,12
67	3,00	2,00	8,43	7,00	3,00	0,11	0,92	3,00	0,46	0,02	0,07	0,15	0,19
68	2,00	2,00	10,11	3,00	2,00	0,14	0,98	3,00	0,47	0,01	0,00	0,08	0,27
69	4,00	2,00	11,18	1,00	11,00	0,09	0,96	1,00	0,35	0,02	0,09	0,17	0,08
70	6,00	2,00	8,73	2,00	5,00	0,14	0,74	2,00	0,40	0,02	0,08	0,22	0,13
71	6,00	1,00	12,45	12,00	7,00	0,12	0,69	1,00	0,34	0,02	0,06	0,14	0,06
72	4,00	1,00	7,98	3,00	2,00	0,14	0,84	4,00	0,48	0,02	0,05	0,09	0,26
73	4,00	2,00	9,14	2,00	1,00	0,14	0,84	4,00	0,40	0,06	0,12	0,25	0,06
74	4,00	2,00	8,90	2,00	5,00	0,09	0,94	1,00	0,40	0,04	0,05	0,14	0,14
75	4,00	2,00	9,47	12,00	12,00	0,13	0,82	4,00	0,42	0,11	0,10	0,19	0,12
76	4,00	3,00	7,97	10,00	5,00	0,11	0,89	3,00	0,44	0,00	0,08	0,13	0,16
77	3,00	1,00	7,27	3,00	1,00	0,19	0,61	4,00	0,52	0,05	0,07	0,16	0,30
78	6,00	3,00	10,14	10,00	3,00	0,11	0,91	3,00	0,50	0,01	0,07	0,17	0,12
79	3,00	3,00	10,50	12,00	10,00	0,09	0,94	1,00	0,40	0,03	0,06	0,15	0,12
80	3,00	1,00	8,99	1,00	6,00	0,12	0,76	2,00	0,42	0,01	0,12	0,21	0,13
81	4,00	1,00	9,19	7,00	2,00	0,11	0,90	4,00	0,45	0,09	0,04	0,07	0,12
82	3,00	2,00	10,70	2,00	8,00	0,16	0,49	1,00	0,34	0,05	0,03	0,20	0,08
83	4,00	2,00	9,50	4,00	1,00	0,11	0,79	1,00	0,48	0,07	0,01	0,05	0,20
84	4,00	2,00	8,28	2,00	3,00	0,17	0,72	2,00	0,32	0,03	0,08	0,25	0,10
85	6,00	2,00	11,74	2,00	1,00	0,10	0,95	2,00	0,38	0,01	0,06	0,15	0,14
86	2,00	3,00	11,93	12,00	5,00	0,15	0,65	2,00	0,51	0,01	0,02	0,08	0,11
87	4,00	2,00	10,07	2,00	3,00	0,13	0,61	1,00	0,32	0,01	0,07	0,19	0,10
88	4,00	1,00	9,14	12,00	6,00	0,15	0,96	3,00	0,48	0,03	0,02	0,05	0,14
89	6,00	2,00	9,38	12,00	8,00	0,12	0,91	3,00	0,55	0,02	0,02	0,12	0,19
90	3,00	1,00	11,73	12,00	7,00	0,13	0,80	2,00	0,42	0,05	0,04	0,10	0,11
91	3,00	1,00	12,29	2,00	1,00	0,17	0,63	2,00	0,28	0,02	0,11	0,27	0,11
92	3,00	2,00	12,95	12,00	10,00	0,13	0,66	1,00	0,39	0,03	0,05	0,14	0,06
93	5,00	2,00	8,04	2,00	1,00	0,15	0,73	3,00	0,41	0,05	0,11	0,26	0,14
94	4,00	2,00	6,79	2,00	1,00	0,12	0,90	4,00	0,40	0,10	0,10	0,22	0,15
95	3,00	1,00	9,07	5,00	4,00	0,11	1,00	4,00	0,41	0,01	0,06	0,11	0,15
96	4,00	2,00	8,91	2,00	1,00	0,28	0,30	1,00	0,36	0,00	0,08	0,36	0,10
97	7,00	2,00	8,42	3,00	1,00	0,19	0,69	3,00	0,52	0,02	0,02	0,05	0,32
98	4,00	1,00	11,84	0,00	2,00	0,10	0,80	1,00	0,35	0,10	0,05	0,13	0,07
99	3,00	2,00	10,59	12,00	3,00	0,18	0,60	2,00	0,48	0,00	0,02	0,03	0,14
100	4,00	1,00	9,22	2,00	1,00	0,14	0,81	2,00	0,41	0,05	0,06	0,20	0,16

General Statistics on Fado

Fado Edition	Melodic Fifths	Melodic Tritones	Melodic Octaves	Direction of Motion	Duration of Melodic Arcs	Size of Melodic Arcs	Melodies Corpus Note Density	Melodies Corpus Average Note Duration	Melodies Corpus Variability of Note Duration	Melodies Corpus Maximum Note Duration	Melodies Corpus Minimum Note Duration	Melodies Corpus Staccato Incidence	Melodies Corpus Average Time Between Attacks
1	0,00	0,00	0,18	0,86	3,84	51,56	2,90	0,31	0,13	0,69	0,11	0,00	0,33
2	0,06	0,00	0,12	0,75	1,99	20,84	2,74	0,32	0,13	0,95	0,22	0,00	0,35
3	0,16	0,00	0,10	0,90	5,30	69,74	2,07	0,40	0,15	0,95	0,22	0,00	0,47
4	0,15	0,00	0,04	0,65	2,45	27,40	1,87	0,47	0,37	1,38	0,22	0,00	0,50
5	0,10	0,00	0,15	0,92	5,96	50,23	1,98	0,46	0,25	1,06	0,25	0,00	0,48
6	0,17	0,02	0,12	0,82	2,75	20,60	1,97	0,46	0,35	2,41	0,22	0,00	0,49
7	0,06	0,06	0,15	0,63	1,61	19,81	2,12	0,43	0,21	1,38	0,22	0,00	0,47
8	0,15	0,02	0,15	0,87	3,88	40,02	2,48	0,34	0,17	0,95	0,19	0,00	0,39
9	0,07	0,00	0,04	0,88	4,24	74,10	3,42	0,27	0,16	0,74	0,09	0,04	0,29
10	0,02	0,02	0,10	0,88	4,44	79,46	2,55	0,35	0,19	0,93	0,19	0,00	0,38
11	0,03	0,00	0,16	0,93	7,60	75,17	2,18	0,39	0,17	0,74	0,20	0,00	0,44
12	0,14	0,04	0,06	0,82	2,72	23,89	2,26	0,36	0,12	0,53	0,11	0,00	0,43
13	0,01	0,00	0,05	0,70	2,43	20,57	2,24	0,41	0,30	1,40	0,09	0,01	0,42
14	0,13	0,00	0,12	0,85	3,35	33,20	2,03	0,41	0,16	1,38	0,22	0,00	0,46
15	0,13	0,02	0,02	0,62	1,41	14,76	2,94	0,32	0,20	1,17	0,09	0,01	0,33
16	0,12	0,00	0,11	0,87	3,86	48,07	2,58	0,32	0,11	0,48	0,22	0,00	0,37
17	0,04	0,04	0,04	0,88	4,38	41,72	2,19	0,40	0,20	1,17	0,22	0,00	0,43
18	0,11	0,02	0,17	0,76	2,56	19,78	2,78	0,33	0,22	1,17	0,13	0,00	0,34
19	0,09	0,00	0,17	0,80	2,86	20,32	2,64	0,32	0,14	0,53	0,12	0,00	0,36
20	0,09	0,03	0,24	0,81	2,67	23,56	1,88	0,44	0,26	0,95	0,22	0,00	0,46
21	0,11	0,06	0,13	0,61	1,81	20,17	2,16	0,39	0,23	1,38	0,19	0,00	0,43
22	0,15	0,00	0,18	0,87	3,98	46,35	2,06	0,41	0,24	0,95	0,22	0,00	0,46
23	0,14	0,00	0,09	0,86	3,59	44,89	2,11	0,39	0,17	1,38	0,19	0,00	0,46
24	0,14	0,02	0,13	0,77	2,24	17,63	2,39	0,39	0,26	0,95	0,07	0,07	0,40
25	0,09	0,05	0,05	0,67	1,98	21,29	2,25	0,37	0,19	0,84	0,20	0,00	0,41
26	0,13	0,02	0,07	0,83	3,10	33,00	2,00	0,42	0,18	0,90	0,22	0,00	0,45
27	0,10	0,00	0,04	0,71	3,48	38,19	4,82	0,20	0,10	0,61	0,10	0,00	0,19
28	0,04	0,02	0,19	0,91	5,68	68,50	2,35	0,37	0,16	0,93	0,20	0,00	0,40
29	0,15	0,00	0,16	0,83	3,33	34,72	2,49	0,30	0,18	1,18	0,09	0,02	0,39
30	0,11	0,01	0,13	0,71	1,96	22,01	1,88	0,43	0,28	1,64	0,07	0,02	0,50
31	0,03	0,00	0,11	0,72	1,80	21,74	1,90	0,43	0,18	0,95	0,22	0,00	0,50
32	0,12	0,04	0,09	0,81	3,06	29,65	2,13	0,42	0,20	0,98	0,22	0,00	0,45
33	0,15	0,04	0,13	0,85	3,45	37,40	2,06	0,41	0,21	1,38	0,20	0,00	0,45
34	0,06	0,00	0,09	0,87	3,82	45,46	2,00	0,41	0,19	0,95	0,22	0,00	0,47
35	0,17	0,00	0,17	0,90	4,96	45,62	2,20	0,43	0,21	0,95	0,20	0,00	0,44
36	0,16	0,04	0,07	0,72	1,80	18,78	2,25	0,41	0,21	1,23	0,20	0,00	0,41
37	0,01	0,00	0,06	0,83	2,96	43,12	2,00	0,41	0,16	0,95	0,22	0,00	0,47
38	0,13	0,02	0,15	0,74	1,98	18,24	2,25	0,41	0,17	1,03	0,20	0,00	0,41
39	0,01	0,00	0,02	0,82	3,07	49,78	2,19	0,37	0,15	0,71	0,09	0,06	0,43
40	0,02	0,09	0,11	0,70	2,17	24,17	2,06	0,43	0,23	1,15	0,22	0,00	0,46
41	0,04	0,00	0,11	0,67	1,72	21,24	2,06	0,41	0,15	0,93	0,22	0,00	0,46
42	0,16	0,00	0,11	0,85	3,29	33,61	2,36	0,35	0,22	1,48	0,09	0,04	0,40
43	0,11	0,06	0,11	0,68	1,80	20,97	1,97	0,46	0,25	1,38	0,22	0,00	0,48
44	0,02	0,00	0,08	0,66	1,71	17,92	3,13	0,28	0,15	0,95	0,09	0,08	0,30
45	0,03	0,03	0,11	0,70	1,89	17,43	2,42	0,36	0,17	0,93	0,09	0,03	0,39
46	0,16	0,00	0,08	0,79	2,46	17,71	2,29	0,41	0,25	1,38	0,09	0,01	0,41
47	0,05	0,04	0,11	0,77	2,16	17,84	2,29	0,39	0,22	1,16	0,19	0,00	0,41
48	0,02	0,03	0,09	0,77	2,35	22,91	4,75	0,20	0,10	0,56	0,09	0,09	0,20
49	0,20	0,02	0,05	0,89	4,58	43,74	2,13	0,40	0,17	0,95	0,22	0,00	0,44
50	0,04	0,02	0,02	0,59	2,39	25,22	2,22	0,35	0,31	1,67	0,07	0,22	0,43
51	0,06	0,03	0,16	0,67	2,08	18,69	2,63	0,31	0,35	1,88	0,05	0,26	0,37
52	0,05	0,04	0,11	0,86	3,67	39,85	2,11	0,43	0,31	1,64	0,19	0,00	0,45
53	0,06	0,04	0,18	0,63	1,60	17,32	2,44	0,38	0,44	1,67	0,09	0,07	0,39
54	0,09	0,06	0,09	0,77	2,37	18,13	1,94	0,45	0,37	1,41	0,11	0,00	0,48
55	0,04	0,01	0,14	0,70	1,84	25,58	2,09	0,45	0,37	2,38	0,19	0,00	0,46
56	0,09	0,05	0,10	0,66	2,03	16,25	2,55	0,37	0,29	1,63	0,10	0,03	0,37
57	0,09	0,05	0,07	0,75	2,74	27,74	2,02	0,44	0,34	1,88	0,09	0,04	0,48
58	0,03	0,00	0,05	0,70	2,06	22,58	2,84	0,32	0,24	1,41	0,07	0,02	0,34
59	0,11	0,02	0,27	0,91	5,74	52,38	1,81	0,48	0,29	1,41	0,22	0,00	0,52
60	0,04	0,07	0,15	0,60	1,76	15,20	2,56	0,34	0,41	2,00	0,09	0,17	0,38
61	0,07	0,07	0,03	0,62	1,69	14,48	2,92	0,31	0,28	1,48	0,22	0,00	0,33
62	0,08	0,01	0,08	0,74	2,56	28,89	2,15	0,45	0,46	2,35	0,06	0,06	0,45
63	0,05	0,03	0,13	0,70	1,89	21,36	3,08	0,28	0,17	1,20	0,06	0,02	0,32
64	0,08	0,08	0,04	0,59	1,92	19,23	2,06	0,46	0,49	2,11	0,15	0,00	0,48
65	0,03	0,03	0,07	0,69	2,24	23,07	1,86	0,48	0,38	2,02	0,12	0,00	0,52
66	0,08	0,04	0,07	0,71	2,49	19,71	2,89	0,29	0,27	1,56	0,09	0,01	0,32
67	0,11	0,04	0,09	0,63	2,24	19,11	2,54	0,37	0,44	3,22	0,07	0,03	0,37
68	0,05	0,01	0,06	0,83	3,42	34,49	1,87	0,49	0,30	2,09	0,20	0,00	0,51
69	0,06	0,02	0,09	0,65	2,02	22,80	2,08	0,45	0,36	1,38	0,09	0,01	0,46
70	0,11	0,02	0,08	0,60	2,87	25,27	2,58	0,35	0,34	1,87	0,06	0,06	0,38
71	0,03	0,01	0,12	0,70	1,96	24,73	2,20	0,43	0,47	1,96	0,10	0,00	0,45
72	0,05	0,05	0,08	0,78	2,42	19,35	1,98	0,47	0,31	2,09	0,07	0,02	0,48
73	0,09	0,02	0,10	0,72	2,21	20,90	2,05	0,43	0,31	1,45	0,22	0,00	0,47
74	0,09	0,07	0,06	0,69	1,83	16,86	2,73	0,28	0,21	1,18	0,09	0,16	0,35
75	0,03	0,04	0,13	0,76	2,20	22,27	2,52	0,35	0,20	0,78	0,08	0,11	0,38
76	0,10	0,09	0,04	0,71	1,73	13,45	2,78	0,34	0,18	1,01	0,20	0,00	0,33
77	0,05	0,01	0,06	0,70	2,45	18,63	3,31	0,28	0,22	1,41	0,05	0,09	0,29
78	0,10	0,04	0,07	0,51	2,78	28,22	1,93	0,49	0,73	3,27	0,10	0,01	0,50
79	0,07	0,05	0,09	0,66	1,83	19,61	2,02	0,46	0,50	3,75	0,12	0,00	0,48
80	0,09	0,04	0,09	0,64	1,82	16,34	2,00	0,42	0,37	1,45	0,09	0,03	0,47
81	0,11	0,06	0,10	0,63	1,64	16,49	2,77	0,33	0,24	2,05	0,19	0,00	0,34
82	0,04	0,05	0,04	0,71	2,15	23,60	2,43	0,38	0,30	1,64	0,09	0,03	0,41
83	0,06	0,05	0,04	0,77	2,50	24,43	2,00	0,42	0,27	1,45	0,09	0,02	0,46
84	0,06	0,02	0,04	0,59	2,06	17,44	4,18	0,21	0,19	1,17	0,06	0,18	0,23
85	0,08	0,04	0,06	0,60	2,85	33,62	3,07	0,31	0,35	1,88	0,06	0,18	0,32
86	0,10	0,00	0,15	0,76	2,61	31,12	2,55	0,36	0,24	1,59	0,06	0,05	0,39
87	0,07	0,07	0,06	0,61	2,61	26,21	3,14	0,31	0,32	1,88	0,06	0,26	0,31
88	0,07	0,14	0,15	0,70	1,69	15,97	5,03	0,18	0,37	4,97	0,05	0,70	0,17
89	0,09	0,04	0,12	0,77	2,72	25,74	2,02	0,39	0,21	0,95	0,19	0,00	0,48
90	0,07	0,02	0,13	0,78	2,61	31,88	2,28	0,44	0,31	1,63	0,12	0,00	0,42
91	0,06	0,01	0,02	0,58	2,07	25,81	1,73	0,57	0,60	3,74	0,19	0,00	0,56
92	0,08	0,00	0,13	0,81	3,41	45,63	4,97	0,19	0,10	0,87	0,08	0,01	0,19
93	0,04	0,04	0,08	0,69	2,32	19,49	2,85	0,30	0,28	1,63	0,05	0,13	0,34
94	0,04	0,07	0,07	0,67	2,14	16,14	3,12	0,29	0,28	2,11	0,06	0,04	0,32
95	0,07	0,02	0,11	0,74	2,12	19,12	2,98	0,32	0,18	0,94	0,17	0,00	0,32
96	0,05	0,01	0,08	0,68	1,88	16,74	1,73	0,55	0,42	1,87	0,10	0,02	0,55
97	0,05	0,03	0,07	0,75	3,04	24,92	2,10	0,45	0,34	1,41	0,20	0,00	0,45
98	0,03	0,02	0,07	0,73	1,91	24,94	3,40	0,26	0,22	1,80	0,08	0,11	0,29
99	0,08	0,03	0,18	0,80	2,46	26,04	2,32	0,39	0,55	3,75	0,13	0,00	0,42
100	0,03	0,06	0,09	0,54	2,27	21,72	3,17	0,31	0,33	1,62	0,09	0,05	0,31

General Statistics on Fado

Fado Edition	Melodies Corpus Variability of Time Between Attacks	Melodies Corpus Average Time Between Attacks For Each Voice	Melodies Corpus Average Variability of Time Between Attacks For Each Voice	Melodies Corpus Initial Tempo	Melodies Corpus Overall Dynamic Range	Melodies Corpus Variation of Dynamics	Melodies Corpus Variation of Dynamics In Each Voice	Melodies Corpus Average Note To Note Dynamics Change	Melodies Corpus Most Common Pitch Prevalence	Melodies Corpus Most Common Pitch Class Prevalence	Melodies Corpus Relative Strength of Top Pitches	Melodies Corpus Relative Strength of Top Pitch Classes
1	0,14	0,33	0,14	64,00	14,00	5,74	5,74	8,08	0,21	0,21	0,79	1,00
2	0,17	0,35	0,17	64,00	14,00	5,79	5,79	7,79	0,32	0,32	0,65	0,73
3	0,23	0,47	0,23	64,00	18,00	6,09	6,09	8,33	0,14	0,29	1,00	0,89
4	0,42	0,50	0,42	64,00	14,00	6,15	6,15	9,00	0,21	0,28	1,00	0,75
5	0,26	0,48	0,26	56,00	14,00	6,02	6,02	7,71	0,24	0,24	0,76	0,76
6	0,39	0,49	0,39	64,00	18,00	6,29	6,29	8,94	0,27	0,27	0,71	0,71
7	0,28	0,47	0,28	64,00	14,00	6,04	6,04	8,80	0,20	0,20	0,80	0,84
8	0,28	0,39	0,28	120,00	18,00	5,73	5,73	6,81	0,25	0,30	0,78	0,64
9	0,17	0,29	0,17	64,00	18,00	3,73	3,73	3,89	0,17	0,25	0,80	0,76
10	0,21	0,38	0,21	64,00	52,00	16,57	16,57	5,11	0,15	0,21	0,93	0,75
11	0,23	0,44	0,23	64,00	18,00	6,11	6,11	8,83	0,22	0,22	0,89	0,89
12	0,23	0,43	0,23	64,00	18,00	5,97	5,97	7,81	0,20	0,22	0,71	0,73
13	0,31	0,42	0,31	64,00	10,00	2,70	2,70	3,14	0,19	0,19	0,93	0,93
14	0,20	0,46	0,20	64,00	18,00	6,16	6,16	8,54	0,19	0,19	0,92	0,92
15	0,20	0,33	0,20	64,00	19,00	5,44	5,44	5,56	0,20	0,24	0,69	0,84
16	0,16	0,37	0,16	64,00	14,00	5,80	5,80	8,18	0,23	0,23	0,67	0,78
17	0,25	0,43	0,25	64,00	14,00	6,10	6,10	8,71	0,19	0,19	0,62	0,92
18	0,21	0,34	0,21	64,00	18,00	5,41	5,41	5,61	0,20	0,22	0,92	0,86
19	0,14	0,36	0,14	120,00	8,00	2,07	2,07	2,18	0,45	0,45	0,20	0,33
20	0,32	0,46	0,32	64,00	14,00	6,26	6,26	9,40	0,33	0,33	0,40	0,40
21	0,30	0,43	0,30	64,00	18,00	5,96	5,96	6,84	0,25	0,25	0,59	0,65
22	0,28	0,46	0,28	64,00	14,00	6,15	6,15	7,00	0,34	0,41	0,45	0,38
23	0,25	0,46	0,25	64,00	30,00	7,98	7,98	8,99	0,20	0,20	0,84	0,95
24	0,28	0,40	0,28	120,00	18,00	5,44	5,44	5,78	0,19	0,29	0,95	0,66
25	0,24	0,41	0,24	72,00	14,00	6,12	6,12	8,95	0,32	0,32	0,70	0,70
26	0,23	0,45	0,23	120,00	19,00	5,79	5,79	7,50	0,31	0,38	0,70	0,67
27	0,14	0,19	0,14	72,00	18,00	4,39	4,39	3,85	0,20	0,20	0,89	0,89
28	0,20	0,40	0,20	64,00	18,00	5,87	5,87	7,78	0,15	0,25	1,00	0,67
29	0,29	0,39	0,29	64,00	18,00	5,79	5,79	7,51	0,24	0,28	0,37	0,61
30	0,46	0,50	0,46	120,00	24,00	6,74	6,74	6,17	0,22	0,24	0,70	0,77
31	0,29	0,50	0,29	64,00	18,00	6,20	6,20	8,62	0,26	0,31	0,42	0,57
32	0,21	0,45	0,21	64,00	52,00	18,43	18,43	9,97	0,27	0,27	0,67	0,78
33	0,21	0,45	0,21	64,00	36,00	9,38	9,38	7,31	0,25	0,28	0,69	0,61
34	0,26	0,47	0,26	64,00	18,00	6,12	6,12	8,77	0,26	0,26	0,63	0,81
35	0,21	0,44	0,21	64,00	18,00	6,14	6,14	9,07	0,28	0,28	0,57	0,57
36	0,18	0,41	0,18	120,00	18,00	5,91	5,91	7,68	0,22	0,25	0,79	0,75
37	0,24	0,47	0,24	120,00	18,00	6,22	6,22	9,00	0,19	0,19	0,92	0,92
38	0,15	0,41	0,15	120,00	14,00	6,01	6,01	6,67	0,30	0,30	0,58	0,58
39	0,23	0,43	0,23	64,00	18,00	5,79	5,79	7,38	0,24	0,24	1,00	1,00
40	0,25	0,46	0,25	64,00	18,00	6,00	6,00	7,91	0,20	0,20	0,92	0,92
41	0,22	0,46	0,22	64,00	14,00	6,10	6,10	9,09	0,31	0,31	0,55	0,60
42	0,34	0,40	0,34	64,00	18,00	5,93	5,93	7,47	0,26	0,26	0,48	0,65
43	0,26	0,48	0,26	120,00	18,00	6,05	6,05	8,26	0,15	0,21	0,78	0,85
44	0,19	0,30	0,19	120,00	19,00	6,11	6,11	7,18	0,23	0,23	1,00	1,00
45	0,22	0,39	0,22	64,00	18,00	5,89	5,89	7,01	0,21	0,21	0,88	0,88
46	0,23	0,41	0,23	120,00	18,00	5,66	5,66	6,31	0,25	0,28	0,78	0,70
47	0,22	0,41	0,22	120,00	18,00	5,99	5,99	8,11	0,27	0,27	0,53	0,53
48	0,10	0,20	0,10	120,00	52,00	13,84	13,84	7,14	0,19	0,21	0,69	0,81
49	0,23	0,44	0,23	120,00	14,00	5,97	5,97	8,30	0,27	0,27	0,67	0,67
50	0,46	0,43	0,46	108,00	36,00	9,76	9,76	1,83	0,23	0,23	0,84	0,84
51	0,47	0,37	0,47	64,00	38,00	6,83	6,83	6,34	0,23	0,23	0,71	1,00
52	0,47	0,45	0,47	64,00	43,00	8,61	8,61	4,28	0,30	0,32	0,45	0,46
53	0,45	0,39	0,45	108,00	14,00	5,90	5,90	6,36	0,24	0,31	0,76	0,59
54	0,42	0,48	0,42	64,00	14,00	5,77	5,77	7,50	0,30	0,30	0,61	0,61
55	0,39	0,46	0,39	72,00	14,00	5,85	5,85	7,49	0,20	0,21	0,83	0,85
56	0,31	0,37	0,31	64,00	18,00	4,10	4,10	3,95	0,32	0,32	0,56	0,56
57	0,46	0,48	0,46	64,00	52,00	13,20	13,20	2,72	0,17	0,19	0,76	0,92
58	0,24	0,34	0,24	64,00	31,00	6,02	6,02	5,61	0,21	0,27	0,56	0,43
59	0,34	0,52	0,34	72,00	35,00	9,97	9,97	4,95	0,20	0,20	0,73	0,73
60	0,49	0,38	0,49	108,00	14,00	5,68	5,68	5,94	0,15	0,21	0,94	0,73
61	0,31	0,33	0,31	64,00	18,00	5,38	5,38	5,79	0,15	0,16	0,96	1,00
62	0,49	0,45	0,49	64,00	30,00	6,81	6,81	2,43	0,20	0,21	0,88	0,96
63	0,27	0,32	0,27	74,00	30,00	7,03	7,03	5,77	0,19	0,23	0,49	0,60
64	0,50	0,48	0,50	128,00	18,00	5,36	5,36	5,17	0,25	0,25	0,60	0,60
65	0,46	0,52	0,46	64,00	72,00	15,27	15,27	7,32	0,14	0,17	0,76	0,76
66	0,39	0,32	0,39	64,00	18,00	5,58	5,58	6,75	0,23	0,23	0,67	0,71
67	0,43	0,37	0,43	64,00	59,00	16,96	16,96	6,46	0,17	0,21	0,71	0,76
68	0,37	0,51	0,37	64,00	64,00	14,27	14,27	6,47	0,19	0,21	0,88	0,96
69	0,43	0,46	0,43	108,00	39,00	8,72	8,72	3,91	0,12	0,17	0,94	0,81
70	0,45	0,38	0,45	64,00	18,00	4,95	4,95	4,55	0,21	0,21	0,63	0,79
71	0,53	0,45	0,53	91,00	33,00	6,54	6,54	6,61	0,27	0,27	0,67	0,67
72	0,36	0,48	0,36	64,00	18,00	6,04	6,04	7,94	0,17	0,19	1,00	0,96
73	0,36	0,47	0,36	64,00	14,00	6,11	6,11	8,80	0,17	0,17	1,00	1,00
74	0,29	0,35	0,29	64,00	72,00	18,81	18,81	6,87	0,22	0,23	0,55	0,69
75	0,33	0,38	0,33	64,00	69,00	19,18	19,18	5,77	0,23	0,23	0,71	0,71
76	0,20	0,33	0,20	64,00	38,00	3,90	3,90	2,46	0,19	0,19	0,92	0,92
77	0,26	0,29	0,26	64,00	27,00	5,78	5,78	6,23	0,16	0,23	0,73	0,70
78	0,74	0,50	0,74	91,00	14,00	5,70	5,70	7,40	0,22	0,22	0,94	0,94
79	0,56	0,48	0,56	64,00	56,00	13,26	13,26	4,55	0,20	0,20	0,71	0,85
80	0,46	0,47	0,46	64,00	18,00	5,62	5,62	6,82	0,17	0,20	0,92	0,80
81	0,27	0,34	0,27	64,00	67,00	17,37	17,37	9,50	0,19	0,21	0,65	0,92
82	0,35	0,41	0,35	64,00	23,00	5,34	5,34	5,84	0,26	0,26	0,97	0,97
83	0,33	0,46	0,33	64,00	39,00	9,07	9,07	6,06	0,15	0,21	0,80	0,86
84	0,25	0,23	0,25	64,00	40,00	11,68	11,68	3,49	0,19	0,20	0,77	0,71
85	0,35	0,32	0,35	128,00	40,00	7,22	7,22	5,08	0,17	0,18	0,96	0,96
86	0,30	0,39	0,30	128,00	18,00	5,95	5,95	5,65	0,21	0,22	1,00	0,96
87	0,32	0,31	0,32	128,00	18,00	5,18	5,18	5,09	0,17	0,19	0,67	0,73
88	0,30	0,17	0,30	64,00	60,00	17,55	17,55	5,51	0,21	0,34	0,62	0,40
89	0,31	0,48	0,31	64,00	39,00	7,80	7,80	8,95	0,13	0,21	0,75	0,96
90	0,31	0,42	0,31	64,00	18,00	6,90	6,90	2,55	0,21	0,21	0,64	1,00
91	0,61	0,56	0,61	72,00	41,00	11,03	11,03	2,08	0,28	0,28	0,60	0,60
92	0,10	0,19	0,10	108,00	18,00	5,05	5,05	5,11	0,16	0,27	0,62	0,61
93	0,41	0,34	0,41	64,00	52,00	14,15	14,15	6,14	0,18	0,20	0,60	0,69
94	0,36	0,32	0,36	64,00	18,00	5,28	5,28	5,65	0,17	0,22	0,90	0,72
95	0,19	0,32	0,19	95,00	18,00	5,61	5,61	6,25	0,16	0,18	1,00	0,91
96	0,44	0,55	0,44	64,00	28,00	7,49	7,49	7,58	0,25	0,25	0,77	0,77
97	0,37	0,45	0,37	64,00	18,00	5,49	5,49	5,30	0,21	0,21	0,92	0,92
98	0,27	0,29	0,27	91,00	17,00	5,93	5,93	7,16	0,18	0,18	0,81	1,00
99	0,56	0,42	0,56	64,00	18,00	4,68	4,68	4,35	0,40	0,41	0,29	0,32
100	0,33	0,31	0,33	91,00	36,00	11,76	11,76	4,88	0,22	0,23	0,52	0,70

General Statistics on Fado

Fado Edition	Melodies Corpus Interval Between Strongest Pitches	Melodies Corpus Interval Between Strongest Pitch Classes	Melodies Corpus Number of Common Pitches	Melodies Corpus Pitch Variety	Melodies Corpus Pitch Class Variety	Melodies Corpus Range	Melodies Corpus Most Common Pitch	Melodies Corpus Primary Register	Melodies Corpus Importance of Bass Register	Melodies Corpus Importance of Middle Register	Melodies Corpus Importance of High Register	Melodies Corpus Most Common Pitch Class
1	4,00	5,00	5,00	11,00	8,00	24,00	0,59	72,00	0,00	0,52	0,48	4,00
2	5,00	7,00	3,00	10,00	8,00	14,00	0,52	68,00	0,00	0,96	0,04	7,00
3	12,00	5,00	4,00	19,00	8,00	27,00	0,50	71,00	0,00	0,56	0,44	4,00
4	4,00	4,00	4,00	9,00	8,00	15,00	0,56	72,00	0,00	0,55	0,45	4,00
5	4,00	4,00	5,00	8,00	8,00	11,00	0,59	72,00	0,00	0,57	0,43	4,00
6	2,00	2,00	5,00	9,00	8,00	12,00	0,56	73,00	0,00	0,44	0,56	0,00
7	4,00	1,00	4,00	13,00	9,00	17,00	0,63	77,00	0,00	0,20	0,80	8,00
8	4,00	4,00	3,00	13,00	9,00	19,00	0,59	72,00	0,00	0,46	0,54	4,00
9	5,00	5,00	4,00	16,00	10,00	20,00	0,59	72,00	0,00	0,55	0,45	4,00
10	5,00	7,00	4,00	14,00	7,00	24,00	0,62	76,00	0,00	0,25	0,75	7,00
11	4,00	11,00	5,00	10,00	7,00	16,00	0,55	68,00	0,00	0,93	0,07	11,00
12	2,00	2,00	4,00	16,00	11,00	22,00	0,62	78,00	0,00	0,14	0,86	7,00
13	2,00	2,00	4,00	15,00	10,00	18,00	0,52	67,00	0,00	0,89	0,11	7,00
14	3,00	3,00	5,00	10,00	8,00	14,00	0,52	67,00	0,00	0,97	0,03	7,00
15	2,00	7,00	6,00	12,00	9,00	15,00	0,56	73,00	0,00	0,50	0,50	7,00
16	2,00	7,00	6,00	9,00	7,00	14,00	0,52	67,00	0,00	0,98	0,03	7,00
17	4,00	4,00	4,00	12,00	7,00	19,00	0,54	69,00	0,00	0,76	0,24	9,00
18	5,00	7,00	5,00	9,00	8,00	15,00	0,59	72,00	0,00	0,59	0,41	4,00
19	5,00	7,00	4,00	9,00	7,00	13,00	0,52	66,00	0,00	1,00	0,00	7,00
20	5,00	7,00	4,00	8,00	7,00	12,00	0,52	66,00	0,00	1,00	0,00	7,00
21	3,00	9,00	4,00	11,00	7,00	17,00	0,54	68,00	0,00	0,91	0,09	9,00
22	1,00	2,00	5,00	9,00	6,00	17,00	0,56	70,00	0,00	0,84	0,16	0,00
23	3,00	9,00	4,00	13,00	10,00	16,00	0,54	68,00	0,00	0,88	0,12	9,00
24	7,00	5,00	5,00	11,00	9,00	13,00	0,54	70,00	0,00	0,67	0,33	4,00
25	3,00	3,00	3,00	8,00	7,00	12,00	0,52	64,00	0,00	1,00	0,00	7,00
26	2,00	2,00	3,00	11,00	8,00	16,00	0,54	66,00	0,00	1,00	0,00	9,00
27	4,00	4,00	5,00	12,00	10,00	15,00	0,56	74,00	0,00	0,41	0,59	0,00
28	9,00	3,00	7,00	13,00	10,00	17,00	0,52	73,00	0,00	0,48	0,52	7,00
29	5,00	5,00	1,00	25,00	11,00	52,00	0,59	75,00	0,06	0,22	0,72	4,00
30	5,00	7,00	4,00	13,00	9,00	19,00	0,50	65,00	0,00	0,98	0,02	4,00
31	1,00	2,00	4,00	11,00	7,00	17,00	0,56	69,00	0,00	0,80	0,20	0,00
32	3,00	3,00	6,00	10,00	8,00	16,00	0,50	64,00	0,00	1,00	0,00	4,00
33	5,00	7,00	5,00	13,00	9,00	16,00	0,56	68,00	0,00	0,91	0,09	0,00
34	2,00	2,00	5,00	8,00	7,00	12,00	0,58	71,00	0,00	0,58	0,42	2,00
35	5,00	2,00	5,00	9,00	8,00	13,00	0,50	61,00	0,00	1,00	0,00	4,00
36	2,00	9,00	6,00	10,00	6,00	17,00	0,48	64,00	0,00	0,97	0,03	2,00
37	5,00	2,00	6,00	8,00	7,00	12,00	0,58	71,00	0,00	0,69	0,31	2,00
38	2,00	2,00	5,00	9,00	7,00	13,00	0,58	74,00	0,00	0,24	0,76	2,00
39	2,00	2,00	5,00	7,00	7,00	9,00	0,56	72,00	0,00	0,56	0,44	0,00
40	2,00	2,00	5,00	9,00	8,00	12,00	0,52	68,00	0,00	0,91	0,09	7,00
41	7,00	7,00	4,00	11,00	9,00	13,00	0,52	65,00	0,00	1,00	0,00	7,00
42	2,00	7,00	6,00	9,00	7,00	14,00	0,52	67,00	0,00	0,98	0,02	7,00
43	2,00	2,00	4,00	15,00	8,00	22,00	0,52	70,00	0,00	0,70	0,30	7,00
44	2,00	2,00	5,00	11,00	10,00	12,00	0,58	73,00	0,00	0,33	0,67	2,00
45	2,00	2,00	6,00	9,00	8,00	14,00	0,58	73,00	0,00	0,45	0,55	2,00
46	3,00	3,00	4,00	10,00	8,00	14,00	0,52	64,00	0,00	1,00	0,00	7,00
47	5,00	5,00	4,00	11,00	8,00	15,00	0,54	67,00	0,00	0,97	0,03	9,00
48	4,00	5,00	6,00	14,00	9,00	20,00	0,59	73,00	0,00	0,47	0,53	4,00
49	1,00	11,00	5,00	9,00	9,00	11,00	0,56	72,00	0,00	0,61	0,39	0,00
50	2,00	2,00	5,00	12,00	9,00	15,00	0,58	71,00	0,00	0,57	0,43	2,00
51	2,00	5,00	4,00	10,00	7,00	16,00	0,58	73,00	0,00	0,35	0,65	2,00
52	2,00	3,00	4,00	13,00	8,00	25,00	0,52	65,00	0,04	0,96	0,00	7,00
53	2,00	2,00	5,00	10,00	7,00	17,00	0,52	65,00	0,00	1,00	0,00	7,00
54	8,00	4,00	5,00	8,00	8,00	11,00	0,62	75,00	0,00	0,37	0,63	7,00
55	2,00	5,00	5,00	13,00	9,00	19,00	0,54	72,00	0,00	0,59	0,41	9,00
56	1,00	11,00	3,00	9,00	7,00	14,00	0,55	70,00	0,00	0,86	0,14	11,00
57	2,00	5,00	4,00	18,00	12,00	19,00	0,54	70,00	0,00	0,68	0,32	4,00
58	2,00	2,00	2,00	21,00	12,00	24,00	0,50	67,00	0,01	0,84	0,16	4,00
59	2,00	2,00	3,00	14,00	11,00	15,00	0,59	75,00	0,00	0,21	0,79	4,00
60	5,00	7,00	4,00	15,00	10,00	17,00	0,55	72,00	0,00	0,55	0,45	4,00
61	2,00	11,00	5,00	14,00	10,00	17,00	0,54	67,00	0,00	0,95	0,05	0,00
62	2,00	2,00	4,00	15,00	10,00	17,00	0,54	67,00	0,00	0,95	0,05	9,00
63	1,00	7,00	2,00	18,00	11,00	22,00	0,50	64,00	0,03	0,91	0,06	4,00
64	5,00	5,00	4,00	16,00	11,00	18,00	0,50	66,00	0,00	0,98	0,02	4,00
65	2,00	2,00	2,00	22,00	11,00	24,00	0,59	73,00	0,00	0,42	0,58	4,00
66	7,00	5,00	4,00	15,00	10,00	18,00	0,54	71,00	0,00	0,64	0,36	9,00
67	1,00	4,00	5,00	16,00	10,00	20,00	0,55	74,00	0,00	0,46	0,54	11,00
68	5,00	7,00	3,00	16,00	10,00	22,00	0,52	68,00	0,00	0,89	0,11	7,00
69	2,00	5,00	4,00	24,00	11,00	29,00	0,58	74,00	0,00	0,40	0,60	4,00
70	5,00	5,00	6,00	14,00	11,00	16,00	0,54	68,00	0,00	0,88	0,12	9,00
71	2,00	2,00	5,00	9,00	9,00	10,00	0,54	67,00	0,00	1,00	0,00	9,00
72	2,00	5,00	5,00	18,00	11,00	19,00	0,54	72,00	0,00	0,51	0,49	9,00
73	5,00	7,00	7,00	12,00	10,00	15,00	0,54	71,00	0,00	0,62	0,38	2,00
74	4,00	7,00	5,00	15,00	10,00	20,00	0,50	65,00	0,00	0,98	0,02	4,00
75	2,00	2,00	5,00	10,00	8,00	14,00	0,59	74,00	0,00	0,40	0,60	4,00
76	2,00	2,00	5,00	12,00	8,00	18,00	0,52	67,00	0,00	0,94	0,06	7,00
77	10,00	2,00	5,00	15,00	11,00	16,00	0,58	71,00	0,00	0,53	0,47	4,00
78	2,00	2,00	5,00	10,00	8,00	14,00	0,58	74,00	0,00	0,26	0,74	2,00
79	2,00	5,00	5,00	17,00	12,00	17,00	0,58	72,00	0,00	0,51	0,49	2,00
80	3,00	1,00	6,00	11,00	7,00	17,00	0,50	68,00	0,00	0,84	0,16	4,00
81	2,00	5,00	5,00	13,00	9,00	19,00	0,59	74,00	0,00	0,34	0,66	4,00
82	2,00	2,00	5,00	9,00	8,00	12,00	0,58	72,00	0,00	0,56	0,44	2,00
83	2,00	7,00	5,00	14,00	9,00	20,00	0,59	74,00	0,00	0,36	0,64	4,00
84	2,00	2,00	4,00	18,00	11,00	21,00	0,59	74,00	0,00	0,31	0,69	4,00
85	2,00	2,00	5,00	14,00	10,00	17,00	0,55	67,00	0,00	0,98	0,02	9,00
86	2,00	2,00	4,00	15,00	11,00	16,00	0,51	64,00	0,00	1,00	0,00	7,00
87	1,00	2,00	4,00	17,00	12,00	17,00	0,54	66,00	0,00	0,93	0,07	9,00
88	12,00	1,00	3,00	22,00	10,00	31,00	0,59	70,00	0,00	0,55	0,45	4,00
89	4,00	5,00	2,00	18,00	8,00	29,00	0,59	69,00	0,00	0,71	0,29	4,00
90	3,00	5,00	5,00	14,00	11,00	15,00	0,54	70,00	0,00	0,74	0,26	4,00
91	2,00	2,00	5,00	14,00	12,00	13,00	0,54	68,00	0,00	0,97	0,03	9,00
92	7,00	7,00	5,00	17,00	9,00	24,00	0,52	67,00	0,00	0,75	0,25	7,00
93	3,00	3,00	2,00	22,00	12,00	26,00	0,50	65,00	0,02	0,84	0,14	4,00
94	5,00	7,00	4,00	21,00	12,00	23,00	0,52	71,00	0,00	0,70	0,30	7,00
95	2,00	2,00	5,00	14,00	11,00	15,00	0,50	67,00	0,00	0,89	0,11	4,00
96	5,00	5,00	6,00	8,00	7,00	14,00	0,50	66,00	0,00	0,98	0,02	4,00
97	2,00	2,00	4,00	12,00	10,00	14,00	0,54	68,00	0,00	0,92	0,08	9,00
98	5,00	5,00	4,00	13,00	10,00	16,00	0,50	65,00	0,00	0,93	0,07	4,00
99	2,00	5,00	3,00	14,00	9,00	19,00	0,50	64,00	0,00	0,99	0,01	4,00
100	5,00	2,00	6,00	14,00	11,00	15,00	0,55	73,00	0,00	0,47	0,53	11,00

General Statistics on Fado

Fado Edition	Melodies Corpus Dominant Spread	Melodies Corpus Strong Tonal Centres	Melodies Corpus Average Melodic Interval	Melodies Corpus Most Common Melodic Interval	Melodies Corpus Distance Between Most Common Melodic Intervals	Melodies Corpus Most Common Melodic Interval Prevalence	Melodies Corpus Relative Strength of Most Common Intervals	Melodies Corpus Number of Common Melodic Intervals	Melodies Corpus Amount of Arpeggiation	Melodies Corpus Repeated Notes	Melodies Corpus Chromatic Motion	Melodies Corpus Stepwise Motion	Melodies Corpus Melodic Thirds
1	4,00	1,00	4,56	3,00	2,00	0,25	0,73	3,00	0,47	0,07	0,18	0,35	0,30
2	2,00	2,00	2,09	0,00	2,00	0,33	0,54	5,00	0,54	0,33	0,15	0,33	0,17
3	3,00	2,00	2,17	0,00	1,00	0,34	0,62	4,00	0,50	0,34	0,21	0,38	0,11
4	2,00	3,00	1,88	2,00	2,00	0,32	0,89	4,00	0,46	0,28	0,18	0,49	0,11
5	4,00	3,00	3,47	3,00	1,00	0,39	0,44	3,00	0,68	0,05	0,06	0,19	0,56
6	4,00	3,00	2,29	0,00	2,00	0,31	0,60	5,00	0,50	0,31	0,13	0,31	0,14
7	2,00	4,00	1,63	0,00	2,00	0,37	0,70	4,00	0,54	0,37	0,14	0,40	0,17
8	3,00	3,00	2,37	0,00	2,00	0,27	0,70	4,00	0,53	0,27	0,18	0,37	0,21
9	3,00	2,00	2,57	1,00	2,00	0,24	0,82	5,00	0,51	0,14	0,24	0,43	0,31
10	7,00	1,00	2,74	2,00	1,00	0,40	0,39	4,00	0,30	0,08	0,16	0,55	0,21
11	5,00	2,00	2,23	2,00	2,00	0,34	0,54	4,00	0,32	0,18	0,17	0,51	0,13
12	3,00	3,00	2,82	0,00	1,00	0,24	0,67	6,00	0,45	0,24	0,16	0,29	0,19
13	5,00	3,00	2,30	2,00	1,00	0,52	0,32	3,00	0,27	0,11	0,16	0,68	0,11
14	6,00	1,00	1,97	2,00	2,00	0,34	0,62	4,00	0,40	0,21	0,19	0,53	0,19
15	3,00	2,00	2,70	2,00	1,00	0,28	0,61	5,00	0,50	0,14	0,17	0,45	0,22
16	3,00	3,00	2,04	2,00	2,00	0,38	0,67	4,00	0,39	0,25	0,10	0,48	0,13
17	7,00	3,00	2,40	2,00	1,00	0,40	0,41	5,00	0,43	0,12	0,16	0,57	0,27
18	4,00	2,00	2,49	2,00	1,00	0,29	0,78	4,00	0,38	0,12	0,23	0,52	0,21
19	3,00	2,00	3,03	0,00	2,00	0,25	0,75	5,00	0,51	0,25	0,03	0,22	0,25
20	4,00	2,00	2,79	2,00	1,00	0,41	0,50	3,00	0,17	0,00	0,21	0,62	0,14
21	6,00	2,00	2,32	2,00	2,00	0,29	0,74	6,00	0,44	0,21	0,11	0,39	0,23
22	4,00	3,00	1,92	2,00	2,00	0,38	0,58	5,00	0,37	0,22	0,16	0,54	0,13
23	4,00	2,00	2,36	2,00	1,00	0,31	0,77	5,00	0,35	0,07	0,24	0,55	0,26
24	3,00	1,00	2,87	1,00	1,00	0,29	0,56	5,00	0,38	0,11	0,29	0,46	0,13
25	2,00	3,00	1,50	0,00	2,00	0,45	0,43	3,00	0,61	0,45	0,13	0,32	0,16
26	1,00	4,00	0,90	0,00	1,00	0,52	0,38	4,00	0,65	0,52	0,19	0,35	0,13
27	2,00	3,00	1,58	1,00	1,00	0,49	0,50	3,00	0,25	0,10	0,49	0,74	0,13
28	7,00	2,00	2,43	2,00	1,00	0,33	0,54	4,00	0,35	0,15	0,18	0,51	0,18
29	4,00	2,00	2,63	1,00	1,00	0,32	0,97	3,00	0,28	0,15	0,32	0,63	0,09
30	3,00	2,00	2,67	3,00	2,00	0,21	0,95	6,00	0,46	0,11	0,20	0,40	0,32
31	4,00	3,00	2,64	2,00	2,00	0,23	0,82	5,00	0,49	0,19	0,15	0,38	0,26
32	6,00	3,00	1,95	2,00	1,00	0,46	0,60	4,00	0,22	0,09	0,28	0,74	0,12
33	4,00	3,00	2,68	1,00	2,00	0,27	1,00	4,00	0,49	0,13	0,27	0,33	0,35
34	5,00	2,00	2,90	2,00	2,00	0,28	0,94	3,00	0,51	0,26	0,07	0,34	0,16
35	4,00	3,00	1,51	2,00	2,00	0,40	0,73	3,00	0,38	0,29	0,18	0,58	0,09
36	4,00	3,00	2,69	3,00	2,00	0,39	0,46	4,00	0,60	0,05	0,18	0,35	0,52
37	4,00	4,00	1,85	2,00	2,00	0,30	0,83	4,00	0,44	0,25	0,23	0,52	0,15
38	3,00	3,00	2,74	2,00	2,00	0,31	0,89	4,00	0,39	0,27	0,03	0,34	0,10
39	4,00	3,00	1,24	2,00	2,00	0,33	0,95	3,00	0,40	0,31	0,27	0,60	0,09
40	4,00	3,00	2,98	2,00	1,00	0,35	0,77	3,00	0,37	0,06	0,10	0,44	0,30
41	3,00	2,00	3,00	1,00	6,00	0,29	0,83	4,00	0,49	0,19	0,29	0,43	0,06
42	7,00	3,00	1,36	0,00	2,00	0,39	0,89	3,00	0,49	0,39	0,14	0,49	0,07
43	7,00	3,00	2,85	4,00	2,00	0,25	0,93	5,00	0,52	0,05	0,13	0,37	0,47
44	2,00	3,00	1,69	1,00	1,00	0,46	0,73	2,00	0,21	0,06	0,46	0,79	0,14
45	4,00	3,00	1,89	1,00	1,00	0,27	0,95	3,00	0,45	0,26	0,27	0,50	0,14
46	2,00	2,00	1,89	0,00	2,00	0,34	0,75	3,00	0,66	0,34	0,06	0,31	0,29
47	4,00	2,00	2,00	2,00	2,00	0,33	0,70	4,00	0,41	0,23	0,16	0,49	0,17
48	4,00	3,00	2,25	1,00	1,00	0,39	0,85	3,00	0,19	0,04	0,39	0,72	0,11
49	4,00	2,00	1,49	2,00	2,00	0,31	0,85	4,00	0,45	0,26	0,25	0,55	0,17
50	4,00	3,00	2,78	2,00	1,00	0,30	0,96	4,00	0,53	0,14	0,14	0,43	0,31
51	4,00	2,00	2,60	2,00	2,00	0,43	0,38	3,00	0,39	0,16	0,06	0,49	0,19
52	6,00	2,00	2,40	0,00	2,00	0,36	0,77	4,00	0,52	0,36	0,07	0,34	0,12
53	3,00	2,00	2,26	2,00	2,00	0,33	0,55	4,00	0,34	0,18	0,18	0,52	0,16
54	3,00	3,00	3,17	1,00	1,00	0,20	0,92	6,00	0,49	0,19	0,20	0,34	0,17
55	4,00	2,00	2,09	2,00	1,00	0,33	0,80	4,00	0,35	0,14	0,27	0,60	0,18
56	4,00	3,00	2,65	0,00	2,00	0,23	0,83	3,00	0,46	0,23	0,18	0,37	0,15
57	4,00	1,00	2,20	2,00	1,00	0,35	0,68	4,00	0,33	0,15	0,24	0,60	0,17
58	1,00	3,00	2,33	1,00	2,00	0,42	0,46	3,00	0,31	0,07	0,42	0,56	0,22
59	4,00	2,00	2,95	2,00	1,00	0,35	0,74	5,00	0,27	0,00	0,25	0,60	0,16
60	3,00	3,00	3,22	2,00	1,00	0,20	0,90	4,00	0,50	0,09	0,16	0,37	0,35
61	6,00	3,00	2,25	0,00	2,00	0,32	0,55	5,00	0,56	0,32	0,12	0,30	0,17
62	3,00	3,00	1,80	2,00	2,00	0,32	0,78	4,00	0,46	0,25	0,18	0,50	0,20
63	2,00	3,00	2,54	2,00	1,00	0,26	0,80	4,00	0,42	0,19	0,21	0,47	0,17
64	5,00	3,00	2,87	2,00	1,00	0,39	0,42	4,00	0,29	0,03	0,15	0,54	0,23
65	4,00	4,00	3,37	3,00	1,00	0,25	0,83	5,00	0,44	0,03	0,18	0,39	0,34
66	3,00	3,00	1,59	1,00	1,00	0,45	0,46	4,00	0,36	0,20	0,45	0,61	0,14
67	5,00	3,00	3,67	2,00	1,00	0,22	0,77	4,00	0,48	0,05	0,15	0,38	0,35
68	4,00	1,00	2,67	2,00	1,00	0,30	0,64	5,00	0,42	0,13	0,13	0,43	0,27
69	5,00	3,00	2,64	2,00	1,00	0,44	0,64	2,00	0,23	0,01	0,28	0,72	0,15
70	7,00	1,00	2,58	2,00	1,00	0,34	0,49	4,00	0,37	0,10	0,17	0,51	0,25
71	3,00	4,00	1,84	2,00	2,00	0,33	0,69	4,00	0,43	0,22	0,19	0,52	0,20
72	4,00	2,00	2,12	2,00	2,00	0,30	0,82	4,00	0,41	0,24	0,17	0,47	0,15
73	4,00	2,00	2,04	2,00	1,00	0,33	0,84	4,00	0,34	0,17	0,27	0,60	0,11
74	4,00	2,00	2,75	2,00	1,00	0,32	0,54	4,00	0,43	0,11	0,17	0,49	0,25
75	4,00	3,00	2,30	2,00	2,00	0,21	0,97	5,00	0,48	0,20	0,20	0,41	0,26
76	3,00	4,00	2,61	2,00	1,00	0,38	0,77	3,00	0,41	0,05	0,13	0,51	0,33
77	2,00	3,00	3,37	3,00	1,00	0,27	0,69	4,00	0,55	0,08	0,16	0,34	0,38
78	6,00	3,00	2,81	2,00	1,00	0,44	0,49	3,00	0,30	0,01	0,21	0,65	0,21
79	4,00	3,00	2,21	2,00	1,00	0,29	0,78	4,00	0,47	0,14	0,18	0,47	0,31
80	6,00	3,00	2,45	2,00	1,00	0,24	0,83	5,00	0,41	0,15	0,20	0,44	0,27
81	4,00	2,00	2,57	2,00	1,00	0,28	0,73	3,00	0,40	0,19	0,20	0,48	0,15
82	4,00	3,00	1,69	2,00	1,00	0,53	0,51	3,00	0,19	0,10	0,27	0,80	0,08
83	4,00	2,00	2,85	2,00	1,00	0,29	0,68	3,00	0,38	0,08	0,20	0,49	0,25
84	5,00	2,00	1,91	2,00	2,00	0,37	0,59	4,00	0,40	0,22	0,19	0,55	0,17
85	3,00	3,00	2,18	2,00	1,00	0,35	0,60	3,00	0,37	0,16	0,21	0,56	0,17
86	2,00	3,00	2,46	2,00	1,00	0,30	0,67	4,00	0,39	0,17	0,20	0,50	0,16
87	4,00	3,00	2,39	2,00	1,00	0,44	0,53	2,00	0,20	0,06	0,23	0,67	0,13
88	2,00	3,00	8,42	12,00	4,00	0,42	0,29	2,00	0,65	0,02	0,07	0,13	0,06
89	3,00	2,00	2,87	0,00	2,00	0,31	0,61	5,00	0,55	0,31	0,10	0,29	0,17
90	3,00	1,00	2,35	1,00	1,00	0,31	0,61	4,00	0,40	0,16	0,31	0,50	0,19
91	3,00	4,00	2,69	2,00	1,00	0,29	0,95	3,00	0,27	0,01	0,28	0,57	0,26
92	3,00	2,00	4,39	0,00	2,00	0,20	0,89	5,00	0,61	0,20	0,08	0,26	0,17
93	2,00	3,00	2,46	2,00	1,00	0,29	0,96	4,00	0,35	0,12	0,28	0,58	0,17
94	5,00	2,00	2,47	2,00	1,00	0,29	0,71	5,00	0,42	0,15	0,20	0,49	0,23
95	5,00	3,00	2,19	2,00	2,00	0,26	0,87	5,00	0,50	0,22	0,17	0,43	0,26
96	5,00	2,00	3,41	4,00	1,00	0,29	0,87	5,00	0,53	0,10	0,04	0,22	0,39
97	4,00	3,00	2,66	1,00	1,00	0,32	0,70	3,00	0,31	0,08	0,32	0,55	0,15
98	4,00	1,00	2,11	2,00	2,00	0,32	0,64	4,00	0,42	0,21	0,19	0,52	0,19
99	3,00	1,00	2,11	0,00	2,00	0,27	0,73	4,00	0,51	0,27	0,19	0,38	0,21
100	5,00	3,00	1,86	2,00	1,00	0,36	0,63	4,00	0,38	0,19	0,22	0,58	0,17

Fado Edition	Melodies Corpus Melodic Fifths	Melodies Corpus Melodic Tritones	Melodies Corpus Melodic Octaves	Melodies Corpus Direction of Motion	Melodies Corpus Duration of Melodic Arcs	Melodies Corpus Size of Melodic Arcs	Melodies pitch 0	Melodies pitch 1	Melodies pitch 2	Melodies pitch 3	Melodies pitch 4	Melodies pitch 5	Melodies pitch 6
1	0,00	0,03	0,06	0,54	1,57	7,38	0,21	0,07	0,00	0,01	0,07	0,21	0,00
2	0,04	0,00	0,00	0,49	1,38	4,20	0,32	0,00	0,09	0,00	0,17	0,23	0,00
3	0,04	0,00	0,01	0,37	1,77	5,60	0,29	0,10	0,00	0,02	0,03	0,25	0,00
4	0,07	0,00	0,00	0,49	2,93	7,57	0,28	0,03	0,00	0,03	0,03	0,07	0,00
5	0,08	0,05	0,00	0,45	1,38	4,89	0,24	0,02	0,00	0,01	0,09	0,13	0,00
6	0,05	0,03	0,00	0,39	1,74	5,80	0,27	0,00	0,19	0,08	0,05	0,16	0,00
7	0,00	0,00	0,01	0,44	1,74	4,43	0,20	0,09	0,09	0,07	0,13	0,00	0,04
8	0,02	0,01	0,03	0,45	1,93	6,21	0,30	0,07	0,00	0,03	0,04	0,09	0,00
9	0,04	0,00	0,02	0,46	2,63	7,80	0,25	0,08	0,00	0,03	0,09	0,19	0,00
10	0,00	0,00	0,01	0,35	2,26	6,46	0,21	0,00	0,13	0,00	0,12	0,15	0,00
11	0,00	0,00	0,00	0,37	2,03	5,21	0,22	0,19	0,00	0,10	0,00	0,08	0,10
12	0,02	0,07	0,00	0,51	1,68	6,23	0,22	0,01	0,14	0,01	0,09	0,14	0,01
13	0,03	0,00	0,00	0,54	2,24	5,66	0,19	0,05	0,18	0,00	0,14	0,04	0,00
14	0,00	0,00	0,00	0,53	2,72	6,50	0,19	0,03	0,14	0,00	0,17	0,10	0,00
15	0,14	0,02	0,00	0,52	1,64	5,11	0,24	0,00	0,09	0,00	0,11	0,20	0,01
16	0,01	0,05	0,00	0,42	2,19	5,56	0,23	0,00	0,15	0,00	0,15	0,18	0,00
17	0,00	0,00	0,00	0,37	2,95	7,20	0,19	0,00	0,12	0,12	0,00	0,10	0,00
18	0,05	0,03	0,00	0,47	2,00	5,63	0,22	0,05	0,00	0,02	0,07	0,16	0,00
19	0,02	0,00	0,00	0,47	2,13	8,26	0,45	0,00	0,03	0,00	0,15	0,15	0,00
20	0,03	0,00	0,00	0,31	2,64	6,36	0,33	0,00	0,13	0,00	0,13	0,13	0,00
21	0,00	0,02	0,00	0,58	1,86	5,43	0,25	0,00	0,10	0,16	0,00	0,12	0,00
22	0,02	0,00	0,00	0,39	2,58	5,79	0,41	0,00	0,16	0,00	0,00	0,06	0,00
23	0,02	0,00	0,00	0,52	2,23	5,45	0,20	0,00	0,12	0,19	0,00	0,12	0,02
24	0,14	0,02	0,00	0,49	1,49	4,74	0,29	0,09	0,00	0,04	0,04	0,19	0,00
25	0,00	0,00	0,00	0,41	1,70	4,40	0,32	0,00	0,10	0,00	0,00	0,08	0,00
26	0,00	0,00	0,00	0,27	2,14	3,86	0,38	0,00	0,25	0,03	0,00	0,06	0,00
27	0,01	0,00	0,00	0,48	2,07	3,64	0,20	0,01	0,13	0,05	0,18	0,13	0,00
28	0,01	0,06	0,00	0,52	1,85	5,27	0,25	0,01	0,10	0,00	0,11	0,12	0,00
29	0,03	0,01	0,01	0,47	2,06	6,30	0,28	0,06	0,01	0,02	0,07	0,17	0,01
30	0,02	0,03	0,00	0,53	1,88	5,58	0,24	0,10	0,00	0,08	0,03	0,17	0,00
31	0,03	0,00	0,01	0,46	1,90	6,10	0,31	0,00	0,18	0,00	0,15	0,09	0,00
32	0,00	0,00	0,00	0,47	2,57	5,30	0,27	0,12	0,03	0,21	0,00	0,09	0,00
33	0,02	0,00	0,00	0,49	1,62	4,94	0,28	0,00	0,09	0,08	0,00	0,03	0,02
34	0,07	0,00	0,02	0,49	1,50	5,73	0,26	0,00	0,21	0,08	0,00	0,15	0,00
35	0,00	0,03	0,00	0,41	3,09	6,35	0,28	0,10	0,00	0,04	0,03	0,15	0,00
36	0,03	0,02	0,00	0,39	1,79	4,91	0,25	0,00	0,17	0,14	0,00	0,00	0,00
37	0,05	0,03	0,00	0,35	1,84	4,48	0,19	0,00	0,15	0,00	0,02	0,00	0,13
38	0,02	0,11	0,00	0,44	1,55	5,83	0,30	0,00	0,17	0,13	0,10	0,13	0,00
39	0,00	0,00	0,00	0,46	2,71	4,71	0,24	0,00	0,24	0,00	0,18	0,03	0,00
40	0,00	0,03	0,00	0,47	1,55	4,92	0,20	0,00	0,19	0,00	0,16	0,14	0,00
41	0,24	0,02	0,00	0,43	1,55	5,70	0,31	0,06	0,09	0,00	0,14	0,19	0,00
42	0,03	0,00	0,00	0,35	2,03	4,40	0,26	0,00	0,13	0,00	0,12	0,17	0,00
43	0,00	0,02	0,00	0,46	2,85	8,50	0,21	0,03	0,18	0,00	0,10	0,13	0,00
44	0,01	0,00	0,00	0,43	1,80	3,20	0,23	0,06	0,23	0,10	0,04	0,06	0,00
45	0,05	0,00	0,00	0,53	2,50	6,32	0,21	0,00	0,15	0,16	0,00	0,03	0,04
46	0,00	0,00	0,00	0,37	2,19	6,05	0,28	0,00	0,20	0,00	0,03	0,04	0,03
47	0,01	0,03	0,00	0,48	1,80	4,50	0,27	0,00	0,14	0,08	0,00	0,10	0,00
48	0,02	0,00	0,02	0,43	1,91	4,45	0,21	0,08	0,00	0,01	0,11	0,17	0,00
49	0,02	0,00	0,00	0,50	1,92	3,84	0,27	0,00	0,12	0,03	0,12	0,06	0,00
50	0,04	0,00	0,02	0,44	1,71	5,41	0,23	0,00	0,18	0,06	0,00	0,05	0,01
51	0,01	0,02	0,02	0,42	1,94	5,96	0,23	0,00	0,17	0,12	0,00	0,23	0,00
52	0,03	0,00	0,01	0,68	2,24	7,38	0,32	0,00	0,14	0,00	0,09	0,11	0,00
53	0,00	0,00	0,00	0,49	1,82	4,87	0,31	0,00	0,18	0,00	0,11	0,09	0,00
54	0,12	0,10	0,00	0,44	1,66	6,41	0,30	0,02	0,03	0,00	0,18	0,13	0,00
55	0,01	0,00	0,02	0,50	2,24	5,43	0,21	0,00	0,17	0,13	0,01	0,12	0,00
56	0,06	0,05	0,01	0,55	1,71	5,86	0,32	0,18	0,00	0,10	0,00	0,14	0,06
57	0,00	0,01	0,02	0,39	1,77	4,40	0,19	0,05	0,09	0,02	0,04	0,18	0,01
58	0,02	0,01	0,00	0,40	1,86	4,65	0,27	0,10	0,12	0,08	0,05	0,09	0,02
59	0,11	0,04	0,00	0,49	1,96	5,64	0,20	0,05	0,09	0,02	0,09	0,13	0,00
60	0,02	0,02	0,02	0,45	2,32	8,10	0,21	0,08	0,04	0,06	0,10	0,14	0,00
61	0,07	0,02	0,00	0,49	1,89	6,20	0,16	0,00	0,11	0,00	0,14	0,09	0,01
62	0,01	0,00	0,00	0,44	1,71	4,02	0,21	0,00	0,20	0,04	0,06	0,05	0,00
63	0,03	0,01	0,02	0,52	2,70	8,35	0,23	0,09	0,09	0,03	0,08	0,09	0,00
64	0,01	0,02	0,00	0,47	1,94	5,63	0,25	0,06	0,12	0,02	0,09	0,15	0,00
65	0,02	0,05	0,01	0,41	1,68	5,80	0,17	0,11	0,07	0,02	0,13	0,12	0,02
66	0,01	0,00	0,00	0,58	3,09	6,15	0,23	0,08	0,12	0,04	0,00	0,06	0,02
67	0,02	0,02	0,05	0,44	1,82	7,00	0,21	0,13	0,00	0,12	0,00	0,08	0,09
68	0,01	0,03	0,02	0,44	1,64	4,96	0,21	0,05	0,08	0,02	0,08	0,21	0,00
69	0,03	0,00	0,01	0,58	2,41	6,36	0,17	0,03	0,11	0,01	0,09	0,14	0,00
70	0,03	0,00	0,00	0,55	1,94	5,47	0,21	0,00	0,13	0,13	0,01	0,11	0,01
71	0,00	0,00	0,00	0,49	1,64	3,76	0,27	0,00	0,18	0,04	0,00	0,04	0,01
72	0,02	0,02	0,01	0,42	2,37	6,34	0,19	0,00	0,18	0,05	0,11	0,10	0,01
73	0,06	0,00	0,00	0,48	2,29	5,58	0,17	0,00	0,14	0,03	0,04	0,02	0,09
74	0,05	0,01	0,01	0,39	2,27	6,87	0,23	0,04	0,09	0,02	0,14	0,15	0,00
75	0,02	0,03	0,00	0,53	1,71	4,87	0,23	0,10	0,00	0,08	0,00	0,12	0,00
76	0,03	0,07	0,00	0,45	2,34	6,41	0,19	0,00	0,17	0,00	0,14	0,09	0,00
77	0,03	0,02	0,03	0,36	1,89	6,95	0,23	0,04	0,09	0,03	0,08	0,09	0,00
78	0,08	0,00	0,00	0,34	1,84	5,21	0,22	0,00	0,21	0,12	0,00	0,12	0,00
79	0,02	0,01	0,00	0,49	1,88	4,83	0,20	0,11	0,02	0,11	0,02	0,17	0,05
80	0,00	0,00	0,00	0,47	2,37	6,63	0,20	0,16	0,00	0,16	0,00	0,13	0,00
81	0,04	0,03	0,02	0,41	1,78	5,57	0,21	0,07	0,05	0,00	0,11	0,19	0,00
82	0,00	0,01	0,00	0,48	1,94	3,64	0,26	0,00	0,14	0,05	0,00	0,03	0,01
83	0,03	0,03	0,02	0,45	2,07	6,14	0,21	0,11	0,02	0,05	0,05	0,15	0,00
84	0,01	0,01	0,00	0,41	1,53	3,70	0,20	0,02	0,11	0,01	0,09	0,14	0,00
85	0,03	0,00	0,01	0,50	2,09	5,39	0,18	0,00	0,17	0,13	0,04	0,08	0,00
86	0,02	0,02	0,02	0,46	1,75	5,15	0,22	0,07	0,05	0,06	0,07	0,05	0,00
87	0,01	0,03	0,00	0,48	2,05	5,17	0,19	0,01	0,14	0,08	0,04	0,09	0,01
88	0,06	0,00	0,42	0,49	1,12	9,62	0,34	0,14	0,06	0,01	0,11	0,11	0,00
89	0,02	0,02	0,05	0,54	1,91	7,84	0,21	0,05	0,00	0,15	0,05	0,20	0,00
90	0,03	0,03	0,01	0,45	1,93	5,39	0,21	0,05	0,03	0,02	0,08	0,21	0,00
91	0,00	0,01	0,00	0,43	1,81	4,88	0,28	0,01	0,17	0,10	0,03	0,05	0,01
92	0,04	0,00	0,18	0,46	1,58	8,60	0,27	0,00	0,03	0,00	0,12	0,17	0,00
93	0,02	0,02	0,02	0,46	1,89	5,28	0,20	0,05	0,12	0,14	0,05	0,11	0,01
94	0,03	0,01	0,00	0,46	1,92	5,55	0,22	0,06	0,10	0,01	0,14	0,16	0,00
95	0,01	0,00	0,00	0,48	1,84	5,12	0,18	0,10	0,16	0,08	0,01	0,15	0,02
96	0,04	0,00	0,00	0,57	1,59	5,97	0,25	0,00	0,12	0,00	0,13	0,19	0,00
97	0,08	0,03	0,00	0,40	1,84	5,23	0,21	0,02	0,19	0,13	0,00	0,10	0,00
98	0,01	0,03	0,01	0,44	2,17	5,74	0,18	0,10	0,08	0,03	0,06	0,18	0,00
99	0,04	0,00	0,00	0,46	1,71	4,81	0,41	0,05	0,00	0,02	0,09	0,13	0,00
100	0,02	0,01	0,00	0,50	2,10	4,78	0,23	0,11	0,04	0,09	0,00	0,12	0,07

Fado Edition	Melodies pitch 7	Melodies pitch 8	Melodies pitch 9	Melodies pitch 10	Melodies pitch 11
1	0,12	0,17	0,00	0,14	0,00
2	0,06	0,00	0,02	0,05	0,06
3	0,17	0,08	0,00	0,06	0,00
4	0,17	0,21	0,00	0,17	0,00
5	0,17	0,18	0,00	0,16	0,00
6	0,13	0,00	0,02	0,00	0,13
7	0,00	0,16	0,06	0,00	0,17
8	0,07	0,19	0,00	0,19	0,02
9	0,14	0,12	0,02	0,07	0,03
10	0,15	0,00	0,13	0,09	0,00
11	0,00	0,19	0,00	0,12	0,00
12	0,06	0,00	0,13	0,16	0,01
13	0,09	0,03	0,16	0,09	0,03
14	0,13	0,00	0,17	0,06	0,00
15	0,14	0,00	0,13	0,03	0,06
16	0,08	0,00	0,10	0,13	0,00
17	0,15	0,18	0,00	0,15	0,00
18	0,19	0,15	0,00	0,13	0,00
19	0,09	0,00	0,06	0,06	0,00
20	0,13	0,00	0,00	0,07	0,07
21	0,15	0,07	0,00	0,13	0,00
22	0,13	0,00	0,09	0,00	0,16
23	0,19	0,07	0,01	0,02	0,06
24	0,15	0,09	0,00	0,07	0,04
25	0,06	0,00	0,22	0,19	0,03
26	0,06	0,09	0,00	0,03	0,09
27	0,06	0,01	0,09	0,00	0,13
28	0,10	0,01	0,16	0,12	0,01
29	0,14	0,14	0,00	0,10	0,01
30	0,18	0,14	0,01	0,04	0,00
31	0,09	0,00	0,07	0,00	0,11
32	0,06	0,09	0,00	0,12	0,00
33	0,17	0,09	0,09	0,00	0,14
34	0,11	0,00	0,05	0,15	0,00
35	0,16	0,09	0,00	0,16	0,00
36	0,11	0,00	0,19	0,13	0,00
37	0,18	0,00	0,16	0,18	0,00
38	0,00	0,00	0,10	0,08	0,00
39	0,00	0,03	0,15	0,00	0,15
40	0,13	0,00	0,06	0,06	0,06
41	0,02	0,00	0,09	0,05	0,05
42	0,09	0,00	0,10	0,13	0,00
43	0,10	0,00	0,10	0,15	0,00
44	0,04	0,00	0,09	0,11	0,03
45	0,13	0,00	0,09	0,19	0,00
46	0,06	0,00	0,20	0,17	0,00
47	0,14	0,13	0,00	0,08	0,06
48	0,14	0,14	0,00	0,11	0,03
49	0,06	0,03	0,12	0,00	0,18
50	0,11	0,00	0,13	0,20	0,02
51	0,11	0,00	0,07	0,07	0,00
52	0,09	0,00	0,15	0,07	0,03
53	0,06	0,00	0,16	0,09	0,00
54	0,03	0,00	0,15	0,15	0,00
55	0,18	0,10	0,00	0,02	0,05
56	0,00	0,00	0,05	0,15	0,00
57	0,13	0,09	0,06	0,11	0,03
58	0,08	0,05	0,04	0,09	0,03
59	0,14	0,07	0,05	0,14	0,02
60	0,15	0,12	0,02	0,09	0,00
61	0,14	0,03	0,15	0,01	0,16
62	0,15	0,06	0,04	0,07	0,12
63	0,14	0,02	0,12	0,07	0,04
64	0,12	0,05	0,03	0,09	0,01
65	0,12	0,06	0,06	0,13	0,00
66	0,17	0,08	0,00	0,11	0,10
67	0,01	0,16	0,02	0,16	0,01
68	0,11	0,05	0,08	0,12	0,00
69	0,12	0,11	0,07	0,13	0,01
70	0,16	0,09	0,01	0,13	0,01
71	0,16	0,13	0,00	0,14	0,02
72	0,18	0,08	0,05	0,02	0,04
73	0,17	0,00	0,16	0,09	0,09
74	0,16	0,01	0,08	0,09	0,00
75	0,14	0,16	0,01	0,16	0,00
76	0,09	0,00	0,13	0,17	0,01
77	0,10	0,04	0,12	0,16	0,01
78	0,10	0,00	0,06	0,14	0,02
79	0,05	0,02	0,09	0,14	0,02
80	0,08	0,14	0,00	0,13	0,00
81	0,13	0,08	0,03	0,13	0,00
82	0,09	0,00	0,17	0,25	0,00
83	0,18	0,12	0,00	0,12	0,00
84	0,13	0,06	0,09	0,15	0,00
85	0,15	0,02	0,08	0,10	0,04
86	0,15	0,12	0,02	0,21	0,01
87	0,10	0,07	0,08	0,07	0,12
88	0,04	0,03	0,00	0,07	0,10
89	0,15	0,15	0,00	0,03	0,00
90	0,12	0,13	0,06	0,08	0,02
91	0,12	0,06	0,06	0,03	0,09
92	0,16	0,01	0,16	0,06	0,02
93	0,08	0,04	0,08	0,09	0,04
94	0,11	0,07	0,02	0,10	0,01
95	0,10	0,04	0,10	0,07	0,00
96	0,15	0,00	0,02	0,13	0,00
97	0,13	0,08	0,02	0,08	0,06
98	0,15	0,04	0,08	0,10	0,00
99	0,06	0,05	0,07	0,12	0,00
100	0,09	0,02	0,07	0,16	0,01