

**ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL OF ARTS AND  
SOCIAL SCIENCES**

**DEBUSSY AS A PROTO-SPECTRALIST**



**M.A. THESIS**

**Ozan H. ÖZCAN**

**Department of Music**

**Master Programme of Music**

**SEPTEMBER 2019**



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**İSTANBUL TEKNİK ÜNİVERSİTESİ ★ SOSYAL BİLİMLER ENSTİTÜSÜ**

**PROTO-SPEKTRALİST OLARAK DEBUSSY**

**YÜKSEK LİSANS TEZİ**

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*To mom,*



## **FOREWORD**

I would thank to Jerfi Aji for his incredible support, Paul Whitehead and Jane Harrison for being great teachers in my MIAM years.

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## ABBREVIATIONS

<b>FFT</b>	: Fast Fourier Transform
<b>mm</b>	: Measures
<b>m</b>	: Measure





## DEBUSSY AS A PROTO-SPECTRALIST

### SUMMARY

Spectralism was born in the second half of the 20th century as a reaction against Serialism and Post Modernism which had been the dominant music schools of that time. The two students of Olivier Messiaen; Tristan Murail and Gérard Grisey formed the first generation of spectralism together with their friends. Spectralism, which is distinguished from other schools by its different perception of form and time as well as its use of technology, has become one of the most important schools in the music by the end of the 20th century.

According to some researchers, the roots of spectralist thinking can be extended to as far as early romantic era. Spectralist ideas can be observed especially in music of Liszt, Debussy and Scriabin so that these composers are even occasionally regarded as "proto-spectralist". The temporal time approach, fondness of timbre and overtone handling of Debussy can be counted as his spectralist thinking in his music as well as his approach to the performance and impact of the performance venue.

Also, there are relations between impressionist visual artists and spectralist composers. Impressionism at the end of the 19<sup>th</sup> century influenced Debussy, he was nominated as impressionist composer, and spectralist composers of late 20<sup>th</sup> century; so, there are undeniable connections between Debussy and spectralist music.

The advances in digital technology especially after 1960 provides us with new information on the differentiation of the frequential densities of music vs time. The latest technology would enable us to analyze music of Debussy once more to search for spectralist approaches in his music and understand his music further. In this thesis, some excerpts extracted from the piano music of Debussy will be analyzed by using spectrums and graphs that have been produced by use of Fourier transform series.



## PROTO-SPEKTRALİST OLARAK DEBUSSY

### ÖZET

Spektralizm, 20. Yüzyılın ikinci yarısında, o dönemin baskın müzik akımları olan yapısalcılık (serialism) ve modernite sonrasına (post-modernism) karşı bir tepki olarak doğdu. Olivier Messiaen'in öğrencileri Tristan Murail, Gérard Grisey ve arkadaşları spektralizmin ilk jenerasyonunu oluşturdu. Farklı form ve zaman algısı ve teknolojiyi kullanım şekli ile diğer akımlardan ayrılan spektralizm, 20. Yüzyılın sonu ve 21. Yüzyılın başında müzik dünyasındaki en önemli akımlardan biri haline geldi. Her ne kadar spectralist müzik akımı günümüzde Fransız bestecilere atfedilse de belli farklılıklarla bazı Romen bestecilerin benzer şekilde müzik besteledikleri ve akımın yaratıcısının kim olduğu konusunda tartışmalar vardır. Hali hazırda hem Romen ekolü hem de Fransız ekolü spektralist bestecileri jenerasyonlara ayırırlar.

İsimlendirme olarak Murail ve Grisey dahil olmak üzere bir çok besteci, 'spektal müzik' (spectral music) teriminin kendi yaklaşımlarını tam olarak karşılayamadığı konusunda hem fikir olmuşlardır. Bu sebeple kendi aralarında 'spektralist düşünme' (spectral thinking) gibi başka terimler de kullanılmaktadır. Bu bestecilere göre spektralist düşünme şeklinin belli ve kesin sınırları yoktur. Spektralist düşünce şekli eski tarzda kalmış müzikal yaklaşımlardan koparak müziğin zamansal değişimleri, frekanssal zenginlikleri, farklı öğeler kullanılarak özgür bir besteleme şekline dönüşmelidir. Her ne kadar eski müzikal akımlarla ve izlenimcilerle olan etkileşimleri bir şekilde araştırmacılar tarafından ortaya konmuş olsa da, Murail, müziğin eski konvansiyonel yaklaşımlarından kopması gerekmektedir ve müzik diğer sanat dallarını kendine bir yöntem bütünü olarak algılamamalıdır. Tamamen müziğin kendine ait anlatım biçimleri olmalıdır.

Spektralist müziğin köklerine baktığımızda, spektralist besteciler sadece kendilerinden önce gelmiş akımlar olan yapısalcılar ve modernite sonrası müzik dışında bir çok müzik akımından da etkilenmiş ve kendi müziklerinde etkilendikleri bu akımlara atıflarda buldukları sıkça gözlenir. Bazı araştırmacılara göre, spektralizmi etkileyen fikirleri erken Romantik döneme kadar uzatmak mümkün; özellikle Liszt, Debussy ve Scriabin'in müziklerinde spektralist fikirler o kadar çok görülür ki bu üç besteci zaman zaman 'proto-spectralist' (öncül spektralistler) olarak bile isimlendirilirler (Nonken, 2014). Debussy'nin değişken zaman algısı, tını düşkünlüğü, harmonikleri kullanma şekli, performans ve performans ortamının müziğe etkisi hakkındaki tavrı, onun müziğindeki spektralist yaklaşımlar olarak sayılabilir.

Bestecilerin, bazen önceki akımlara tepki ve bazı akımları da kendilerine temel olarak almaları ve bu sayede ortaya çıkan akımlar bize müzik tarihini anlatır. Avrupa kökenli sanat müziğinde bestecilerin diğer müzikal akımlardan etkilenmenin ötesinde, diğer sanat formlarıyla da etkileşimleri dikkat çekicidir. Dönem dönem klasik batı müziğinde farklı sanat akımlarının etkileri oldukça fazladır. Özellikle mimari ve retorik ile başlayan bu etkileşimler, Debussy konu olduğunda resme dönüşür. Bestecinin resim ile olan ilgisi kendi anekdotlarında bizzat kendisi tarafından dile getirilmiştir. Bestecinin çağdaşı olan ressamların, teknolojideki gelişimler ve sosyal hayattaki değişimlerden yola çıkarak, ortaya koydukları izlenimcilik (impressionism), resme düşkünlüğü ile bilinen, Debussy'nin üzerinde büyük bir etki yaratmıştır. O

kadar ki kendi zamanında izlenimci bir besteci olarak tanımlanmasına sebep olmuştur. Özellikle, *La Mer* (1905, Okyanus), bestecinin orkestra için yazdığı eseri, bir nevi deniz tablosunun sese yansımış hali olarak isimlendirilmektedir. İzlenimci ressamların ortaya koyduğu işler 20. yy'ın son çeyreğinde müzikte ana akımlardan birisi haline gelmiş spectralist bestecileri de derinden etkilediği bilinmektedir. Bu sebepten Debussy ve spektralist besteleme fikriyatı arasında olgusal olarak da temel yakınlıklar vardır.

Debussy'nin müzikal yaklaşımındaki öncü spektralist fikirlerin (proto-spectralist ideas) irdelenmesi bu tezin ana yaklaşımlarından birisi olmaktadır. Debussy'nin olgusal olarak spektralist müzik ile ilişkilendirilebilecek yaklaşımları, Debussy'nin müziğinden etkilenmiş spektralist bestecilerin yazdığı bestelerdeki Debussy etkisi, anektodlar ve önceden yapılmış araştırmaların ışığında ortaya konulmaya çalışılmıştır. Ancak spektralist müzik gibi geçtiğimiz yüzyılın son çeyreğine damgasını vurmuş bir akımın öncü izlerini Debussy'nin bestecilik stilinde ararken, eski ve artık modası geçmiş analiz yöntemlerinin uygulanması uygun görülmemiştir.

Özellikle 1960 sonrası büyük bir gelişme gösteren dijital teknolojiler, müziğin frekans yoğunluğunun zamana göre değişimi üzerine eskiden ulaşamayacağımız bilgiler sunuyor. Günümüz teknolojileri, Debussy'nin müziğini yeniden irdelemek, onun müziğini ve müziğindeki spektralist yaklaşımları daha iyi algılayabilmek açısından bize yardımcı olabilir.

Spektralist müzik üzerine uygulanan analiz yöntemleri de artık olabildiğince teknolojiden faydalanmaktadır. Besteleme yaklaşımı olarak teknolojiden bu kadar yararlanan bir akımın, eski konvansiyonel tetkik metodları ile analiz edilmeye çalışılması, ne yazık ki elimize doğru sonuçlar çıkartamıyor. Bu sebepten modern müziğin analizi için, müzik teorisyenlerinin yeni yaklaşımlar yaratması gerekli. Schafer yöntemi 20. Yüzyıl sonlarında ortaya çıkan metodlardan sadece bir tanesi. Teknolojinin bize sunduğu yenilikler yeni analiz yöntemlerinin içerisinde kullanılarak çok daha verimli sonuçlar elde etmemiz mümkün.

Fransız matematikçi Fourier'in bulduğu, zaman ortamı ve frekans ortamı arasında geçiş yapılabilmesini sağlayan Fourier transform serileri yaklaşımı (Fast Fourier Transform – FFT) bize müziğin zamanda içerisinde gösterdiği frekanssal değişimleri görüntüleyebilme şansı veriyor. Müzikte zaman içerisinde değişen frekans yoğunlukları ise spektral müziğin temel taşlarından olan tını ve zamansal değişimler hakkında enteresan doneler sunabiliyor.

Bu tezde, Debussy'nin bazı piyano eserlerinden alınmış örnekler, Fourier dönüşüm serilerinin kullanılmasıyla üretilmiş spektrumlar ve FFT grafikler ile yeniden yorumlanması amaç edinilmiştir. Ancak yapılan analizlerin ışığında Fourier denklemleriyle oluşturulan grafiklerin ve spektrumların solo piyano için yazılmış müziklerin analizi hakkında tek başlarında çok da yeterli olamadığı yönündedir. Tek enstrüman üzerinden yapılan böylesi bir analiz tını üzerindeki değişimleri doğal olarak yakalayamamaktadır. Ancak tek enstrüman üzerinde yapılan analizlerde enstrümanın oluşturduğu doğuşkanların yakalanması konusunda başarılı bir yaklaşım olabilir. Müziğin zaman içerisinde gösterdiği değişimler konusunda ise müzikten alınmış kısa süreli alıntılar üzerinde temel bir bilgi verememektedir.



Spektrum ve FFT grafiklerinin diđer analiz metodları ile iç içe ve yardımcı bir araç olarak kullanıldığında daha kullanışlı olacağı düşünölmektedir. Bazı araştırmacılar bu tür araçların diđer analiz yöntemleriyle hibrit bir şekilde kullanılması konusunda çalışmalar yapmaktadırlar.

Çağının en önemli bestecilerinden olan Debussy'nin müzikal kompozisyon üzerine olan yaklaşımları, tarihsel ve olgusal olarak spektralist müziğin öncül hallerini şüphesiz içermektedir. Ancak akımları isimlendirmek ve sınıflandırmak bizim çağımızın alışkanlıklarından birisi. Debussy kendisini bir akıma bağlamak yahut bir akımın temsilcisi olduğunu iddia etmek ister miydi bunu hiç bir zaman bilemeyeceğiz. Bu noktada Debussy'i şimdilik tarihselliği içerisinde romantizm sonrası bir besteci olarak isimlendirip, gelecekte müzik üzerine çalışacak akademisyenlerin daha geniş bir perspektiften bakarak böylesi bir tanımlamayı yapmasını beklemek daha mantıklı görünmektedir.





## **1. INTRODUCTION**

### **1.1 Purpose of This Research**

It has been thought that Debussy had composed his first piece in 1876. Considering that he died in 1918, we can suggest that his creative life span was separated between 19<sup>th</sup> and 20<sup>th</sup> centuries. Although he was musically active longer in the 19<sup>th</sup> century, Debussy still would be acclaimed as an absolute 20<sup>th</sup> century composer who furthermore influenced many musical schools following his life (Mimaroglu, 1961, p.9).

One of the important schools of the 20<sup>th</sup> century was spectralism. Debussy was considered as a ‘proto-spectralist’ composer by some scholars and spectral composers. The harmonic and timbral understanding of Debussy were different from the other composers of his time. Debussy was differentiated than his counterparts by his approach to temporal perspective of acoustic sound. He also had a different point of view on the time in music as well as being distinctive in his compositional style (Moscovich, 1997, p.22). The purpose of this thesis is to search for the traces of ‘proto-spectralist’ aspects in the works of Debussy, especially in his piano music by using modern analysis procedures. Using spectral analysis method would give us the opportunity to explore some different specialties of Debussy’s piano music and his compositional characteristics. The main purpose of concentrating on Debussy’s piano works is to narrow down the area of the study and focus on the main objective which is to conclude whether he can be regarded as ‘proto-spectralist’ or not.

In this research some excerpts from Debussy’s piano works will be examined by using spectral analysis method. Spectral analysis of these excerpts would give some interpretations about Debussy’s overtone handling. Especially excerpts of Debussy’s piano pieces mentioned in Gary W. Don’s article (Don, 2001), “Brilliant Colors Provocatively Mixed; Overtone Structures in the Music of Debussy” will be used for the analysis. The purpose of this analysis is to scrutinize the article of Gary W. Don and to further study the music of Debussy from different perspectives and to compare

analyses of his works by using spectral analysis and Fourier analysis methods. The expectation of this research is to produce more analytical and concrete ideas about Don's suggestions.

Until today, there have been many analyses made on the music of Debussy, including studies that examine the formal, harmonic and temporal structures of his pieces. All approximations that have been used until now can be classified as conventional analyzing methods. The use of spectral and Fourier transform analysis in defining the works of Debussy would certainly change our perception of him as well as the music of the 19<sup>th</sup> century.

## **1.2 Overview of Chapters**

For the sake of clarity of this research, it would be appropriate to start with the brief life history of Debussy followed by his career in music and then continue with the aspects of his piano music which could be associated with 'proto-spectralist' ideas. Debussy's 'proto-spectralist' ideas will be divided into four different parts to understand his perspective in his music which could be considered as spectralist thinking. Each part will be investigating different components of spectralist ideas in Debussy's music. The first section is about Debussy and his time approach in his music, the second section is about timbre in Debussy's musical style, the third section is about Debussy's treatment of overtone series in his music, and the last section is investigating Debussy's ideas about performance and how the performance space changes the performance and affects the listening experience.

The third chapter is about spectralism. The first section of this chapter will commentate about the history of spectralism and spectral thinking, how spectral music was born as a reaction to former musical currents, how spectralism and spectral thinking were being differentiated from previous musical schools, which had influenced precursors of spectralism and discussions about the denomination of 'spectralism'. The second section of this chapter will be reserved to seek Debussian impressions in spectral composers, who were influenced by Debussy directly or indirectly, consciously or unconsciously.

The fourth chapter is about methodology, recording sessions and analysis. The methodology of the research will be explained with the reasons of choosing this

approach and the analysis methods used. Regarding the recording sessions, there will be an explanation of what the aim was, how the excerpts were recorded and why they were recorded in certain ways. In the last section of this chapter, there will be the spectral analysis and Fourier transform analysis of the recorded excerpts ending with the comparative discussions about the results.

The last chapter will be the conclusion and further research suggestions. In this chapter, it will be discussed whether naming Debussy as a ‘proto-spectralist’ is appropriate or not in the light of the results of the research and historical background. Further researches may be about the shortcomings of this research, how this research could be developed in the future by using different and more advanced digital tools or applications, and how it could be expanded by using similar approach to analyze any music written before the 20<sup>th</sup> century.



## **2. DEBUSSY**

### **2.1 Life and Musical Career**

Achille-Claude Debussy was born on August 22, 1862. Debussy said that ‘some thought me as an infatuated northerner, and some thought me as a southerner who came from the Daudet’s country, whereas I was born in a place which is half an hour away from Paris, Saint-Germain’ (Mimaroglu, 1961, p.10). His father Manuel-Achille was a civil servant who was doing some other businesses like selling porcelain etc. and his mother was a housewife.

In 1670’s, Debussy’s ancestors were peasants in Burgundy. His great grandfather, Claude-Alexandre moved to Paris permanently in 1848. Because of the political reasons of that time, the family had chosen not to use the name of ‘De Bussy’. For the public ‘De Bussy’ was a reminiscent of the aristocracy, and at that time there was a reaction against the aristocracy. Instead of ‘De Bussy’, ‘Debussy’ as a surname sounded much more democratic. Firstly, the composers’ aunt Clementine used the name ‘Debussy’ for her manufacturer shop although there were some family members using the name ‘De Bussy’ in Leeds, England, still in the 1960’s (Nichols, 1998, p.4).

Debussy and his family were sent to Cannes by his father in 1870 to stay at aunt Clementine’s house. During his stay in Cannes, juvenile Debussy took his first piano lessons from an Italian violinist Jean Cerutti. A banker Atono Arosa had made the payment for these lessons, as he was caring for Debussy’s aunt at that time (Mimaroglu, 1961, p.11). During the same time period Debussy’s father Manuel had joined the army in the Franco-Prussian war. After the war because of his poor economic situation and political reasons he decided to join the forces of the Commune. Manuel sentenced to four years in prison due to joining the forces of the Commune, but he was prisoned only for two years. This unfortunate incident changed young Debussy’s life. His father Manuel had met with Charles de Sivry in prison, who had mentioned the piano teacher Mme. Maute de Fleurville to Manuel Debussy (despite

the claim that she had studied with Chopin, there weren't any records of her name in Chopin's students lists), and later Mme. Maute de Fleurville would be the first piano teacher of Debussy (Nichols, 1998, p.8). She started giving piano lessons to young Debussy and prepared him for the conservatory. Debussy was accepted by the conservatory on October 22, 1872. Since especially his mother preferred Debussy to take lessons at home from private teachers, Debussy had not gone to any regular school till that time (Lesure, Howat, 2001, p.1).

Debussy was appreciably successful at his first years of conservatory. His piano teacher Marmontel, also known as being the teacher of Bizet, Albeniz and D'Indy, and his solfège teacher Lavignac noticed the extraordinary talent of Debussy. After 1877, Debussy's accomplishments at the conservatory started to decline. Not being able to win the first prize in piano classes has changed his family's and his ideas about him being a piano virtuoso. This was a breaking point in his life which changed his path. In 1879, he earned the rights to attend Ernest Guiraud composition classes. His first compositions date from this year, his first song *Madrid* 1879 and the first larger piece *Piano Trio in G* (Nichols, 1998, p.10-14).

Debussy was determined to be the winner of the Prix de Rome, so he was composing some pieces for the contest. His first trial was a choir piece, which he composed on a text by Theodore de Banville, *Diane au bois*. His piano teacher Marmontel demanded him not to send this piece to the jury because it was too progressive. However, Debussy was strong-minded and after that disappointment he attempted Prix de Rome four times in the following years; at first with *Printemps*, a piece for choir, which was found immature by the jury, in his second trial, the jury gave the fourth prize for his work named *Invocation*, and in his third trial, Debussy got the second prize with his cantata *Gladiateur*. At the end, he finally won the Prix de Rome with another cantata *L'Enfant prodigue*. In 1884 Debussy earned the right to go to Villa Medici because of being the winner of Prix de Rome, then he left Paris behind on January 27, 1885. In that time Prix de Rome winners were composing music by the Academy's demands, and the Academy was expecting some pieces from Debussy during his stay in Rome; but Debussy sent only one piece: his symphonic suit *Printemps*. While composing *Printemps*, Debussy was inspired by Botticelli's *La Primavera*. Debussy was not happy at Villa Medici. He was more occupied with Verlaine, Baudelaire, Rosetti, Shakespeare than he was with Italian opera. Despite his distractions, he was still



impressed by the Renaissance composers' music like Palestrina and Lassus (Mimaroglu, 1961, p. 12).

Debussy came back to Paris from Rome in March 1887 and his life was socially colorful but financially struggling. His financial condition was not good in Italy either which had continued after moving to Paris although he kept receiving a payment from the Academy till 1889, as the winners of the Prix de Rome were paid by the Academy for the five years after winning the prize (Nichols, 1998, p.44-45). Debussy spent three years at the cafes that symbolist artists were gathering; in these years, the composer was mostly influenced by Wagner (Lesure, Howat, 2001, p.2). Wagner was considered the king during the second half of the 1880, not only in music but also in literature circles. Especially Debussy's *La Damoiselle elue* was close to Wagner's *Parsifal* by usage of leitmotive technique (Mimaroglu, 1961, p.13). In October 1889 Debussy's *Fantasie* for piano and orchestra was planned to be performed for the demand of the Academy. This was a tradition; Prix de Rome winners would take place in these concerts. D'Indy who would have been the conductor of the orchestra asked Debussy to play only the 1<sup>st</sup> movement due to its being too long, but Debussy declined this suggestion and withdrew his piece from the concert. After Debussy's refusing to submit *Fantasie* to the Academy, an independent era for Debussy started. He was freed from the pressure of the Academy which was a turning point for Debussy's music (Nichols, 1998, p.59-61). Again in 1889, Universal Exposition was coordinated in Paris, where Debussy met with Java's Gamelan music, which influenced his music in his future works. Universal Exposition was also important because it brought French and Russian musicians together and made them familiar to each other's music (Mimaroglu, 1961, p.14).

During the first half of the 1890's, Debussy started to compose music for the symbolist Maurice Maeterlinck's *Pelleas et Melisande*. Although Debussy had respect for Wagner, this was a reaction to the Wagnerian effect on the French Opera. On the other hand, he was composing *Cinq Poemes de Baudelaire* at the same time, which carried traces of Wagner (Mimaroglu, 1961, p.15). In 1893 while he was composing *Pelleas et Melisande*, his works *String Quartet* and *La Damoiselle elue* were being performed at Société Nationale. Debussy had appeared on the bigger stages at Parisienne art society with these performances. By these striking introductions of Debussy to the wealthy circle of Paris, he made new friends who would support him financially and

morally (Lesure, Howat, 2001, p.3). After *Pelleas et Melisande*, Debussy composed another important work in his musical life named *La Mer*. *La Mer* was premiered in 15 October 1905; although it was a great work, it had been badly criticized because of Debussy's private life at that time (Mimaroglu, 1961, p.17). He was well known in Paris and artistic circles; however, people hadn't heard Debussy's piano music until 1910 (Howat, 2009, p.18).

The end of the 1890's and the first fifteen years of the 1900 were very productive and important for Debussy's musical career. In this time span, Debussy composed his master pieces like *Nuages*, *La Mer*, *Pelleas et Melisande*, *Images*, *L'isle Joyeuse*, *Preludes*, *Iberia*, *Rondes de Printemps*, *Douze Etudes*, among others. Debussy signed a contract with publisher Georges Hartmann, this was the first time he was paid a regular salary. After end of the contract with Hartmann, Debussy made an agreement on publishing his works with Durand. Conditions were improving for Debussy, his operas were translated into other languages and performed in the United States and Germany, and at the same time the first biography of Debussy was published in London. Debussy was accepted to the conservatory as an advisor by the call of Fauré. Debussy gave many concerts out of France, like Russia, Italy for the wealth of his family (Lesure, Howat, 2001, p.4-6).

Some claimed that, after 1914, Debussy's creativity was depleted. He was even criticized as being 'dead' for music by the beginning of the First World War and this situation was related to his sickness. On the contrary, *Douze Etudes*, which was composed after 1914, not only has pedagogical purposes but also, they are colorful and sensible pieces. His works that he composed after 1914 were stimulating neo-classicism, so this inference of 'Debussy was dead' by the beginning of First World War, was an exaggeration (Mimaroglu, 1961, p.20).

On 25 March 1918, Debussy died in Paris, while the World War was still in progress.

## **2.2 Spectralist Ideas in Debussy's Music**

According to Debussy, an ingenious artist should deal with the acoustic possibilities of the instrument, not only with virtuosity at the keyboard. The operating principles of the overtone series and approaching the microtonal nature of resonance are the causes of Debussy's treatment of harmony. His aesthetic concerns were about the changes of

sound and color in a duration, and his time approach is very flexible in his scores. Debussy uses operations of timbre transformation as a supporter of conventional formal structures. (Nonken, 2014, p.32-33). In Nonken's view there are many aspects that could be seen in Debussy's music that could be easily associated with proto-spectralist approach to music composition. So, it would be suitable to study Debussy's 'proto-spectralist' aspects in different titles; namely, time approach, timbre, overtone approximation, modificatory attitudes in different performances and different performing spaces.

### **2.2.1 Debussy and the time approach**

To understand the time approach of spectralist attitude, first we should think about time in a different way. There was a change in the understanding of time at the end of the 19<sup>th</sup> and at the beginning of the 20<sup>th</sup> centuries. Bergson's ideas about time are more suitable for time approach of spectralist thinking and there are similarities with Debussy's understanding of time in his music. Bergson specifies the time as not a clock time but as an experience that lasts in a duration. You can measure how long they are by using a clock, but the main understanding of time is about the total experiences that occur in a duration (Bergson, 1910, p.104). In this point of view, understanding of time could be dichotomized as subjective and objective. Bergson's ideas could be named as subjective time understanding, the time is perceptive and on the contrary, objective time is measurable. In Debussy's music, Debussy has a subjective time understanding.

In the Classical and early Romantic era, the conception of time is rigid. Because of the rhetorical and constructive basis of this music, composers of that time would need steady metronome pulses to build proportional relationships between metric and temporal elements, and by using them, they would build larger formal structures. This conception of time started to change with the later Romantics. In the Romantic era composers started to use elastic temporal directives like 'rubato'. Composers like Chopin, Liszt, Scriabin, Fauré and Debussy started to show more liberal rhythmic approaches in their music (Nonken, 2013, p.49).

The anecdote of François Gillet at the rehearsal of *La Mer* before its premiere gives different ideas about Debussy's interesting attitudes about time. Gillet was advertising about the conversation between Debussy and the conductor of the orchestra; Debussy was not happy with the tempo, and the conductor told that they were playing at exactly

the same tempo as yesterday, and he (Debussy) was happy with it yesterday, then Debussy replied “But I don’t feel music the same way every day!” (Nichols, 2003, p.183). This anecdote makes one think that Debussy hasn’t got a traditional musical time understanding. Musical time and feeling could change by the mood of the person, understanding of time in music could differentiate from one day to another and it is not rigid.

The musical time perception of Debussy evokes ‘proto-spectral’ attitudes, presenting an experimentation on instantaneous acoustic complexity which is a part of an evolving continuous resonance (Moscovitch, 1997, p.22). Debussy repeatedly uses instructive notes on his scores towards a nonrigid approach to time. Debussy’s piano music needs a great virtuosity, since the instructions he uses on his scores can only be realized by manipulating the piano, and this could just be actualized by understanding the potentials and characteristics of different instruments. In practices of Debussy, time changes are very common and musical flux is constantly changing. His focus is on the timbral changes and transformations; these are the basis of the formal structure. His above-mentioned focus requires different time approaches for the realization of musical flow. Debussy’s directions about time and temporal changes indicate that his time consciousness is to secure the liberation of the musical flux from the traditional time perception (Nonken, 2014, p.32-33-51).

We can suggest that Debussy and some of his contemporaries were aware of Bergson’s time conception that was mentioned at the beginning of this section. As Henri-Louis Bergson lived in the same time span with Debussy, there are indeed some significant similarities in his time approach with spectralist composers. That kind of understanding of time was not an invention of the composers of that era. This was a part of how society started to think about time. The inventions in science first affected the ideas of philosophers who evoked artists to think about it, but it was not a conscious reaction, it was rather a change in the society and a kind of revolution in the intellectual cycles. This will be discussed in detail at the end of the research in the conclusion chapter.

### **2.2.2 Debussy and timbre**

Debussy comprehends music as a timbral incident. This approach was to be labeled later as “klangfarbenmelodie” (sound-color-melody) in Webern’s music, but actually

Webern's concept was directly coming from Debussy's orchestration. Debussy's music was not based on the harmony. Harmony was not the main part of the structure, but it was the main statement in different existential occurrences (Mimaroglu, 1961, p.9-10).

For Debussy, timbre was a very important aspect of music. There were a lot of anecdotes and scholars who have been speculating and searching his interest in timbre. The anecdote of George Copeland, when he visited Debussy at his house, is quite interesting and gives us a clue for Debussy's fondness for timbre:

"The piano, at the far end of the room, was draped with a silk scarf held in place by a heavy cloisonné vase. I asked permission to move the vase, so that I might open the piano cover. 'Absolument non!' he replied with obvious annoyance. 'Do not touch it! I never permit that anyone should open my piano. As it is, everyone plays my music too loud'" (Copeland, 1955, p.35).

In my opinion this was not just to stop people from playing his works loud, but also, he was very fond of the timbre of his room in that way. It's well known that Debussy was a little too obsessive about his working room. He could not work if any piece, a vase or a statue was misplaced or changed its positioning in his room. There is another anecdote from Robert Schmitz, although it looks very exaggerated: at a rehearsal in Debussy's room with a soprano, Debussy was not satisfied in one way or another. He asked them to start over again and again while grumbling 'it is not ok'. After a while Debussy had found a pin on the carpet and asked them to play once more, then he said, 'it is ok now!' (Schmitz, 1937, p.781-2). Debussy was not obsessive only about the placement of the objects in his working room, but also, he was fond of the acoustical impulse of his room and the timbre of the piano. His keen interest on piano's timbre will be investigated separately in the next section on overtone handling, which is a part of timbre.

Debussy's impressionist ideas about music are also evidence for his concentration on timbre. This makes the interpreter work harder on his piano pieces. The player should focus on his directions on the score to assure the accurate realization of Debussy's music. Every nuance is important to pronounce the timbre of Debussy's 'pictorial-poetic' tones (Naie, 2015, p.137-138). Marilyn Nonken mentions how she had worked with her piano teacher Armand Basile, on how to catch and feel the resonance and timbral color.

“In lessons, we would play all the notes in a measure at tempo, then catch their resonance in the pedal and simply wait, sitting silently and listening their decay..... As I became versed in a broader repertoire, I became aware that there were certain composers, like Scriabin, like Liszt, and Debussy, whose music was particularly suited to Basile’s approach, rewarding the pianist intrigued by the temporal nature of timbral color. Other composers’ music, approached from this perspective, offered no rewards. Their music was ‘about’ other things, not the sonorous world unique to the piano and the environment it offered for musical exploration.” (Nonken, 2014, p.2)

Debussy’s piano music shouldn’t be thought of as just an organization of pitches. It is obvious that Debussy cared much about timbre and overtone creation of the acoustical piano. In the fourth chapter, a comparative analysis of the performances with digital piano and acoustic piano will be discussed.

Debussy was very aware of the acoustical possibilities of the piano while composing for the piano. His piano technique evolved to generate every possible acoustical aspect of piano, its timbre, sonorous capability (Gatti et. Al., 1921, p.491). He was using different instruments, but one was very important for him. This instrument was his Blüthner medium grand 1904, which had extra resonating treble strings that could resonate without touching the other strings (Howat, 2009, p.311). Maurice Dumesnil reported that: “...He played a number of passages and the tone he extracted from the Blüthner was the loveliest, the most ethereal I have ever heard...” (Nichols, 1998, p.159). Nearly in all anecdotes about his Blüthner, he was very proud of it. All these anecdotes point out how much importance Debussy attached to the piano’s sonority and how much he cared about enriching the piano’s timbral and tonal capabilities. Nonken mentions the relationship between Debussy and his piano in her book as follows:

“...He viewed the piano as not a machine but, empathetically, an organism; the environment as a sounding board for pianistic resonance; and timbre as the result of additive processes leading to perception of color.” (Nonken, 2014, p.54)

Also, she adds that Debussy’s approach to harmony, timbre and resonance could be correlated with his relevance to ‘shimmering microtonal sonorities of Balinese gamelan’ (Nonken, 2014, p.55).

His such keen interest on timbre may be attributed to his impressionist behavior in his music. Impressionism was an art movement is used for both painting and music. Like other French composers, Debussy was also concerned with visualization. It has been

reported that he said constantly he would be glad to be a painter (Howat, 2009, p.3). It's not surprising that he cares about timbre, when color and texture in painting are considered to be evolving to timbre and tone color in Debussy's music.

In a nutshell, Debussy was very interested in timbre in his music although the piano may not be the most appropriate instrument when it comes to feeling timbre. Despite this handicap, he was still successful in exposing the timbral aspects of the piano.

### **2.2.3 Debussy and overtone treatment**

Debussy's overtone treatment has been frequently discussed by scholars. Gary W. Don's article specifically deals with Debussy's overtone treatment in some of his piano pieces. Don investigated Debussy's overtone usage in *L'isle Joyeuse*, *La Cathedrale engloutie*, *Pagodes*, *Danseuses de Delphes*, *Cloches a travers les feuilles*, *Prelude a l'apres midi d'un faune* and these will be discussed in later chapters (Don, 2001, p.1). Debussy was giving importance to the higher fundamentals and the subsets of upper partials. His harmonic language could be denominated as 'a movement from one overtone series to another overtone series' (Johnston, 1988, p.237).

Debussy's piano music forces interpreters to understand the background of overtones. Many of his pieces need more consciousness about overtone series; some are nearly inaudible. Without this acoustical perception these pieces are 'mere skeletons'. Debussy was not interested in a note that could clearly be heard by the listener, he was interested in overtones which were generating that note (Nichols, 1998, p.178).

Karl Lahm mentions his experience about Debussy playing his own music. Lahm talks about Debussy's gentle, fascinating piano playing, and wants to draw attention to Debussy's correct and not distracting overtone handling (Nichols, 1998, p.123). Pianist Maurice Dumesnil's memoir with Debussy is illuminating about how important the overtones are for Debussy:

“... Again, the matter of triplets values came up. Now he found them too strictly in time. It was all right in a way, he said, but they ought to be included 'within a general flexibility'. He advised me to depress the two pedals before starting, so that the overtones would vibrate immediately upon contact...” (Nichols, 1998, p.159).

Debussy's special Blüthner piano is also interesting and a very special instrument. That piano has 'aliquot' resonating treble strings on it. This extra set of strings is not touched by the hammers, they are just for resonance and produce a richer sound with powerful

overtones. This special piano can still be seen at the Musée Labenche in Brive-la-Gaillarde (Howat, 2009, p.311).

Anecdotes and scholarly research make a strong point about Debussy's interest in overtones, and indeed Debussy put a special importance to overtones. In some piano pieces he uses it nearly as a kind of harmonic language. This situation can be associated with his interest in Balinese gamelan music which he became acquainted with at the Universal Exposition in Paris in 1899 (Nonken, 2014, p.55). Pianist E. Robert Schmitz talks about Debussy and his interest on Balinese gamelan music:

“Debussy regarded the piano as Balinese musician regard their gamelan orchestras... He was interested not so much in the single tone, as in the patterns of resonance which that tone set up around itself” (Schmitz, 1937, p.781-782)

Also, acoustical research of Helmholtz about acoustics in the second half of the 19<sup>th</sup> century may be related with Debussy's overtone treatment (Pasler, 2007, p.91).

In the light of all anecdotes and research, we can deduce that Debussy's music is certainly related with the overtone series and manipulations of overtones.

#### **2.2.4 Debussy and his approach to performance**

Mimaroglu mentions that Debussy's piano music style comes from Chopin (Mimaroglu, 1961, p.9). His piano technique also reminded his listeners of Chopin (Nichols, 1998, p.69). However, Debussy differs from Chopin particularly by his way of using the pedal and his ideas about performance and where the performance takes place. Although performance and performance spaces were also important for composers who lived before Debussy, 19<sup>th</sup> century composers, especially late Romanticists started to put much more importance to these aspects. Eventually performance and performing venues became a fact for Debussy and other late Romanticists.

His practice room was mentioned in previous sections. His obsession about the furnishing of the room was not just for aesthetic reasons, but also the acoustical outcome of his room was satisfying him in a particular way, as seen in Schmitz's anecdote below.

“Debussy was ‘a’ very particular about everything in this room. He could not work properly if a picture hung crooked or one of the small wooden animals on the desk were turned the wrong way” (Schmitz, 1937, p.781).



As mentioned above in the memoir of Gillet, Debussy had an argument with the conductor of the orchestra at the rehearsal of *La Mer*. He was not happy with the tempo which he was totally satisfied with the day before. Debussy ended the conversation as he wasn't feeling the music the same way every day (Nichols, 1998, p.183). Gillet's anecdote proves that Debussy considered music as a performance art. This anecdote shows us that Debussy thought that music is changeable day to day, depending on your feelings and your musical perception in that exact moment.

Debussy uses many instructions that were unorthodox at the time. He was asking the interpreter to play freely (*librement*), supple and flowing (*souple et ondoyant*), as if speaking animatedly (*volubile*) (Nonken, 2014, p.51). These are relativistic instructions, they need to be examined and assimilated by the interpreter, and the interpreter should make a synthesis. On the contrary he was not fond of writing down pedaling indications on his scores. Dumesnil reports that:

“It has been noted that Debussy's pedal indications are extremely scarce. In fact, their presence in his list of compositions for piano can be counted on the fingers of both hands. ‘Pedaling cannot be written down’ he explained. ‘It varies from one instrument to another, from one room, or one hall, to another.’ So, he left it to interpreters: ‘faites confiance a votre oreille’ (entrust it to your ear), a remark that is not surprising from a musician whose aim had always been the pleasure of the ear” (Nichols, 1998, p.163).

Debussy's ideas about pedaling are indicative: he was giving a significant importance to the instrument and to the performing place, these are the two elements combined with the interpreter's decisions which would make a performance unique.



### 3. SPECTRALISM

#### 3.1 History of Spectralism and Spectral Thinking

In the second half of the 20<sup>th</sup> century, there have been great developments in digital technology and extensive research on psychoacoustics. The developments in digital technologies affected electronic music. Research in psychoacoustics and electronic music generated a new compositional style in music that is called spectralism (Pressnitzer, Adams, 2000, p. 35). Spectralism was a reaction to 1950's structuralist compositional techniques. Spectralism as a musical movement attributes importance to natural resonance in contrast to the serialist movements of the 1950's with extravagant calculations and strictness in compositional style (Porcos, 2017, p.85).

Messiaen, one of the most influential composers of the mid 1900s, was the teacher of both Murail and Grisey, who were the founders of 'spectralism' or 'spectral thinking'. Messiaen's compositional style and ideas about music deeply affected these two composers (Nonken, 2014, p.56). However, there were some confusions about who started spectralism and who denominated as 'spectralism'.

Although researchers agree on spectralism having phases and generations, like proto-spectralists, 1<sup>st</sup> and 2<sup>nd</sup> generations etc., Iuliana Porcos based the roots of spectralism to Edgar Varese (1883-1965), Giacinto Scelsi (1905-1988) and Györgi Ligeti (1923-2006). Porcos does not refer either to Messiaen or Debussy as an influencer as Nonken did; but Porcos considered Romanian composers as the 1<sup>st</sup> spectralist generation:

“The first spectral sub direction (1965-1975) advances into the history of contemporary music with six Romanian composers. These simply created music on the harmonics, in a fundamentalist type..... This type of music, on the harmonics, was stimulated analogously..... The second sub direction is also known as spectralism around a chord (the harmonics of a fundamental have a static hypostasis as well as the generating sound); see *Colinde* (1968) by Mihai Mitrea Celarianu..... The third subdirection (1970-1980) is represented by Horatiu Radulescu and Iancu Dumitrescu. The former employs another spectral modality which O. Nemescu called

improvisational and monochord. Radulescu invites the performer to make use of instrumental effects which may unleash harmonic but also partial sounds (that is to say the emission of sound close to the bridge, then activating a free string to result into a harmonics spectrum; also the multi-phonics produced by woodwind instruments; thus was the timbrality of the instrument transformed)..... The fourth sub direction was born in France after 1975...” (Porcos, 2017, p.88).

Romanian composers and French composers had different attitudes and the denomination of spectralism belonged to the French composers (Porcos, 2017, p.85-89). On the other hand, the nomenclature of spectralism was found inadequate by the French composers (Anderson, 2000, p.7). At the end of the 1970’s, spectralist composers had an argument about the terminology and the founder of the denomination of ‘spectralism’. The use of the term ‘spectralism’ was credited to Hugues Dufourt in 1979 but Murail rejected this and claimed that Grisey and himself had talked about using ‘spectralism’ as a term before Dufourt did. It is interesting that at the Internationale Ferienkurse für Neu Musik, Darmstadt, in 1978, there was a discussion about the term ‘spectralism’, and who coined it first. Nobody claimed responsibility for that (Murail, 2017). After disagreement in the nomenclature of ‘spectralism’, Grisey used the ‘spectral’ terminology again in 1998, but he had some addition to it. Grisey suggested naming as ‘spectral thinking’ because spectralism is not a set of rules for contemporary composition, it is an attitude, a way of thinking;

“The spectral adventure has allowed the renovation, without imitation of the foundations of occidental music, because it is not a closed technique but an attitude.”  
(Grisey, 2000, p.3)

These kinds of specifications were accepted by other composers who were dealing with spectralism and who had spectral attitudes in their compositional language (Cross, 2018, p.6). Thus, spectral composers may have vastly different styles, and some might even prefer to reject the label. However, what these composers share is a central belief that music is ultimately sound evolving in time. Grisey’s statement about form and temporal differences of spectral music is elucidative:

“No musicians were waiting for spectral music to use or to highlight the use of sonic spectra, just as none waited for dodecaphonic techniques in order to compose chromatic music: but just as the series is not a question of chromaticism, spectral music is not a question of sonic color. For me, spectral music has a temporal origin.

It was necessary at a particular moment in our history to give form to exploration of an extremely dilated time and to allow the finest degree of control for the transition from one sound to the next.” (Grisey, 2000, p.1)

Viewing music in this way, as a special case of the general phenomenon of sound, facilitates these composers’ use of the available knowledge in the fields of acoustics and psychoacoustics within their music. They can refine their understanding of what sound is, how it may be controlled and what, ultimately, a listener will be able to perceive. The only true constant for spectral composers is that they consider music to ultimately be sound and see composition as the sculpting in time of those sounds that a listener will hear. All other shared attributes might change with time, but this attitude towards music and musical perception is the true hallmark of a spectral composer (Fineberg, 2000, p.2).

From its beginning, spectralism has been characterized by the hypnotic power of slowness and by a major obsession with continuity, thresholds, transience and dynamic forms. It is in radical opposition to all sorts of formalism which refuse to include time and entropy as the actual foundation of all musical dimensions. Grisey goes a step further in his words:

“Strengthened by an ecology of sounds, spectral music no longer integrates time as an external element imposed upon a sonic material considered as being ‘outside-time’, but instead treats it as a constituent element of sound itself. This music forces itself to make time palpable in the ‘impersonal’ form of durations; apparently far removed from spoken language, but doubtlessly close to other biological rhythms which we have yet to discover. Finally, it is sounds and their own materials which generate, through projections or inductions, new musical form.” (Grisey, 2000, p.2)

Before spectralism, the musical world was dominated by two main approaches. One was serialism, which was led by Boulez, and influenced by the twelve-tone music of the Second Viennese School. They had post-Schoenbergian serial esthetic attitudes. The other was aleatoricism interrelating with Cage and advocated by André Boucourechliev especially in the Parisian musical circles. This musical current considered itself as an antithesis to formalized compositional techniques. Messiaen,

the influencer of the first spectralist composers, also influenced serialism which was dominated by Boulez, a former student of Messiaen. (Nonken, 2014, p.60).

Messiaen thought that the sound and color relations are not subjective and could be heard and felt by everyone. After his ideas about color and sound, he started to be criticized by serialist composers and they interpreted Messiaen's ideas about sound and color relationship as an illusion (Hill, Simeone, 2005, p.244). Messiaen's attitudes, which were thought of as a proto-spectralist, were felt by his young students Murail and Grisey (Harvey, 1999, p.39). Messiaen's ideas inspired his students and made them look more deeply in the essence of sound and its connections with 'harmony, timbre, and color' (Nonken, 2014, p.63).

Boulez established *The Domaine Musical* ensemble in 1954, which became very popular among Parisian art chambers. The ensemble was playing the Second Viennese School's repertoire, and some new young composers' pieces. Boulez was the one who selected the repertoire. By his decisions, a young composer could become very famous or stay as an unknown composer. Boulez was a very strong figure of that time nearly comparable to Wagner in his time. In 1970, Boulez established IRCAM, a center for new music research (Nonken, 2014, p.73). Spectralist composers were related to IRCAM but they still put a distance to Boulez and his ideas.

In January 1973, students of Messiaen namely, Murail, Tessier, Grisey, Dufourt, Levinas (composer, pianist, son of the philosopher Emmanuel Levinas) established the group *L'Itinéraire*, which means 'the path' as a reaction to Boulez and *The Domaine Musical*. Their aim was to put their own works and some by other composers, who revealed and influenced them, into the practice (Smith, 2000, p.11-19). Members of *L'Itinéraire* kept a distance to Boulez and *The Domaine*. Although they were researching at IRCAM, they avoided Boulez and his agenda (Nonken, 2014, p.74). Spectral movement or attitude was presenting a new idea about contemporary music. It was a reaction to Boulez's serialism and soon gained recognition as a successor of serialism. *L'Itinéraire* was a democratic formation; members were expressing themselves in freedom (Drott, 2009, p.41-51). Spectralism was not a school or set of rules for a compositional style, but it was an attitude, a behavior. *L'Itinéraire's* stance

against Boulez and his *Domaine* was an important milestone for the spectral movement (Fineberg, 2006, p.130).

Messiaen and his ideas about color and sound, influenced initiators of the spectralist movement in particular, Murail and Grisey. Murail became his student in 1967 and Grisey in 1968. While serialist composers were concerned with pitch classes and serial techniques rather than timbre, Messiaen considered harmony and timbre as inseparable parts of musical thinking. He was influenced by Scriabin's synthetic chord and it was a kind of starting point for him (Nonken, 2014, p.56-59). His ideas about musical composition, even though he would not be labeled as spectralist, were still respected as a composer who had spectral attitudes (Cross, 2018, p.7). Messiaen believed that the sound and color relationship is recognizable by everyone. His compositional technique could not be entitled as tonal or atonal, or modal; he was using varied zones of colors (Dingle, 2007, p.163-164). Murail was impressed by Messiaen's classes at conservatoire; he was thinking that his musical ideas could not be realized by using serialist approaches, he was looking for another possibility, and it was there (Murail, 2003). He enhanced these kinds of spectral approaches about listening and performance. Messiaen conceptualized '*vraie harmonie*' (true harmony) and handed it on to his students Murail and Grisey (Fineberg, 2006, p.125). Messiaen, one of the most important influencers of Murail and Grisey, was considered as significantly impressed by Romantic composers, and Debussy and Liszt (Griffiths, 1994, p.122).

### **3.2 Debussy's Influence on Spectralism**

In the last two centuries humanity witnessed the most advanced scientific and technological developments in the history of civilization. These developments affected social life and therefore naturally compositional styles and musical schools. The change in science, technology, social life and musical composition gave birth to spectralism. It would be legitimate to say that spectralism and spectral attitudes took their roots from this period, and we can find the baby steps of spectral attitudes starting from the early Romantic era (Nonken, 2014, p.1).

Debussy is one of the most important composers of his time and French music school. He influenced many musical currents, not only in euro-genetic art music but also jazz music with his modal and harmonic approaches in his music. In our case, Debussy's

ideas about tone-color relationship as well as his overtone handling, fondness of timbre and temporality influenced Messiaen and spectralist composers. As mentioned earlier, scholars referred to this influence as a chain, Debussy affecting Messiaen, and him affecting Murail and Grisey who then influenced the second spectralist generation which went on (Nonken, 2014). Debussy was influenced by other composers older than him, but this is not an influential chain, but a kind of French school characteristics. Jean-Phillippe Rameau, 18<sup>th</sup> century French composer, was the starting point. Rameau's practices about harmony was a beginning, he had tried to find the relationship of intervals in nature. His explanations were based on overtones. In Rameau's point of view, a chord should ground on natural partials of the root (Rameau, 1971). This is the idea that a sound is formed by its overtones. Debussy's approaches about overtones and his way of handling them as a part of harmony can be considered as extended versions of Rameau's ideas. Debussy added tone-color relationship on Rameau's practice, which can also be considered as a part of overtones. Messiaen shared the ideas of Debussy about overtones and tone-color relationship. In other words, ideas about perception of harmony and understanding of overtones of Rameau could be traced till spectralism. This stylistic approach is considered to belong to the French school and elaborated by Debussy followed by Messiaen, then Murail and Grisey. Also, by looking at which composer was influenced by whom, we can constitute a chain of composers; Debussy was influenced by Liszt, 'Messiaen and Scriabin oriented themselves towards Debussy, Murail towards Messiaen', then generations of spectralism were influenced by the previous spectralist generations (Nonken, 2014, p.9). This influential chain started with some of the Post-romantic composers (proto-spectralists), then 1<sup>st</sup> generation, then 2<sup>nd</sup> and so on. On the other hand, if we make a longer chain considering that Chopin influenced Debussy, then could we say that Chopin also had spectralist ideas? Not exactly, because Chopin hadn't shown much spectralist attitudes in his music as Debussy did.

According to Nonken's ideas, spectralist attitudes were rooted in the early Romantic era. Being a late Romanticist and a composer who experienced the transition between the 19<sup>th</sup> and 20<sup>th</sup> centuries, Claude Debussy was one of the monumental figures of this long period from early romanticism till spectralism. Members of *L'Itinéraire* historically were impressed by Debussy's approach to sound and color interaction (Cross, 2018, p.7). In Dufourt's opinion:



“Its (Spectralism) genesis is situated in the confluence of various mindsets that preceded it. It discovered its source in the notion of sonic substance that Debussy conceived.” (Nonken, 2014, p.163).

Emile Vuillermoz speaks of Debussy’s pianistic approaches, and in particular, bell-like sounds as follows:

“All those who have had the privilege of seeing one of Debussy’s works well up from under his fingers know what a miraculously gifted pianist he is. Personally, I have never heard more supple, elegant, or velvet playing. He obtained sonorities from the piano which softened the angles and asperities generated by his forward-looking inspiration ... And no one else had his gift of transforming a dissonant chord into a little bell made of bronze or silver, scattering its harmonics to the four winds.” (Nichols, 1992, 156)

It is also known from Maurice Dumesnil’s anecdotes about Debussy that he was commenting about Dumesnil’s playing as “I do not hear the bells” (Nichols, 1992, 160). Vuillermoz and Dumesnil’s memoirs about Debussy and his keenness about bells are important. Debussy composed *Cloches a travers les feuilles*, from his second volume of *Images* in 1907 (an excerpt from this piece will be analyzed in the next chapter). Debussy’s pianistic imaginations on piano echoed in modern piano compositions. The bell ringing affect in *Cloches a travers les feuilles* was surely known by Murail and Grisey, and we can also see it in Messiaen, who used bells in his music too. These two composers have been mentioned above as the beginning of the influencing composers’ chain. Grisey’s works *Daphnis et Chloé* and *Quatre Chants pour franchir le seuil* have the same bell ringing affects in them. And also, Murail composed *Cloches d’adieu, et un sourire* in 1992 and the piano solo of this piece has remarkable traces of Debussy’s pianistic style. Bells are popular in spectral composers’ music, because of their varied sonic characteristics, ‘bell offers infinite possibilities for both contemplation of sound and the crossing of thresholds into ritual spaces’ (Cross, 2018, p.4-5).

In Murail’s work *Territoires de l’oubli*, echoes of Debussy can be easily heard. The damper pedal is held down from the beginning to the end to create a full resonance. This resonance is sustained and manipulated throughout the whole piece. In *Territoires de l’oubli* Murail realized the components of sound, overtone structures to develop in time. According to Murail, the piano is not just vibrating strings, but a resonant room (Nonken, 2014, p.77). This approach is very close to Debussy’s ideas and attitudes on

the piano and music in general. Especially using damper pedal, holding down the damper pedal and letting the piano resonate with harmonics in the whole piece is very close to Debussy's pedaling approach. Debussy was mentioned with the same special attitudes, 'handling overtone structures and changes in overtone series, and thinking of the piano as a resonating room'.

Debussy's tone-color relationship, time approach and temporality were earlier considered as close to spectral thinking. *La Mer* (1905) was one of Debussy's works that was composed suitable for a spectral interpretation. *La Mer* has interesting ideational similarities with Murail's *Treize couleurs du soleil couchant* (1978) (Thirteen Colors of the Setting Sun).

“(…) this (*Treize couleurs du soleil couchant*) is one of the pieces of mine that is most often performed, because it is considered a kind of paradigm of spectral music, but in fact, it is not spectral at all (……)

(…) The idea or metaphor is that when the sun is setting, you have many colors – red, yellow, orange, et cetera – but you do not really see where they move. When you look at the sky, you do not really see where they are moving, but there is a process going on. If you take a series of snapshot, you can see that the colors are different from minute to minute, but when you watch it, you do not realize it.” (Murail, 2008, p.249-250)

*La Mer* could be considered as a portrait of the ocean, as *Treize couleurs du soleil couchant* is a portrait of a setting sun. *La Mer* with its fragments and timbre changing and evolving in time as if it is a continuous exposition of a live ocean, can be regarded as it has the same approach as *Treize couleurs du soleil couchant*. As Murail's statement for his piece, “if you take a series of snapshot, you can see that the colors are different from minute to minute”, is an appropriate representation of Debussy's *La Mer*, if we replace “the ocean” with “the colors”. Both pieces are musical metaphors of an alive tableau or a duration. *La Mer*'s first movement suggests an idea about how Debussy manipulates overtone series (Don, 2001). Debussy's *La Mer* has many aspects in it which could be easily called as proto-spectral attitudes.

A score created by a composer with spectral attitudes serves simply as a means of communicating the composer's sonic intensions to the musicians. The score is not the actual musical work and any notational or other innovations that may be present in spectral scores are attempts to express the composer's intent more clearly with regards to the final realization; the actual piece of music is the sonic result or at least would be

in an ideal performance (Fineberg, 2000, p.3). In this viewpoint, Debussy was known as using many instructions about temporal changes and directions about how a player should play the piece. Also, it was mentioned above that Debussy was very critical about the performance of his pieces. Especially about damper pedal usage, according to Debussy, pedaling is variable which depends on to the performance hall and the capability of the instrument.

Joshua Fineberg's work *Veils* heralds Debussy's *Voiles*, not just by its name but also with its content. Debussy's proto-spectral attitudes can be seen in Fineberg's approach. They have similar approximation in rhythm, representation of material and color, and all these are liberated from constant rhythmic time. It can be thought that Fineberg had extended Debussy's language (Nonken, 2014, p.126). It's known in music history that composers get influenced by other composers, who lived before them. It is a heritage that is carried on in music history; especially a reaction to the previous schools but an updated imitation of a musical current that is older than the previous one. We can see this at the end of the Romanticism, many composers used Baroque forms/genres and contrapuntal techniques in their compositions, but they were writing atonal pieces, like Schoenberg and other composers of the Second Viennese School. In this point of view, Debussy's effect on spectralist composers looks historically logical, but would these effects, and historical approaches make Debussy a 'proto-spectralist' composer? This will be discussed in the conclusion chapter.

### **3.3 Parallelisms Between Spectralism and Visual Art Forms**

*La Mer* could also be considered as the result of the impressionist approaches of Debussy. Impressionism was an art movement that influenced painting before influencing music. By the invention of photographic apparatus in the 19<sup>th</sup> century, artists were stimulated to find new attitudes in painting. This quest gave birth to the impressionist ideas in painting. Artists started drawing objects differently than their original forms and shapes. For example, photographs capture the moments, but the impressionist artists depict an object as light changes in time; like the Sun from noon to evening. It can be argued that the same behavior occurred in music as well, since Bergson's above-mentioned ideas about time and temporality were shaped in the 19<sup>th</sup> century during the same era with impressionism. As result, we can say that art

movements like philosophy were deeply influenced by the developments in science and technology.

Murail's ideas in *Treize couleurs du soleil couchant* have an interesting similarity with Monet's ideas while he was creating his work *Cathédrales*. Twenty-eight of the thirty paintings in the series of *Cathédrales* show, with a slight variation in perspective, the main façade of the structure seen at different times of the day. Monet dated all the paintings of the series 1894, when they were finalized (Malharbe, 2000, p.19). If we considered that Monet was a contemporaneous artist of Debussy, and *La Mer* was one of the most impressionistic works of Debussy, connection between *La Mer* and *Treize couleurs du soleil couchant* could be seen much clear.

In other words, impressionist ideas in painting in the 19<sup>th</sup> century, also affected the spectralist composers of the last quarter of the 20<sup>th</sup> century. These ideas about light and color should have impressed Debussy, who was very fond of painting.

“It is tempting to draw a parallel between painters from the nineteenth century who made light the central subject of pictorial realization and composers today who accept sound as the bedrock of musical creation.

The first impressionist group exhibition was held in Paris in 1874; Georges Seurat completed his *Grande-Jatte* in 1885; Monet began his *Cathédrales* series in Rouen in 1892 and completed it at Giverny in 1894. A hundred years later, in the mid 1970's, the Parisian group, *l'itinéraire*, began to produce works fully taking into account the acoustical dimensions of sonic matter.” (Malharbe, 2000, p.15)

Parallelism between the impressionist school of painters and the spectralist composers are not just in vision of understanding their art forms, but there are also historical similarities between them.

“Like their predecessors who opposed official art connected with the Ecole des Beaux-Arts and painters exhibiting, in salons no less official, the *l'itinéraire* musicians of the 1970's also turned their backs on what was the predominant musical esthetic of their period: the Darmstadt School's conception of serial music. In both cases these artists concentrated their attention on concrete materials, thus renewing their artistic vision: the painters liberated a new palette of colors in focusing their attention on light and the musicians liberated instrumental timbre in focusing their attention on sound. Moreover, the initial steps of these radical developments, both spontaneous and intuitive, were quickly bolstered by the artists' appeal to scientific fact.” (Malharbe, 2000, p.16).

Impressionist painter Georges Seurat reprinted the equations relative to light and a model of the circle of colors in his *Chromatics*. He learned the differences between the colors which were resulted by the optical mixes (*Couleur-lumière*) and created by mixing pigments (*Couleur-matière*). With this idea Seurat created remarkable transitions of colors by using a new technique which consists of placing side by side a multitude of tiny dots of ‘pure’ colors. These dots are producing an optical mix on the retina, which has a smooth gradation of color. This distinction, which is decisive for painters, between *material-color* and the *color of light* found its counterpart in the world of music nearly a hundred years later.

The idea of *timbre-matière*, present through the traditional art of orchestration – subtle mixes and balances of instruments placed within abstractly constructed configurations (chords, counterpoints, harmonies) – is replaced by *timbre-son* based on the science of acoustics – instrumentation derived from natural sound, previously analyzed to reveal its component elements (Malharbe, 2000, p.17).

As an art form, music can’t be abstracted from social circumstances which are triggered by progresses in science and technology. Bergson’s ideas about time, Rutherford’s first articles over subatomic particles and the theory of general relativity of Einstein occurred in the same short time period. These inventions and ideas in science and philosophy firstly affected the intellectual circles, which artists and musicians were familiar with. The developments and changes happening in the world have affected music which resulted in that Debussy and some of his contemporaries generated new approximations for music. Like in the time of Debussy, in the second half of the 20<sup>th</sup> century, music and visual arts shared similar features. In visual arts, American painter Mark Rothko’s nearly spectralist ideas can be seen in his work No.3 (Figure 5.1). There isn’t any form in the painting but there are color changes creating a kind of form. Colors, like sound, are formed of wavelengths.



**Figure 3.1:** Mark Rothko's painting, No.3., 1949. (Retrieved on May 28, 2019 <https://en.wikipedia.org/w/index.php?curid=20541537>).

Fikret Anadol has 'data sculptures' that are close to spectral thinking in music. For example, Anadol used the data from cardiac rhythms of the customers of a commercial company and created a data sculpture. In my opinion, this parallelism between music and visual arts was not only because of their influences on each other, but also social circumstances triggering these approaches. So as in Debussy's time period and in the second half of the 20<sup>th</sup> century, every art form is related with intellectual ideas of their time and reflecting their social circumstances.

## 4. ANALYSIS

### 4.1 Methodology and Recording Sessions

In music history, composers and music theoreticians used many different approaches to analyze compositional techniques such as contrapuntal features, rhythmic structures, form, harmony, imitated phrases, musical fragments, etc. After the Baroque era in music, methods for analysis were developed, evolved, and some analysis approaches gained more importance than the others in time.

Also, some theoreticians developed some analytical systems that could be easily used to analyze earlier pieces. For example, Schenker developed his own method for analyzing music. His approach was based on separating music in layers and analyzing each layer in their own domain. By this approximation, he could get results by analyzing parts separately, and then reach a general result for the whole piece. Schenkerian analysis could be used in Bach, or in other pieces which were composed before the 20<sup>th</sup> century (Forte, Gilbert, 1982, p.1-3). This kind of generalization was a great success for an analysis method. Schenker's success was devising an analysis method which was applicable in the works of his contemporaries as well as of earlier compositional styles. Analysis methods generally can be used for earlier music than their time, and they can provide interesting results and help us comprehend earlier composers' point of view better.

In *New Images of Musical Sound* (1984), Robert Cogan explored the use of spectral photographs as a new analytic tool for music theorists. Perhaps it is understandable that spectral analysis has not been more thoroughly embraced as a tool for understanding euro-genetic art music. While Cogan outlines a system for describing and classifying all kinds of music with spectral photographs, what spectral imaging reveals most dramatically is timbre. There is a section of *New Images of Musical Sound* devoted to analyzing Beethoven's *Piano Sonata No.9 in E Major Op. 14*, but timbre is not structurally significant to Beethoven's composition as harmonic progression.

The same is true for most pieces written in the euro-genetic musical tradition. Good tone quality is an important part of each individual performance, but harmony is the preeminent structural component (Cogan, 1984). On the other hand, because of proto-spectralist aspects of Debussy, Spectral and Fourier analysis will be applied to Debussy's excerpts in this research.

Until the 20<sup>th</sup> century, our tools for analysis were working properly on the pitch organizational or conventional music. Edgar Varèse, one of the influencers of spectral music, stated that ideally in his compositions:

“The role of color or timbre would be completely changed from being incidental, anecdotal, sensual or picturesque; it would become an agent of delineation... and an integral part of form” (Varèse, Wen-Chung, 1966, 11-19)

Timbre is more than just a matter of sound quality when it comes to Varèse; it is a critical structural component. Not only is timbre uniquely important in his works, harmony can be entirely absent. *Ionisation* (1931) is widely recognized as the first significant percussion ensemble piece by a euro-genetic composer. There is no melody, no harmony. Timbre is the paramount. Wen-Chung has made an analysis of the piece, but after questioning by Elliot Carter in 1977, he made a statement about difficulties of analyzing these kinds of music:

“I must say that the problems of definition of terms I have used here – timbre, sonority, texture – are partly responsible for my not having written on this subject earlier. One has to deal with these questions quite decisively before we can proceed in a definitive way. But this may take some time. I do not see how I am going to analyze this work, even tentatively, except by going ahead in an instinctive way. Thus, I have not given you a precise definition of timbre at this time, but I did point out that the work is based on Varèse's conception of articulative and vibratory characteristics... I will have to depend on people who specialize in this type of analysis to tell me whether what my ear tells me instinctively as a musician is the right thing or not” (Wen-Chung, 1979, p. 26-74)

Seven years later, Robert Cogan published *New Images of Musical Sound*.

Spectral music has neither organizational pitch classes nor a temporal understanding as conventional music. When someone hears the name ‘spectralism’, he/she would think that it was about timbre and spectrum, but the most striking parts of spectral thinking are time and form which are interconnected parts. Form in spectral music is like a motion from one material to another, and this motion is continuous. While this



motion is occurring, other elements of the music such as timbre, pitches etc. have a fluent progress, too. Spectralist composers avoid using thematic materials and variations of those materials, because they want to create a fluid motion and manipulate the time without older rhetoric of music. Therefore, they did not want to be a neo-something, but they wanted to create a bright new perspective in music (Murail, 2008, p.248-249). From Murail's ideas it is obvious that analyzing spectralist compositions is impossible by using conventional analysis methods. Spectralist compositions do not have conventional structures, melodic fragmentations, static temporality, and pitch classes.

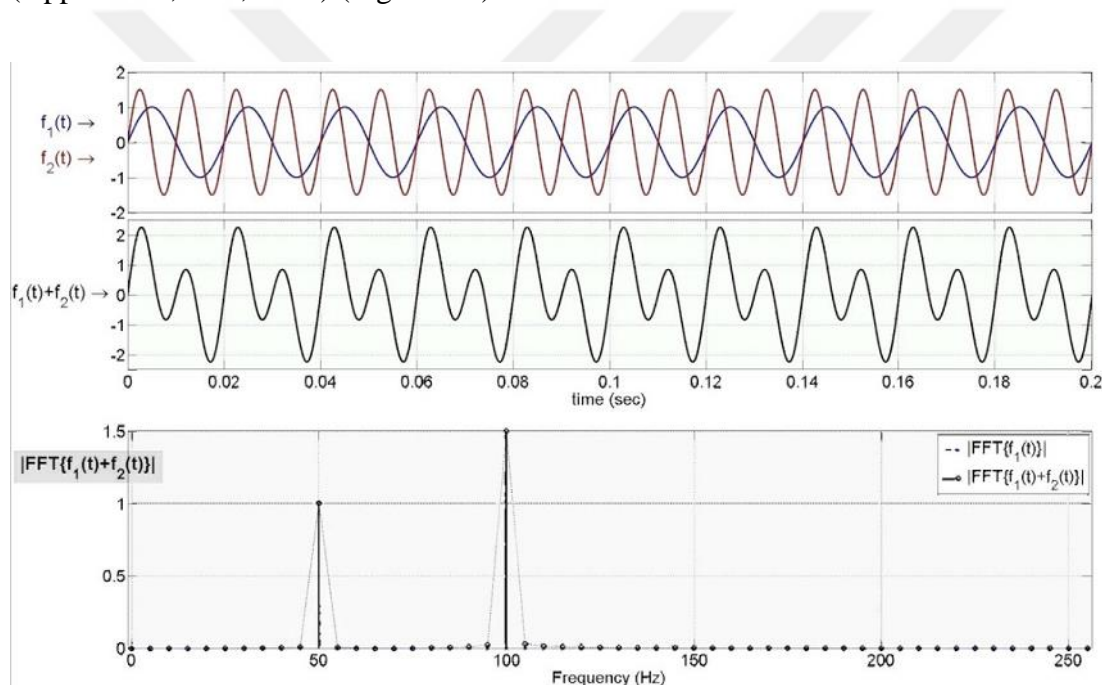
Conventional older analysis methods are not always applicable in today's music, because spectralist music is not being determined by conventional methods. However, technological progress can give us different approaches, like spectral analysis, and Fourier analysis. The digital age came with its own tools and its own music. Using the groundbreaking techniques pioneered by Robert Cogan more than thirty years ago, combined with modern technology, theorists can view sound for what it really is. The incredible complexity of timbre can be viewed, measured, and discussed for one instrument at a time, or within the context of an entire piece of music. With the correct vocabulary, an understanding of Cogan's compact bands and diffuse noise, frequency ranges, length of decay, and the right equipment, spectral analysis can be a useful tool to understand the sound of music in a whole new way.

The pieces of the spectralist composers are not easy to understand via old fashioned tools as they are formally different. They are not composed by putting pitches in an order and there are not any musical phrases or fragments to analyze since their aim is not to get stuck in older rhetoric of music as mentioned before. They have different approaches about harmony, timbre and time. Due to their different attitudes and their being related with technology, using technological and digital tools are necessary to analyze spectral music.

Tüzün stated that between 1993 and 2005, there wasn't any journal mentioned about the analysis of timbre, even though after the Second World War musical academic circles were dealing with timbre in music. This situation was caused by the perception of music still being interpreted as pitch organization and variations of the pitch classes (Tüzün, 2003, p.296). In my opinion technological developments in recent history have changed these circumstances. Due to the digital evolution in the last 30, years we

can use spectral analysis in our computers. Spectral and Fourier analysis identify the spectrum of a sound and give an opportunity to visualize it. This visual context is very helpful to understand the overtones and the timbral changes in music, as timbre is related to overtones in some ways.

Basically, spectral analysis could be identified as a mathematical tool that exports a waveform signal into a frequential density graph over time. In spectral analysis, remarkable details can be identified much better than a waveform signal. Like spectral analysis, Fourier analysis is another mathematical tool, too. This analysis took its name from its founder, French mathematician Joseph Fourier (1768-1830). Fourier analysis uses Fourier transform series to convert a frequency spectrum into the time domain (Oppenheim, et.al, 1997) (Figure 4.1).



**Figure 4.1:** Fast Fourier Transform of a basic signal which was formed by two different sinusoidal signals.

In Figure 4.1, the transformation of the time domain to frequential domain can be seen. Theoretically, in a sampling interval of a time there is a wave form signal of sound which was formed by the different frequencies. By the help of the FFT, recorded signal of the sound can be split into the basic frequencies which were forming the main signal. By the transformation from the time domain to the frequency domain, basic frequencies which were forming the main signal are observable with their amplitudes. Spectrums that were used for the spectral analysis are being formed by a mass of the FFT's which were taken in a constant sampling interval of time. The sum of all FFT's

constitutes the spectrum in a larger time interval. Basically, it could be thought that spectrum is the aligning of the FFT graphs vertically. In the spectrum, amplitudes of the frequencies are shown by the color, if the color is brighter that means that frequency is more powerful.

Spectral and Fourier analysis let us observe the frequential changes versus time in detail. Teodorescu explained the importance of Fourier analysis:

Unlike the perception of pitch and volume, timbre is a global effect of all the signal information transmitted through the aural system to the brain. The harmonic spectrum represents the ensemble of frequencies that accompany the fundamental and could be deconstructed according to the Fourier series. The resulting overtone series describes vibration sets whose frequencies are integral multiples of the fundamental frequency. Changing the aural interest toward the behavior of the spectral component, spectral music invests both the harmonic and inharmonic spectra of a note (Teodorescu, 2003, p.91).

The specific features of these analysis methods made them popular in contemporary music analysis. Debussy was analyzed formally, harmonically, contrapuntally, fragmentally, in every way that we knew until the 20<sup>th</sup> century (Howat, 1986). Every theoretician has got results by analyzing him with the tools that were used before the 20<sup>th</sup> century. All the conventional analysis methods were used on Debussy's music. As we are searching for the traces of Debussy's proto-spectralist attitudes, in this thesis, we will be analyzing the excerpts from Debussy's music by using digital tools like spectral analysis and Fourier analysis approximations. Of course, the analysis part will include just his overtone handling but, other proto-spectralist attitudes have already been mentioned in the previous chapters.

To understand Debussy's spectral attitudes, in this case overtone handling, we recorded some excerpts from his piano pieces, which were mentioned in Gary W. Don's article. Jerfi Aji has played the acoustical piano and the digital piano, Laçin Şahin has recorded the sessions and helped us as a sound engineer. In the recording sessions, the acoustic piano was recorded via different microphones at different angles and places (Figure 4.2). By recording at different places and distances, the aim was to catch the player's and listener's sense of perception of the music and see how they differ from each other. Theoretically, some frequencies should have different densities at different places These differences

should have effects on the perception of the players and the listeners. To like or to dislike any kind of music is subjective, however if we could reach an outcome that shows different intensities of different frequencies, we would have quantitative results.



**Figure 4.2:** Whole set up of microphones.

To understand how the player hears the music, we put two microphones near the ears of the player to make an approximate recording (Figure 4.3).



**Figure 4.3:** Microphones recording at the back of the player.

There is a microphone set to capture the room effect and make an approximation for the listener's perception (Figure 4.4). Our aim was to make a correlation between the player's and the listener's senses of music.



**Figure 4.4:** The microphone set to catch the listener's sense of music.

The comparison of the listener and the player's senses of music might have been considered sufficient but, in my opinion, to understand what is happening inside the piano or how the piano is vibrating is also important. Piano is our vibrating source and recording inside or very close to the source and correlating it with the player's and the listener's microphone placements would clarify the vibration changes after they were created in the piano. In the recording session there was a microphone set that consisted

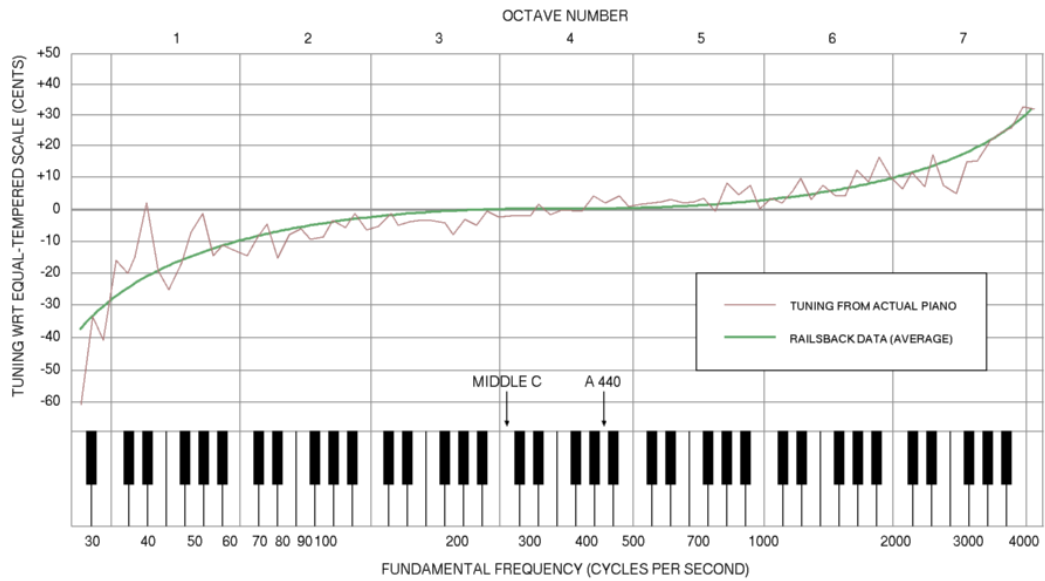
of two microphones which were recording inside the piano (Figure 4.5). There will be a comparison of these three different recording spots in the next chapter.



**Figure 4.5:** Acoustic piano recording sessions, microphones which are recording inside the piano.

There are certain differences between an acoustic piano and a digital piano. The acoustic piano creates a vibration by using hammer and strings. On the other hand, a digital piano creates the sound with its artificial digital database. Acoustic pianos are being tuned slightly out of tune at higher and lower pitches because of the inharmonicity in their strings. This phenomenon is named as the Rainsback curve (Figure 4.6) (Rainsback, 1938, p.274). To examine these differences, we recorded the same excerpts on a digital piano as well (Figure 4.7). Our aim was to make a comparison between frequential densities of the acoustic piano and the digital piano. Gary W. Don has made a similar approximation between two digital pianos, one of which was tuned in just intonation and the other in equal temperament. Don's experiment was to study different perceptions by using different tuning systems, however we know that Debussy was not using just intonation on his piano (Don, 2001).

Just intonation doesn't allow the player to modulate into other tonalities in one piece, therefore the piano should be tuned according to the new tonality.



**Figure 4.6:** Railsback curve (Retrieved on May 15, 2019 at <https://upload.wikimedia/commons/a/ae/Railsback2.png>).



**Figure 4.7:** The digital piano which was used in the recording sessions and connection set up with the recording system.

Today, based on developments in digital sampling, digital pianos are tuned as if they are imitating an acoustic piano. Their tuning system is also similar; higher harmonics are sharper than the real harmonics. In our recording sessions, we used a Kurzweil

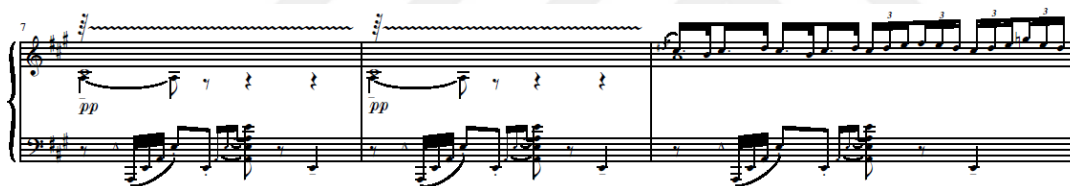
PC88mx. In the next section, the spectral and Fourier analysis of the recordings and their comparison will be provided.

## 4.2 Fourier Analysis and Comparison

In this part, the outcomes of the spectral and Fourier analyses of the recorded excerpts will be examined and compared with each other.

### 4.2.1 Excerpts from *L'isle Joyeuse*

The first excerpt is from mm.7-9 of *L'isle Joyeuse*. Debussy used a quasi-mixture of whole tone scale and Lydian mode. F#, at the 9<sup>th</sup> measure, is interrupting the whole tone scale and G natural, at the end of the 9<sup>th</sup> measure, is not the 7<sup>th</sup> degree of Lydian mode (Don, 2001, p.62) (Figure 4.8). If the phrase at the 9<sup>th</sup> measure had F natural instead of F#, then the phrase would create the whole tone scale, which is consisted by A-B-C#-D#-F-G. And, if G was sharp then we will have a full Lydian scale which will be consisted of A-B-C#-D#-E-F#-G#.



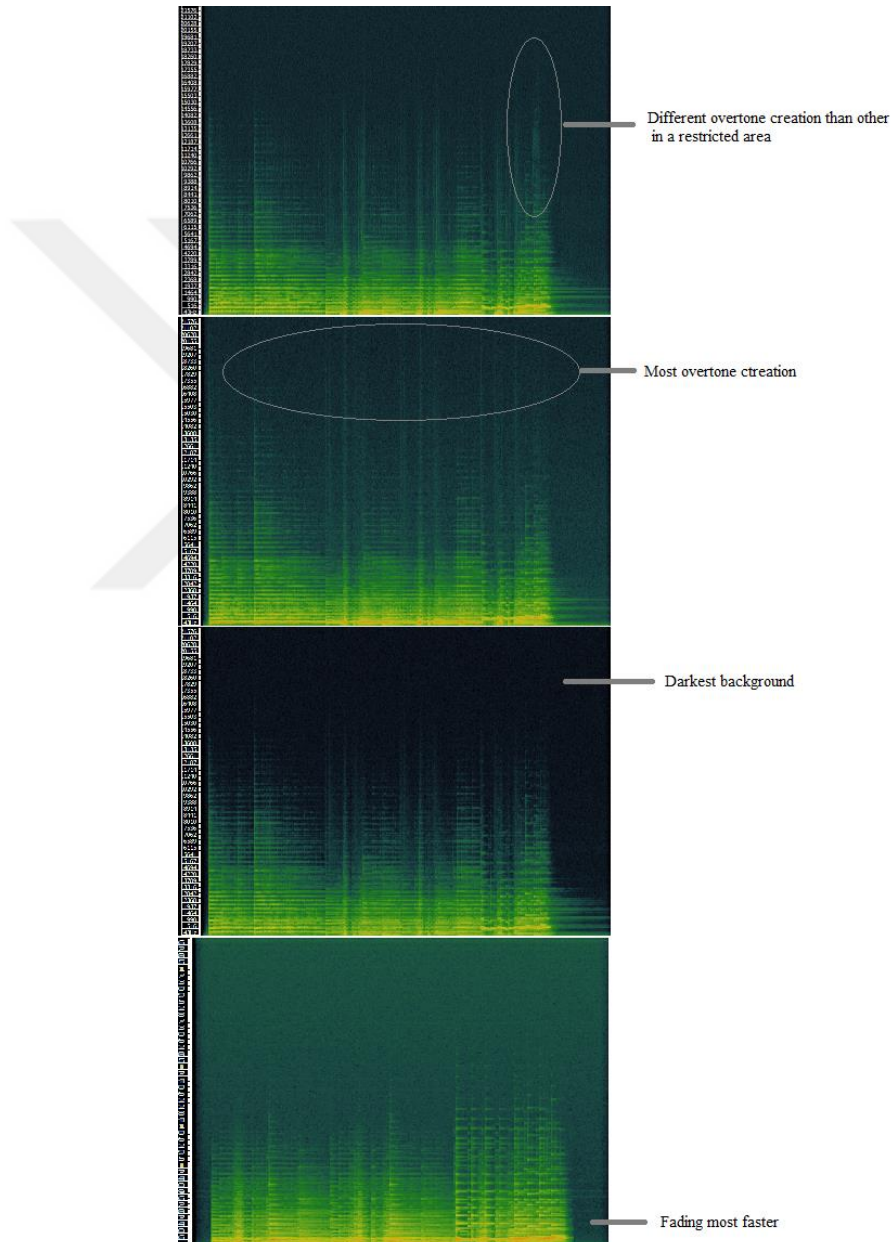
**Figure 4.8:** Excerpt from *L'isle Joyeuse*, mm.7-9.

Figure 4.9 contains spectrums of the digital piano and acoustic piano recordings. Starting from the top, the first spectrum was recorded at the back of the player, the second was in the room, the third was inside the piano, and the fourth was recorded using the digital piano. The fourth spectrum (digital piano) shows remarkable differences; it is fading much faster at the end, and denser at low frequencies than the first three spectrums. Compared with the other spectrums, the fourth spectrum was restricted in the overtone creation, especially in the first two measures, which have trills in the treble clef, and has smooth attenuations of the pitches. If we consider that the digital piano is trying to imitate the acoustic piano, results that look artificial are apprehensible. In my subjective opinion, an acoustic piano gives better flavor than a digital piano does.

The third spectrum's (inside the piano) background is darker than the others, that could be caused by the recording devices being very close to the sound creator. In the

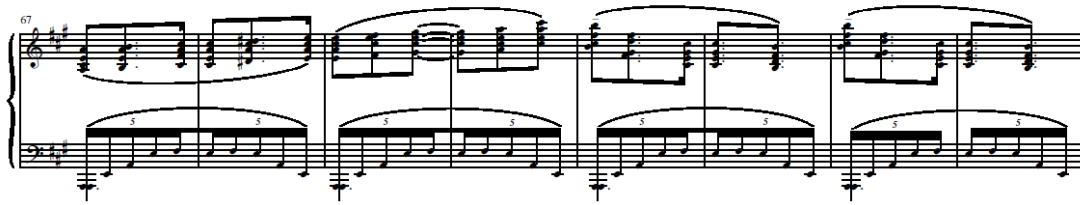


spectrum, amplitudes of the frequencies are shown by the color, if the color is brighter that means that frequency is more powerful. In other words, by looking at the darker background, we can say that creation of the overtones is much more than the fourth spectrum but less than the first and the second spectrums. On the other hand, fading at the third spectrum is the most distinguishable. The first and second spectrums look more similar to each other than the other two, but the second spectrum (recording for room affect) has more overtone creation at the same points as marked (Figure 4.9).



**Figure 4.9:** Spectrum comparison of the first excerpt, mm.7-9 of *L'isle Joyeuse* re.

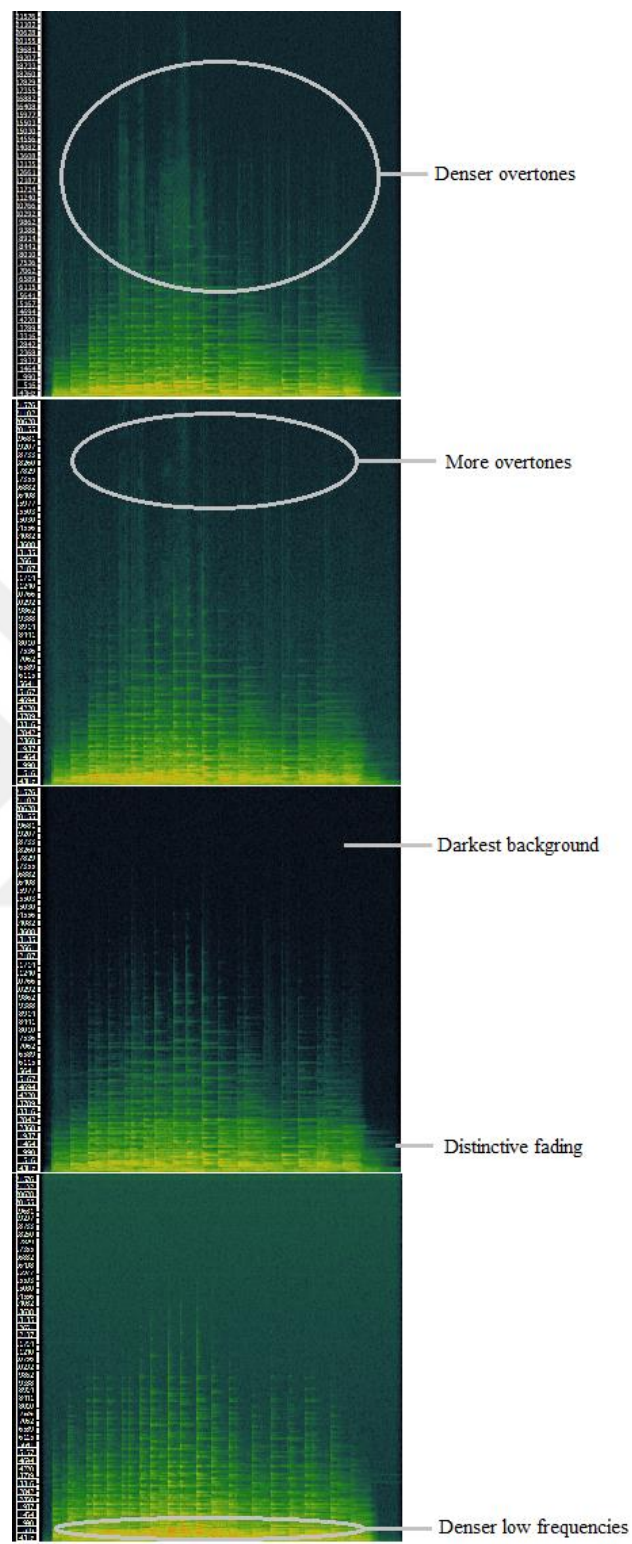
The second excerpt from *L'isle Joyeuse*, is between m.67 and m.74 (Figure 4.10). With the addition of G# to the pitches in the first excerpt, the Lydian mode has been completed (Don, 2001, p.62).



**Figure 4.10:** Excerpt from *L'isle Joyeuse*, mm.67-74.

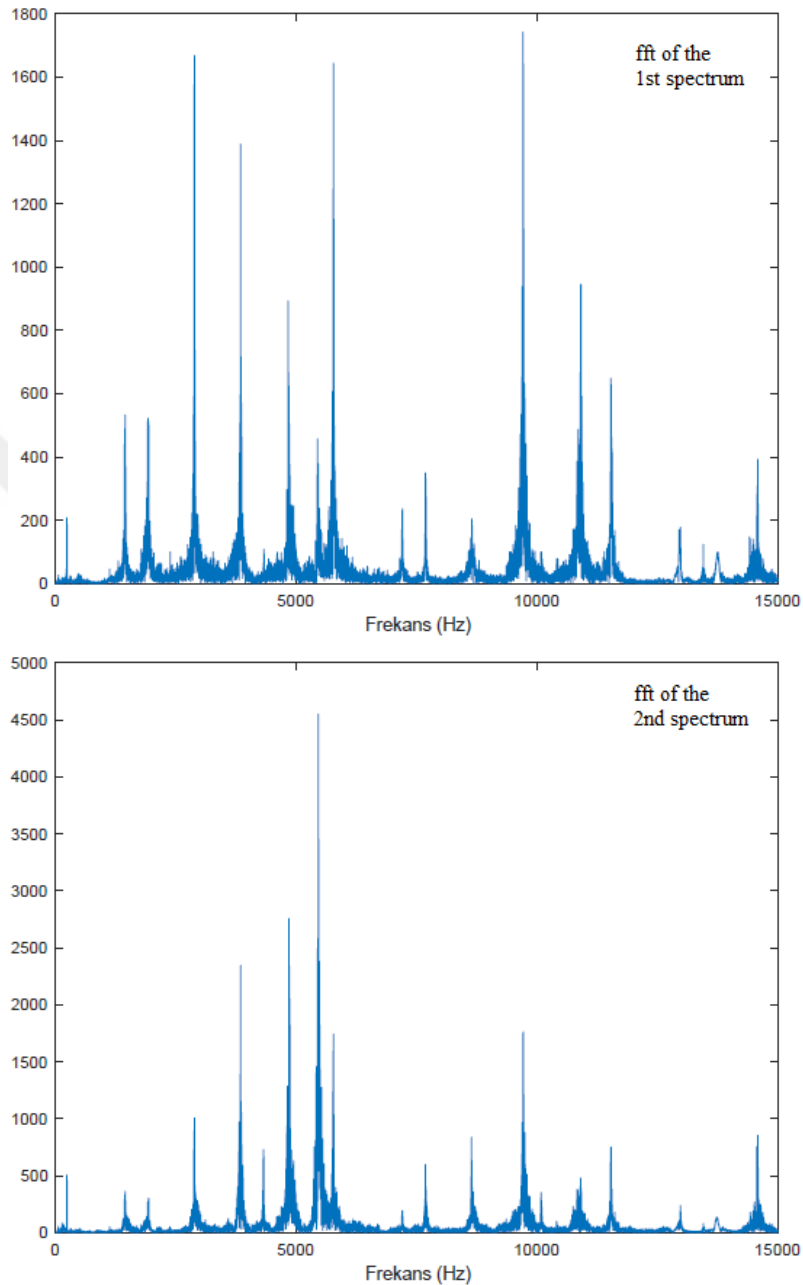
The spectrums are in the same order as the first excerpt, the first was recorded at the back of the player, the second in the room, the third inside the piano, and the fourth was recorded by using the digital piano (Figure 4.11). There are some similarities between the spectrums of the two excerpts, the first and second spectrums (recording at the back of the player and recording in the room) have higher frequencies or overtones, the third spectrum (inside the piano) has a darker background, the fourth spectrum (digital piano) has denser low frequencies, slightly than the previous excerpt. In this excerpt, the remarkable difference is that the third and the fourth spectrums look much more similar (Figure 4.11), except their backgrounds and fading at the end. The difference between the perspectives of the player and the listener in this excerpt are more distinguishable than the first one; the second spectrum (room/listener) has more overtones than the first spectrum (player), but on the other hand the first spectrum is denser at the high pitches/overtones.

All spectrums have more overtones in the first half of the excerpt than in the second half. If we consider that the excerpt has the same arpeggios in the bass clef and moving chords in the treble clef, this difference between the first and second half of the excerpt is caused by playing. At the first half, the chords in the treble clef are going upward and reaching a climax, not only in pitch and but also in volume, then the chords in the treble clef are going downward and the volume is also decreasing. This fact enabled us to see a differentiation between the spectrums' first and second halves.



**Figure 4.11:** Spectrums comparison of the second excerpt from *L'isle Joyeuse*, mm.67-74.

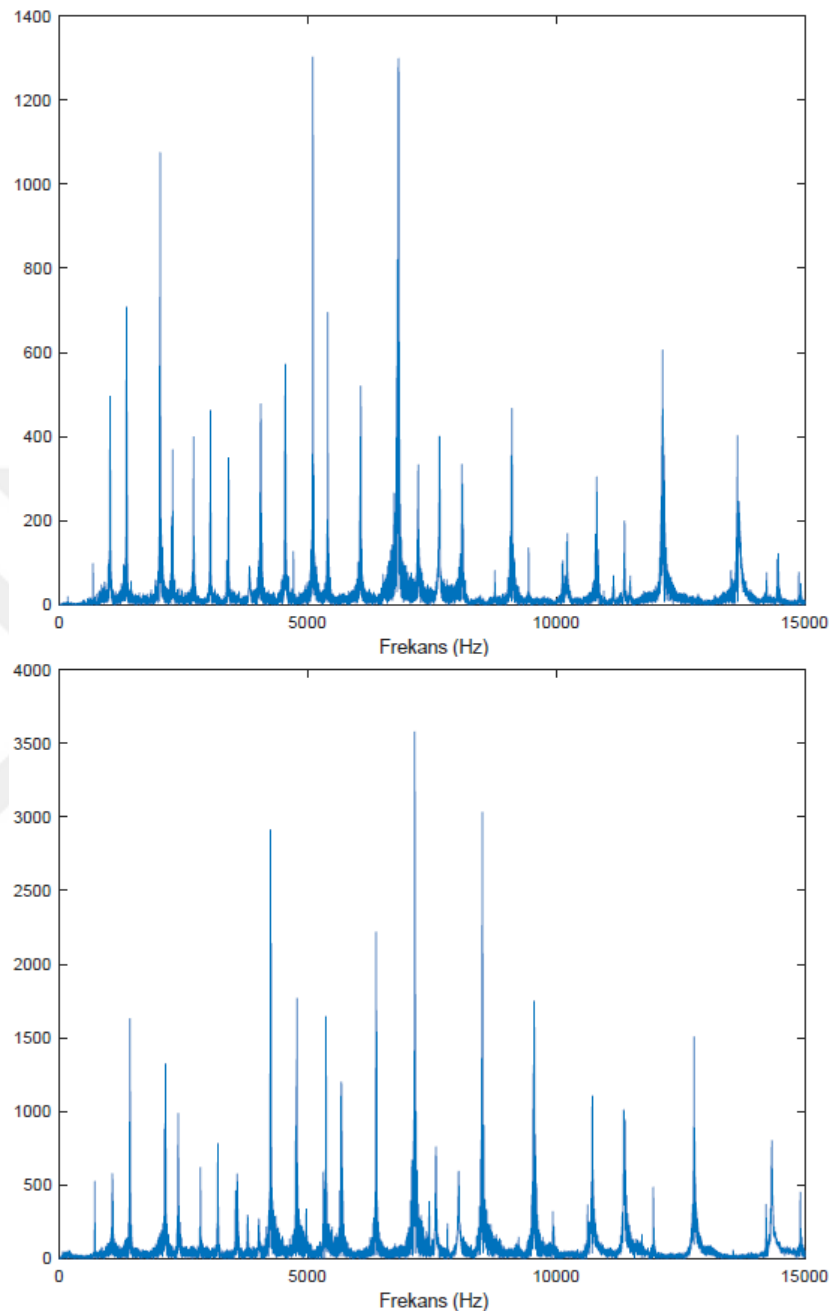
Fourier analysis (Fast Fourier Transform – FFT) can be used to see how similar the 1<sup>st</sup> and the 2<sup>nd</sup> spectrums of the first excerpt are as well as the 3<sup>rd</sup> and 4<sup>th</sup> spectrums of the second excerpt of *L'isle Joyeuse* (Figure 4.12 and Figure 4.13).



**Figure 4.12:** FFT of the first and second spectrums of *L'isle Joyeuse* mm.7-9.

Amplitude differences between the first and second spectrums are significant. The second spectrum (listener's perception) has higher amplitudes just once in the interval

between 500 hertz and 550 hertz. It could be the 9<sup>th</sup> or the 10<sup>th</sup> partials of A<sub>1</sub>, B<sub>4</sub> (493.88 Hz.) and C#<sub>5</sub> (554.37 Hz).

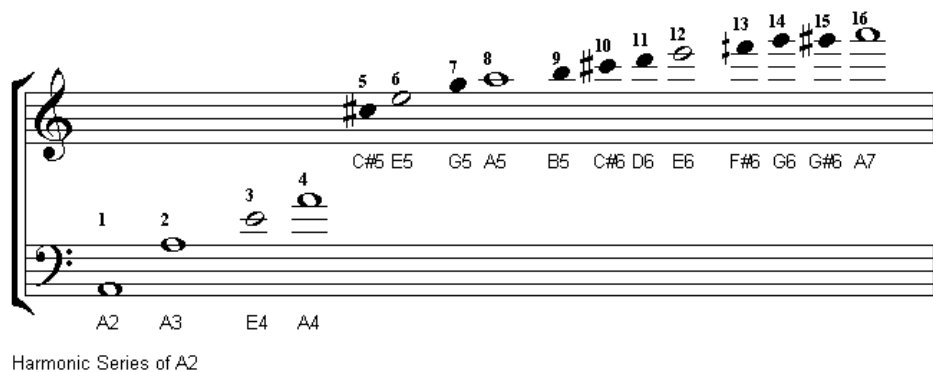


**Figure 4.13:** FFT of the third (inside the acoustic piano) and fourth (digital piano) spectrums of the second excerpt from *L'isle Joyeuse*, mm.67-74.

In the second excerpt from *L'isle Joyeuse*, there are similarities between the third spectrum (inside the piano) and the fourth spectrum (digital piano). These similar aspects in spectrums are seen in the FFT graphs, except around 500 Hz. (it could be B<sup>4</sup> 9<sup>th</sup> partial of A<sup>1</sup>, 493,88 Hz.). The third spectrum has a remarkably greater amplitude

than the fourth spectrum, and the fourth spectrum has a remarkably higher amplitude around 800 Hz. (it could be G#<sub>5</sub> 15<sup>th</sup> partial of A<sub>1</sub>, 830,61 Hz.).

Debussy was using most of the sixteen partials of A<sub>2</sub> in these excerpts (Figure 4.14). The treble clef line at first example m. 9 corresponds to partial 8 through 14, with partial 14 a G<sub>5</sub>. The top line of mm. 67-70 of second excerpt, corresponds to partial 8 – 13, 15, and 16, with partial 15 as G#<sub>5</sub>. The bass clef line of the first excerpt contains partial 1 – 4, and the bass clef of the second excerpt contains 1 – 3.



**Figure 4.14:** Sixteen partials of A<sub>2</sub>. (Retrieved in 01.10.2019, [http://www.personal.kent.edu/~sbirch/Music\\_Production/MP-I/Reading/overtone\\_series.htm](http://www.personal.kent.edu/~sbirch/Music_Production/MP-I/Reading/overtone_series.htm)).

This kind of proto-spectralist approach about using partials echoed in spectralist composers. Grisey composed his *Partiels* in 1975. This work was written for eighteen instruments and constructed on a sonogram analysis of a single tone on a trombone. Of course, there are great differences between *Partiels* and *L'isle Joyeuse*. The relationship of the inspiring technology to the compositional practice, and composers' individual aesthetic goals are different:

“We began to feel that the music had perhaps become too directional and predictable; we then had to find a way to re-introduce surprise, contrast and rupture.... Passing of thresholds, reversing of the direction of motion, triggering of ‘catastrophic’ changes, abbreviated processes where only some of the steps in a process are present...”  
(Murail, 2000, p.7)

#### 4.2.2 Excerpt from *La cathédrale engloutie*

*La cathédrale engloutie* took its name from a Breton legend in the 4<sup>th</sup> or 5<sup>th</sup> century, meaning ‘The Submerged Cathedral’ (Bruhn, 1997, p.41). The excerpt chosen from

this piece is between measures 28 and 41 (Figure 4.15). In this excerpt, the sustained note  $C_1$  in the bass clef corresponds to a lower partial of an overtone series. All the other notes are diatonic, except the B flat in the middle of the excerpt. This Bb is a cross-reference to the mixolydian mode and the seventh partial of  $C_1$  (Don, 2001, p.64).

The remarkable overtone creation at the spectrums of the acoustic piano coincides with the Bb at m. 36, as mentioned in Don's article (Figure 4.15). This observation makes us think that Debussy may have wanted to reach the climax with the highest Bb, the seventh partials of  $C_1$ , at measure 36 by enforcing it with the overtone series. It is obvious that the highest overtone creation is at the end of the m. 36, which has the Bb at the top, as indicated on the spectrum given in Figure 4.15. Till m.35 Debussy has used pitches that are diatonic to C Major, between mm.35-37 Bb is not diatonic to C major and suggests both 7<sup>th</sup> partial of  $C_1$  and the mixolydian mode (Mixolydian mode is a half-step lowered 7<sup>th</sup> degree in major scale). Bb was introduced after a C pedal is being repeated at the previous measure as a half note. The same procedure is being repeated at the m.36, a whole note pedal C started and Bb at the climax of the excerpt re-introduced after a half note. This duration could be thought as it is enough to create the Bb, 7<sup>th</sup> overtone of the  $C_1$ . Debussy's handling and use of overtones as harmonic structure mentioned above are realized in this excerpt.

On the other hand, the same climax hasn't been observed in the recording of the digital piano. This phenomenon could be explained by the limited artificial overtone creation of the digital piano, but the acoustic piano's natural resonance creates more and richer overtones which causes a characteristic timbre.

All the four spectrums are fading similarly, and this situation is a distinguishing mark for these recordings, which hasn't been observed in the *L'isle Joyeuse* spectrums (Figure 4.9). The reason of that could be because of the interpreter's approach to the progression of mm. 40-41. At the end of measure 40,  $D_3$  in the treble clef starts a

motion over a C Major 7 tonality. This motion continues with C followed by B and ends with D<sub>4</sub> in the end. This progression gives a suspended and irresolute feeling.

In the spectrums of this excerpt (Figure 4.16), the lowest C effect is denser at the listener’s recording (first spectrum), and in this recording, overtone creation is much more significant than the other recordings. The distance may have caused this, as low frequencies get noticeable by the distance. In addition to this, the player’s spectrum (first spectrum) has a dispersion at high frequencies. Considering all above-mentioned findings, it is logical to say that the perceptions of the player and the listener are different.



Figure 4.15: Excerpt from *La cathédrale engloutie*, mm.28-41.

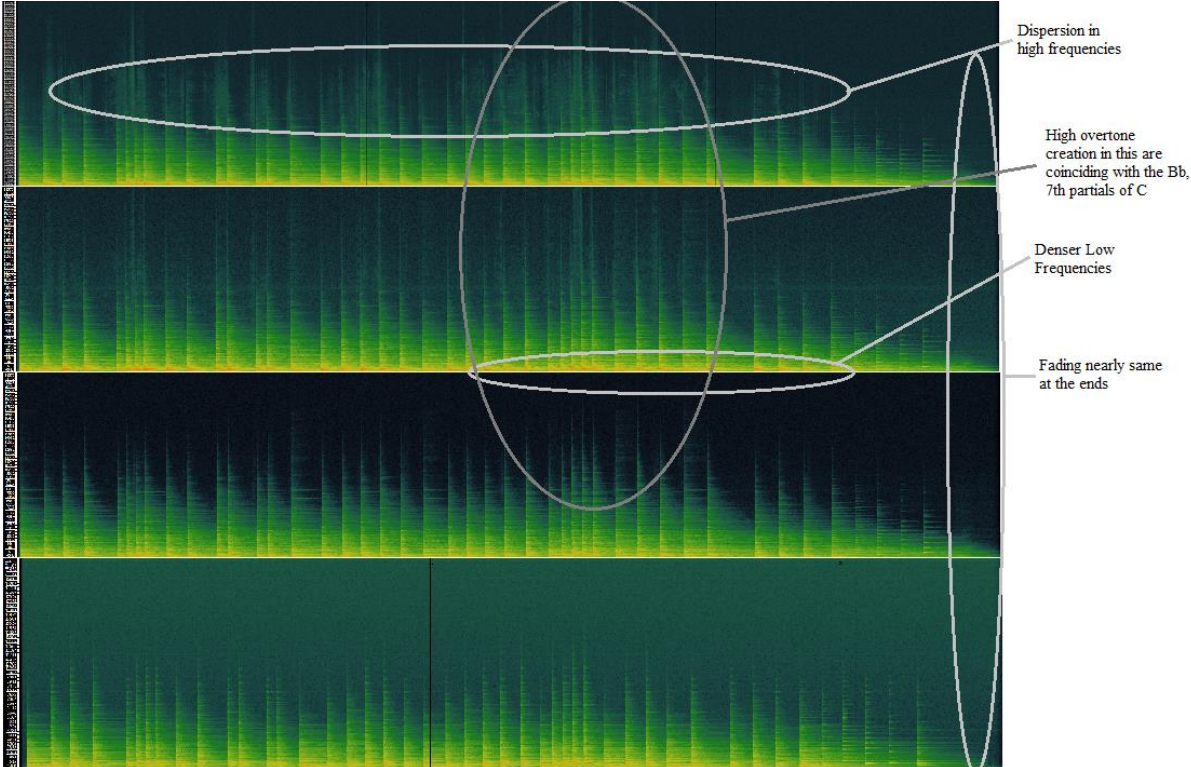
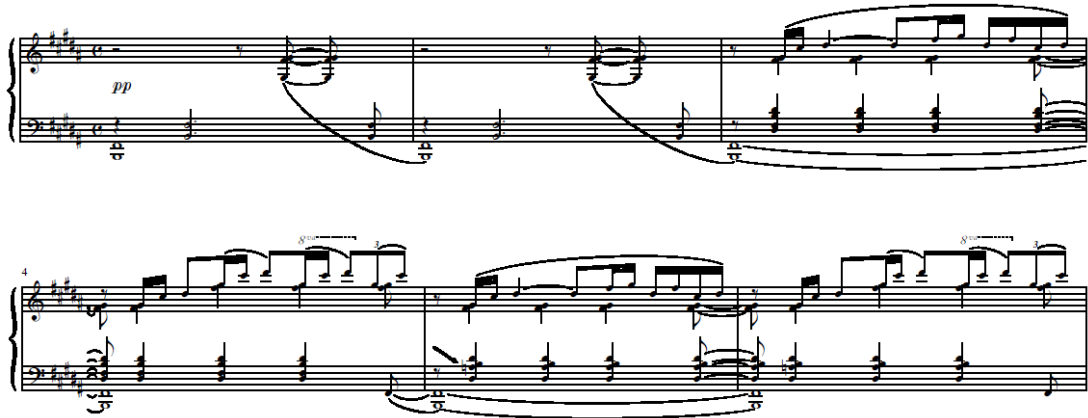


Figure 4.16: Comparison of *La Cathédrale Engloutie* recordings’ spectrum.



### 4.2.3 Excerpt from *Pagodes*

Debussy composed his work *Estampes* (Prints) in 1903, and *Pagodes* is the first piece of the set. In the opening, in the bass clef F# over B is giving the idea of tonality clearly in B Major. The G# is producing a dissonant effect above the B-F#. A in the measure 5 corresponds to the seventh partial of B (Don, 2001, p.65) (Figure 4.17).



**Figure 4.17:** Excerpt from the opening of *Pagodes*, mm.1-6.

In comparison of spectrums there are again similarities between the perceptions of the player and the listener as well as between the recordings captured inside the piano and from the digital piano (Figure 4.18). Accordingly, we can conclude that these pairs of recordings give similar spectral results. On the other hand, we observe differences in the fast Fourier transform graphs (Figure 4.18). In the graph of the player, the most remarkable frequencies have bigger amplitudes than the graph of the listener till 5000 Hz., except the lowest one which might be B<sub>2</sub> 123.5 Hz. On the other hand, after 5000 Hz. the graph of the listener has bigger amplitudes than the graph of the player. In this graph remarkable frequencies look like overtones of B, respectively, B 123.5 Hz. which is fundamental, F# 1479,9 Hz., D# 2489 Hz. etc. There is an anomaly in the spectrum of the player, which is caused by extra overtone creation as indicated in Figure 4.17. This anomaly occurred at the first three chords of the first measure as seen by the cuts in the spectrum. In this kind of an anomaly, it is suitable to use the fast Fourier transformation for these three chords one by one and compare them all together (Figure 4.19) so that we can comprehend which overtones created this anomaly. As mentioned above *Pagodes*'s first measure starts with B<sub>2</sub>-F#<sub>3</sub> in the bass clef, then B<sub>3</sub>-

F#<sub>4</sub> in the treble clef followed by G#<sub>5</sub>-F#<sub>5</sub> over G#<sub>4</sub>. Pedal was released from the beginning.

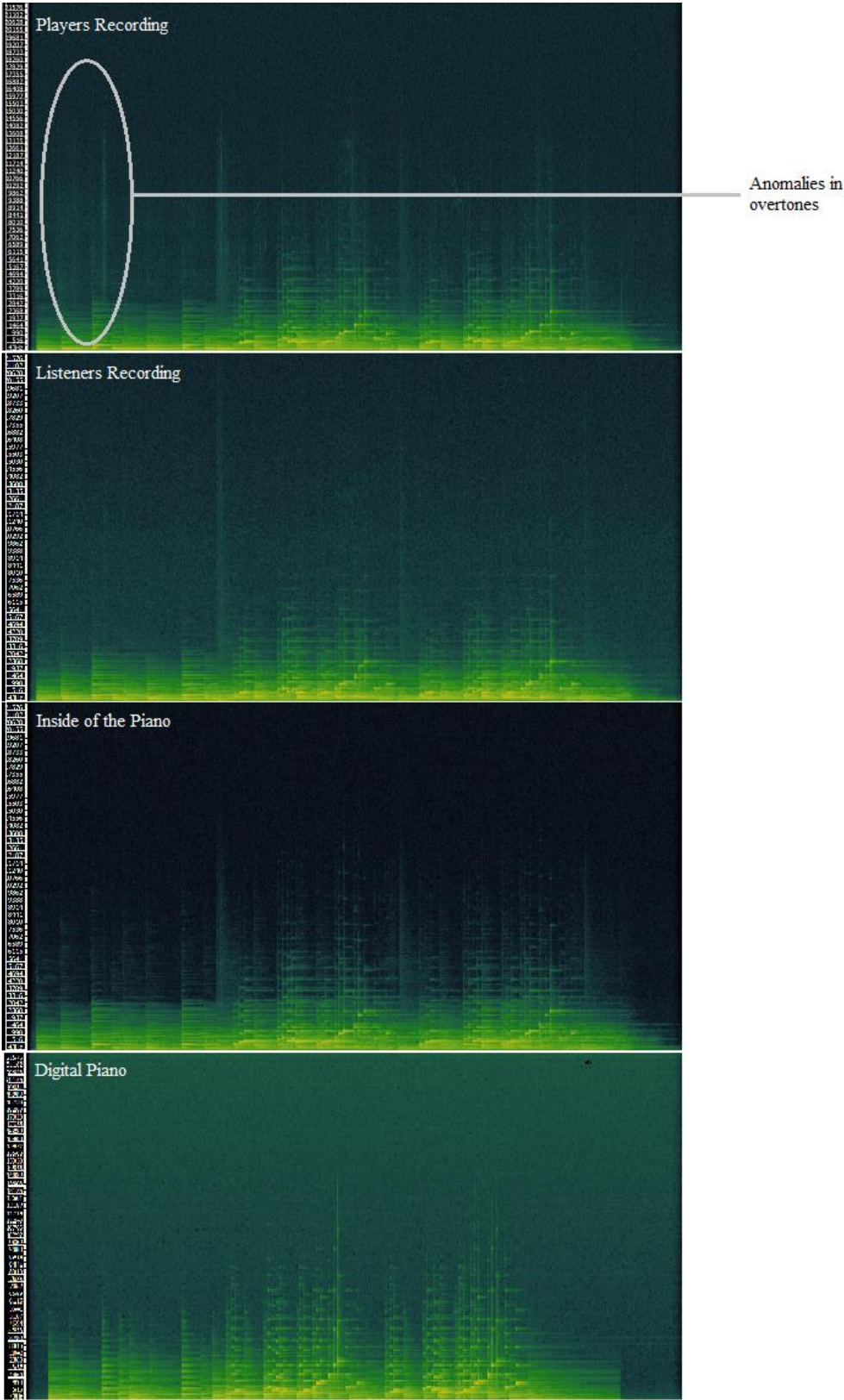
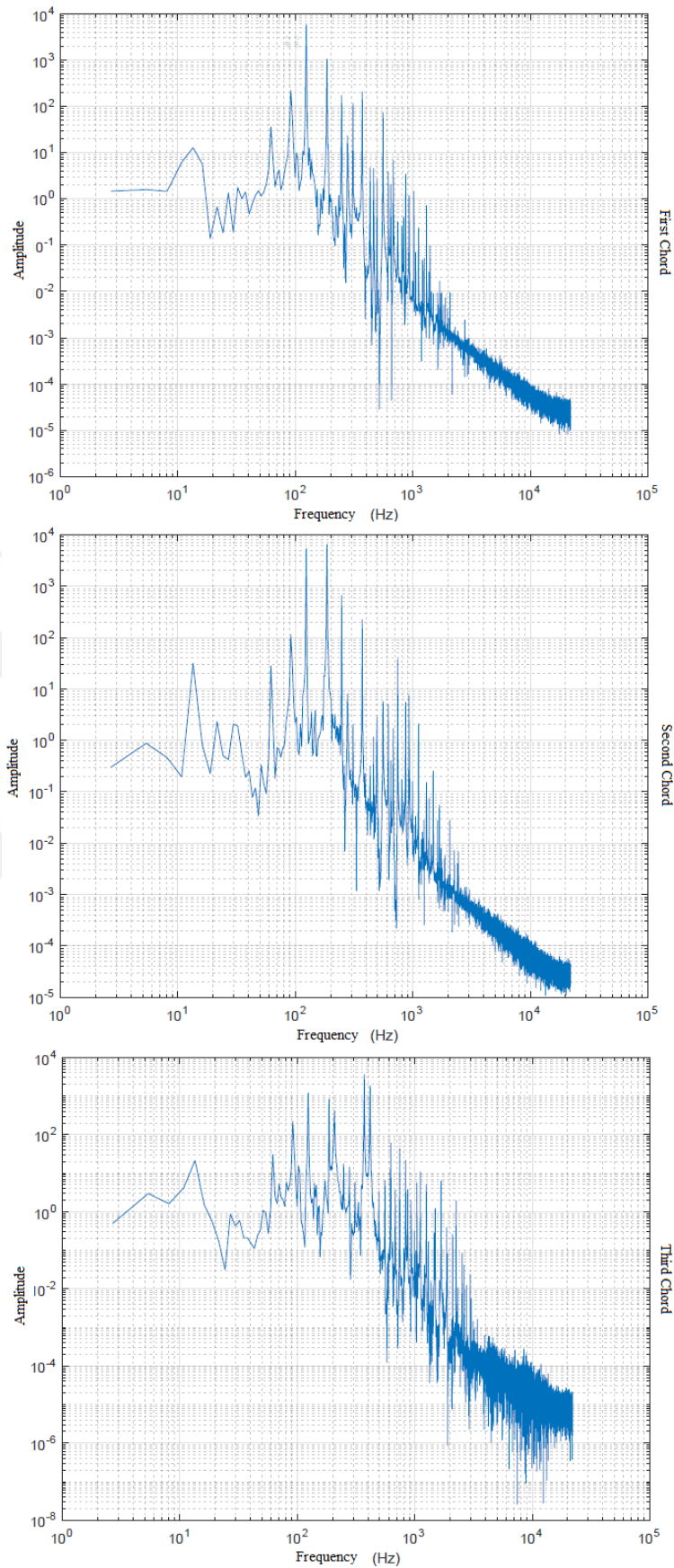


Figure 4.18: Spectrums of the excerpt from *Pagodes*, mm.1-6.



**Figure 4.19:** Fast Fourier Transformation (FFT) of first three chords in the first measure of *Pagodes*.

The first two peaks of the first and second chords are B<sub>2</sub> 123.471 Hertz and F#<sub>3</sub> 184.997 Hertz. This result is highly expected at the first two chords. The graph of the third chord has also densities at those frequencies because pedal was lowered and resonance of B continued, but on the other hand the third chord has peaks at F#<sub>4</sub> 369.994 Hertz and G#<sub>4</sub> 415.305 Hertz. This F#<sub>4</sub> should come from the first two chords as an overtone. After that, dissonances are occurring at the higher overtones. The G#<sub>4</sub> and G#<sub>3</sub> at the third chord have revealed denser overtones that clash with the overtones created by B<sub>2</sub>. Ben Johnston came up with a different point of view in his letter to Gary W. Don, and addressed this situation as an issue of polytonality:

“A ... major triad with (an) added major sixth can be seen as major and relative minor combined polytonally.” (Don, 2001, p.64)

Subjectively, my opinion in this case, the first three chords are not being heard as a dissonance. Added the minor sixth degree gives a feeling of changing the key to the relative minor.

#### 4.2.4 Excerpt from *Cloches a travers les feuilles*

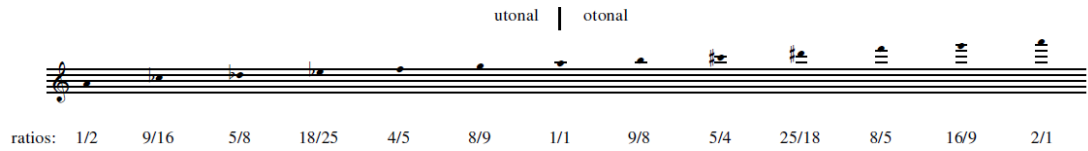
Debussy composed *Cloches a travers les feuilles* in 1907. The piece is from the second book of *Images*, a work for solo piano. The first three measures will be used for the analysis (Figure 4.20).



**Figure 4.20:** Excerpt from *Cloches a travers les feuilles*, mm.1-3.

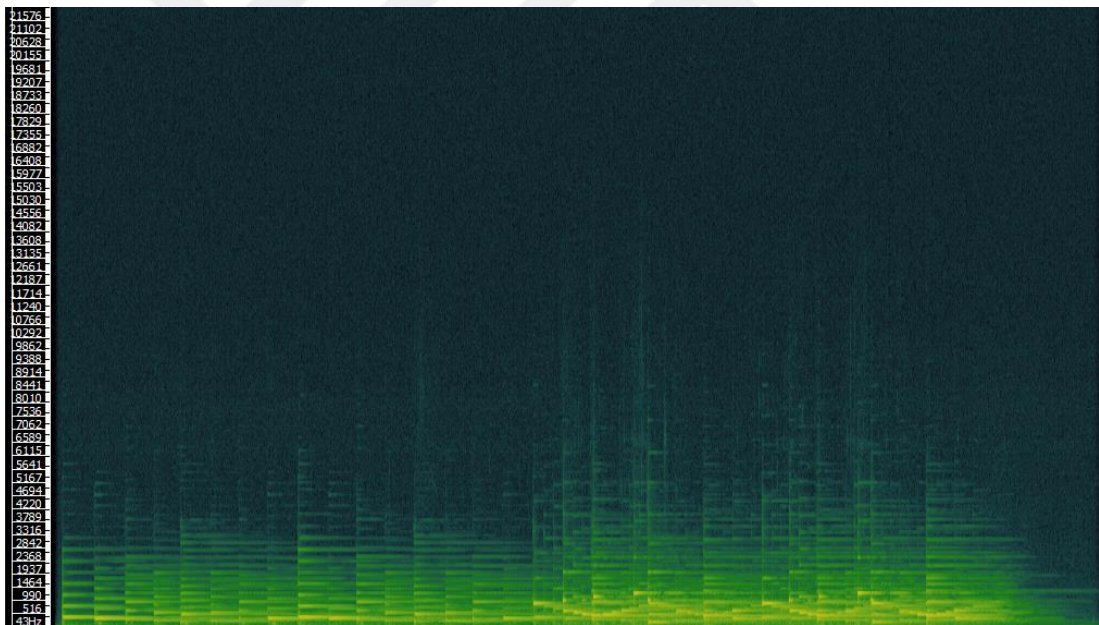
Two different whole tone scales are ascending and descending, at first two measures G – F – Eb – Db – Cb whole tone scale, at the third measure B – C# - D# - F – G whole tone scale added, and both are ascending and descending simultaneously. These whole tone scales take A as a center of inversion (Figure 4.21). Johnston uses the terminology ‘utonal’ (under-tonal) and ‘otonal’ (over-tonal) in order to designate a structure which

is a mirror inversion around a given note. Broken numbers at the figure are indicating ratios of the frequencies of the notes over the frequency of the center note A<sub>5</sub>. For example, G 784 Hz. – A 880 Hz. equals to 8/9 (Don, 2001, p.66-72). This approach of Debussy is very ahead of his time and indeed very proto-spectralist.



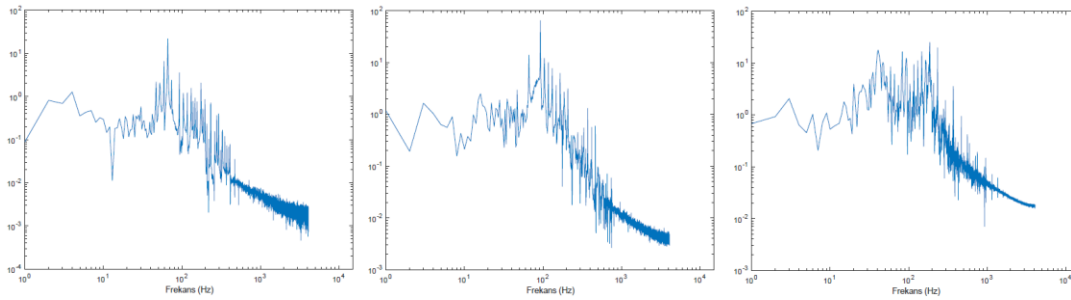
**Figure 4.21:** Whole-tone scales ascend and descend simultaneously, while A is the center of whole-tone scales.

In Figure 4.22, the spectrum of player's recording can be seen. In the spectrum, harmonics of the first G could be identified easily, but because of the released damper pedal in every half beat there are new harmonics and dissonances occurring. At the beginning of the 2<sup>nd</sup> measure the same G has more dispersion again because of the



**Figure 4.22:** The spectrum of mm.1-3 of *Cloches a travers les feuilles*.

damper pedal. Using damper pedal in this way creates more harmonics and gives a bell affect. In the 3<sup>rd</sup> measure, there are some different overtone creations. These overtone creations occur at the highest notes, while the top line is going to a climax, B – C# - D#. This part could be examined with FFT analysis (Figure 4.23). 3<sup>rd</sup> beat of the 3<sup>rd</sup> measure has more dissonances.



**Figure 4.23:** FFT graphs of first, second and third beats of the 3<sup>rd</sup> measure of *Cloches a travers les feuilles*.

This excerpt evokes Emile Vuillermoz’s anecdote about Debussy.

“... And no one else had his gift of transforming a dissonant chord into a little bell made of bronze or silver, scattering its harmonics to the four winds.” (Nichols, 1992, 156)

## 5. CONCLUSIONS AND FURTHER RESEARCH

In this research some excerpts from Debussy's piano works have been examined by using FFT graphs and spectrums which were created by the Fourier transform series. These kinds of analysis of these excerpts would give some interpretations about Debussy's overtone handling. Especially excerpts of Debussy's piano pieces mentioned in Gary W. Don's article (Don, 2001), "Brilliant Colors Provocatively Mixed; Overtone Structures in the Music of Debussy" have been used for the analysis. The purpose of this analysis is to scrutinize the article of Gary W. Don and to further study the music of Debussy from different perspectives and to compare analyses of his works by using technological tools. The expectation of this research is to produce more analytical and concrete ideas about Don's suggestions.

Due to the digital evolution in the last 50 years we can use our personal computers to solve complex equations like Fourier transform series. FFT is a very sufficient tool to identify the spectrum of a sound and give an opportunity to visualize it. This visual context is very helpful to understand the overtones and the timbral changes in music, as timbre is related to overtones in some ways. Also, spectrum gives us a visual idea about temporal changes in the music

My expectation throughout this research was that using FFT series and spectrums would yield more accurate results but using this kind of approach has some shortcomings. First of all, using FFT and spectrums of a piano music excerpt did not produce sufficient results, because these approaches don't let us identify timbral differences. Results of the spectrum and FFT graphs could change depending on the performance, the performance venue and the instrument. But on the other hand, using FFT graphs and spectrums to analyze solo piano music gave better results for detecting partials that were created by the piano.

On the other hand, FFT analysis could be beneficial in formal analysis and temporal analysis. Using FFT graphs and spectrums is very practical for identifying timbral

differentiation of different instruments (Cogan, R., 1984). Temporality, passing of thresholds, using high partials of base note etc. are critical in serialist composition; visualization of the whole music could make it easier to understand the form of the piece, the temporal changes in music and to identify the thresholds. So, spectral analysis could help us to understand the formal structures of spectralist compositions. Differentiations in spectrum would indicate transitions between different parts of parts, as Murail mentioned above changes between ‘different colors’ can be detected.

For further research, using only FFT graphs and spectrums created by Fourier transform series would be useful but not sufficient. Visual data obtained from FFT series, as opposed to my expectation, did not give much detail about the music by themselves. It could be used to identify the spectrocentricity of the piece, the formal shape and the temporality. But there should be some hybrid approaches, too. Livia Teodorescu applied this kind of method to her own piece *Rite for Enchanting the Air – Concerto for Flute’(s)* (1998).

“I believe that Schenker’s theory can be expanded to spectral music, and I have made a Schenkerian analysis of the Concerto, reducing the work to obtain several structural levels that revealed the fundamental structure of the entire work, the so called Ursatz. Using this Schenkerian approach, the fundamental structure (the Ursatz) of the whole work shows a relationship between the fundamental sound, the 5th and the 9th harmonic.” (Teodorescu, 2003, p.98)

John Deck used Schaefferian methodology, which was created by Pierre Schaeffer, to analyze spectral music:

“Schaeffer made a clear distinction between musical languages using sound of long duration and those based on differences between sound objects with discrete, short to medium durations. This distinction forms an important part of his typological systems for sound classifications.” (Deck, 2008, p.78)

Schaefferian methodology could give better results by interpolating it with spectral analysis, while doing classification of sound objects. Temporal differences and spectral changes in FFT graphs and spectrums let us understand the timbral and temporal variances in different sound objects, and these sound objects could be associated within themselves. Developing these kinds of hybrid approaches and using them to analyze contemporary music would provide us with more tangible results.

Also, analysis procedure in this thesis could be expanded to analyze Debussy’s larger works, for example *La Mer* which is considered a proto-spectralist piece. Analyzing



spectrum changes in time and calculating density of frequencies instantaneously are practical methods and comparison of their expanded versions with harmonic analysis could yield interesting results. Also, timbral and temporal changes could be identified visually.

In conclusion, Debussy undeniably has proto-spectralist approaches in his music, but it may be more legitimate to interpret Debussy in his time, as a post-romantic. If we consider that naming art movements is a 20<sup>th</sup> century habit, Debussy did not call himself as a member of any movement. In the future, if scholars would interpret music holistically from Debussy till today, it is more likely they would denominate Debussy as a 'proto-spectralist'.





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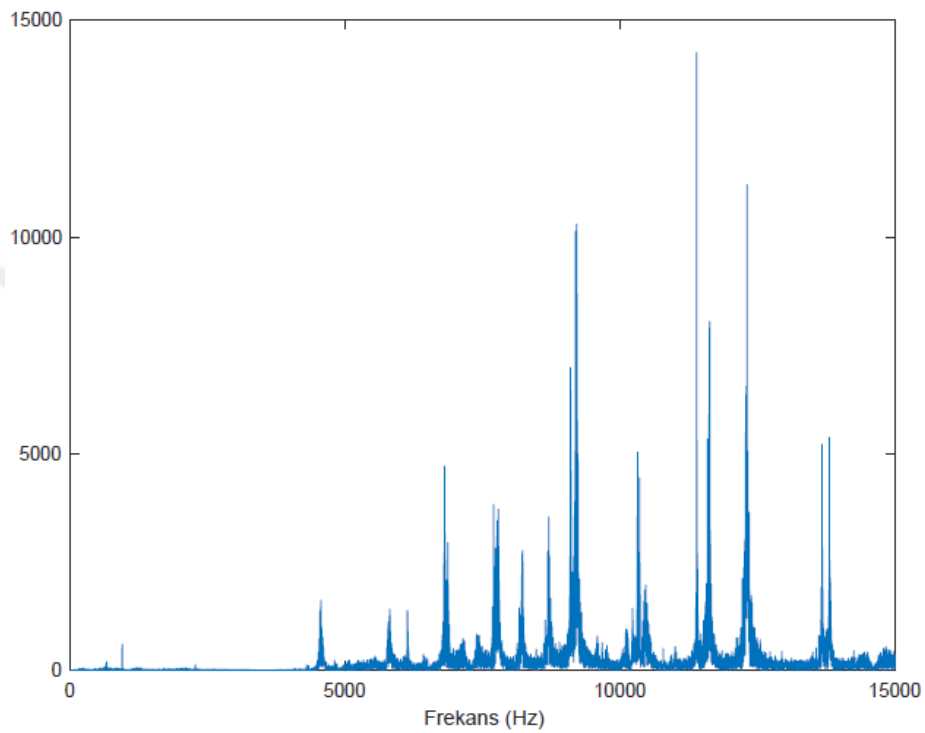
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**APPENDICES:**

**APPENDIX A:** Fast Fourier Transforms of *La Cathédrale Engloutie* and *Pagodes*



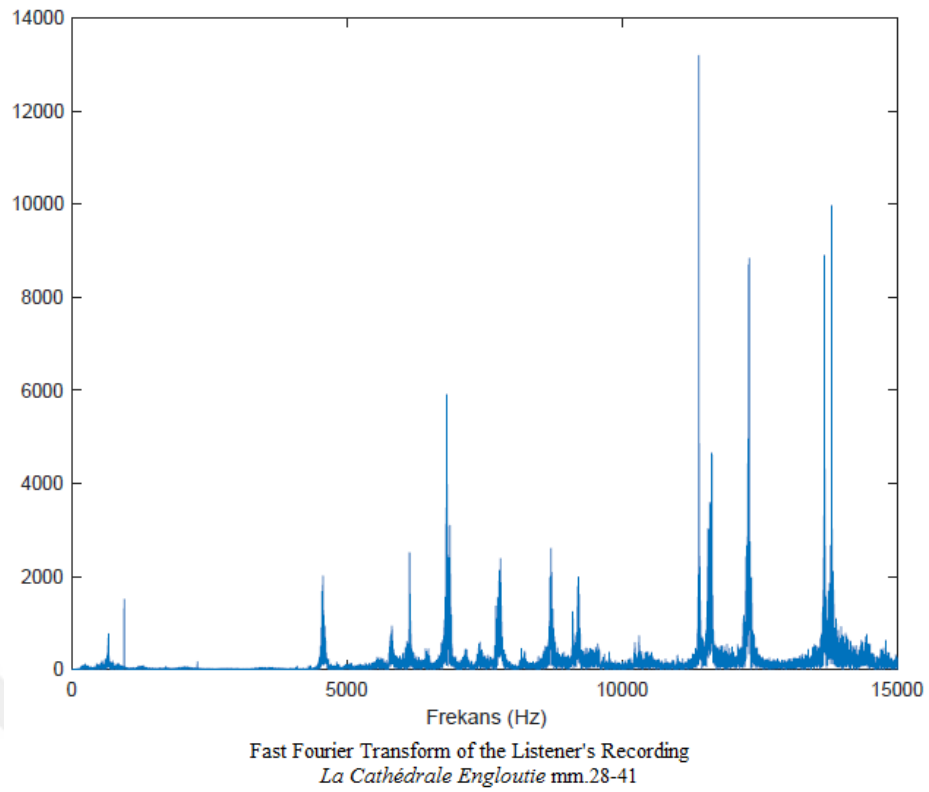
**APPENDIX A:**



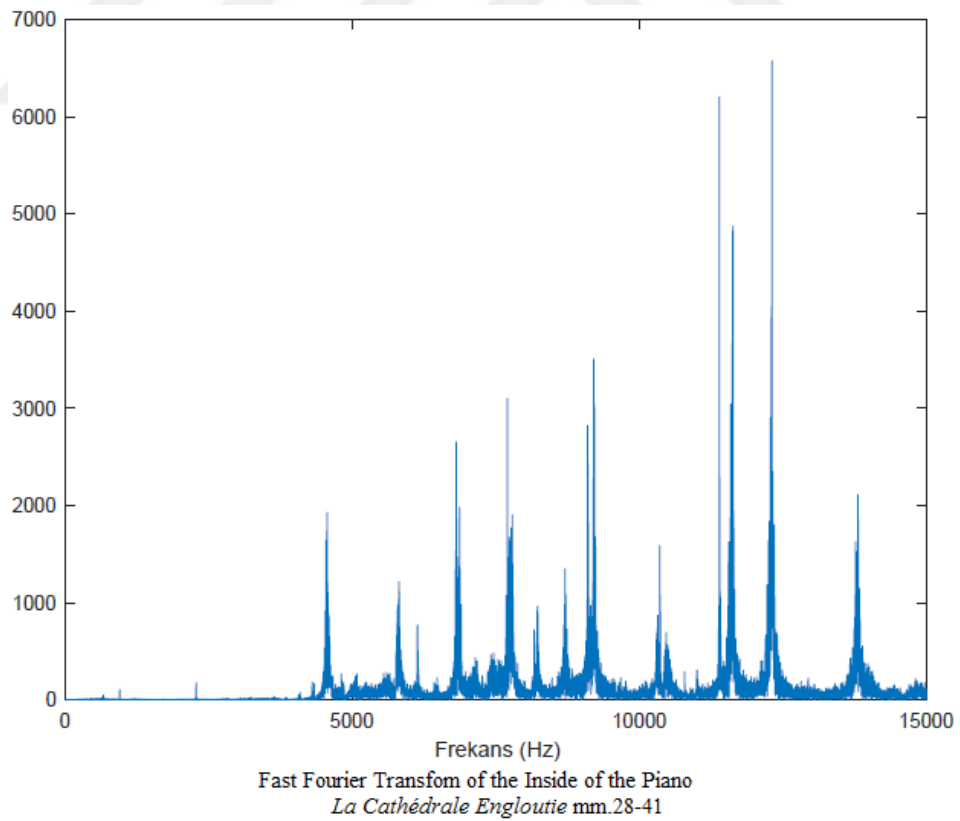
Fast Fourier Transform of the Player's Recording  
*La Cathédrale Engloutie* mm.28-41

**Figure A.1:** *La Cathédrale Engloutie*, mm.28-41.

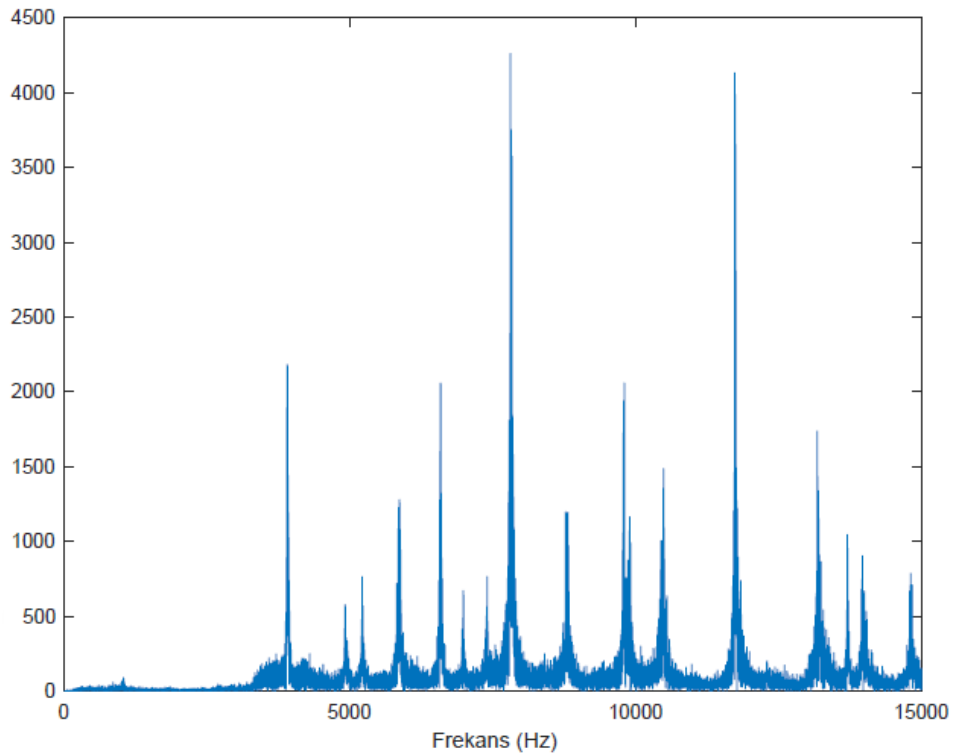




**Figure A.2:** *La Cathédrale Engloutie*, mm.28-41

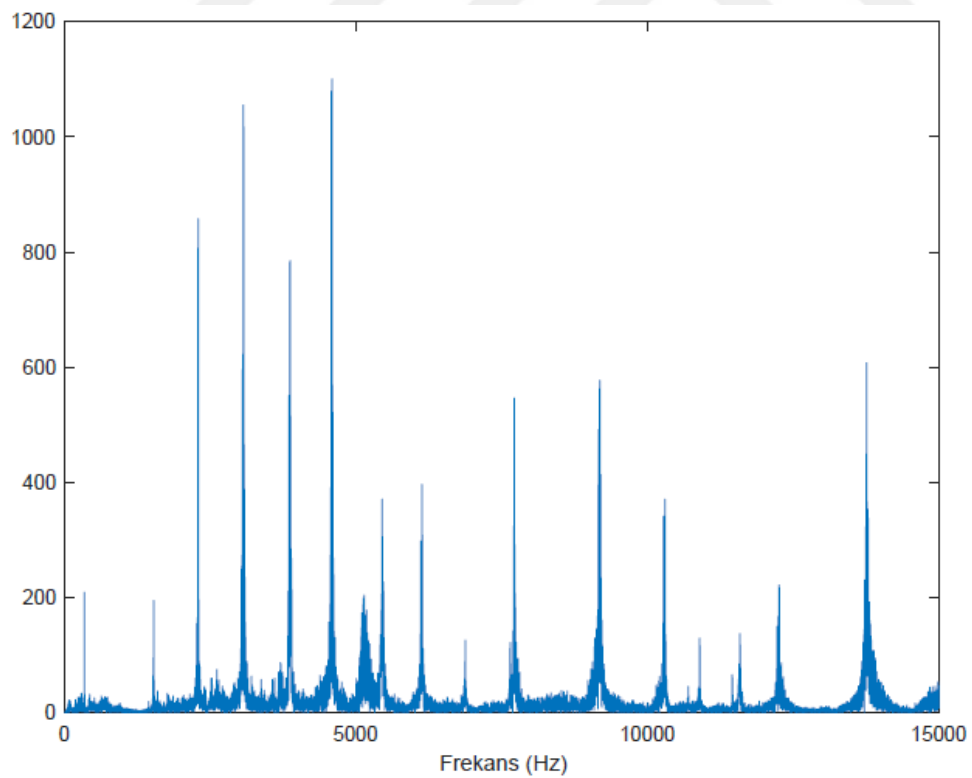


**Figure A.3:** *La Cathédrale Engloutie*, mm.28-41.



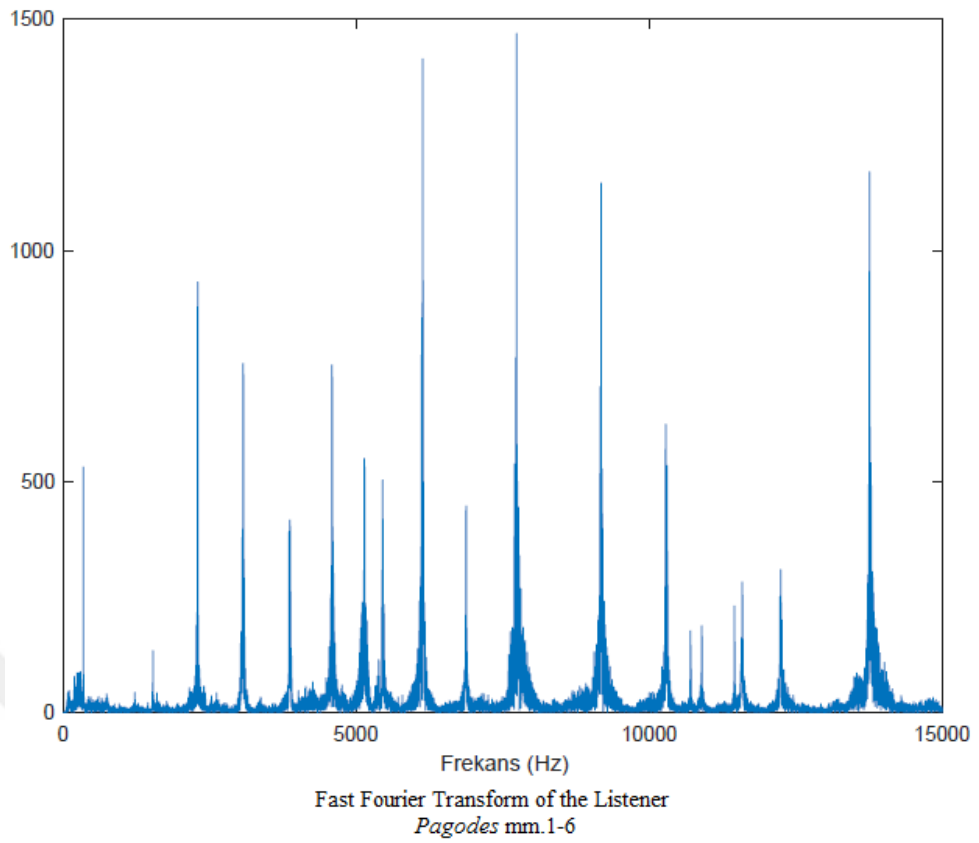
Fast Fourier Transform of Digital Piano's Recording  
*La Cathédrale Engloutie* mm.28-41

**Figure A.4:** *La Cathédrale Engloutie*, mm.28-41

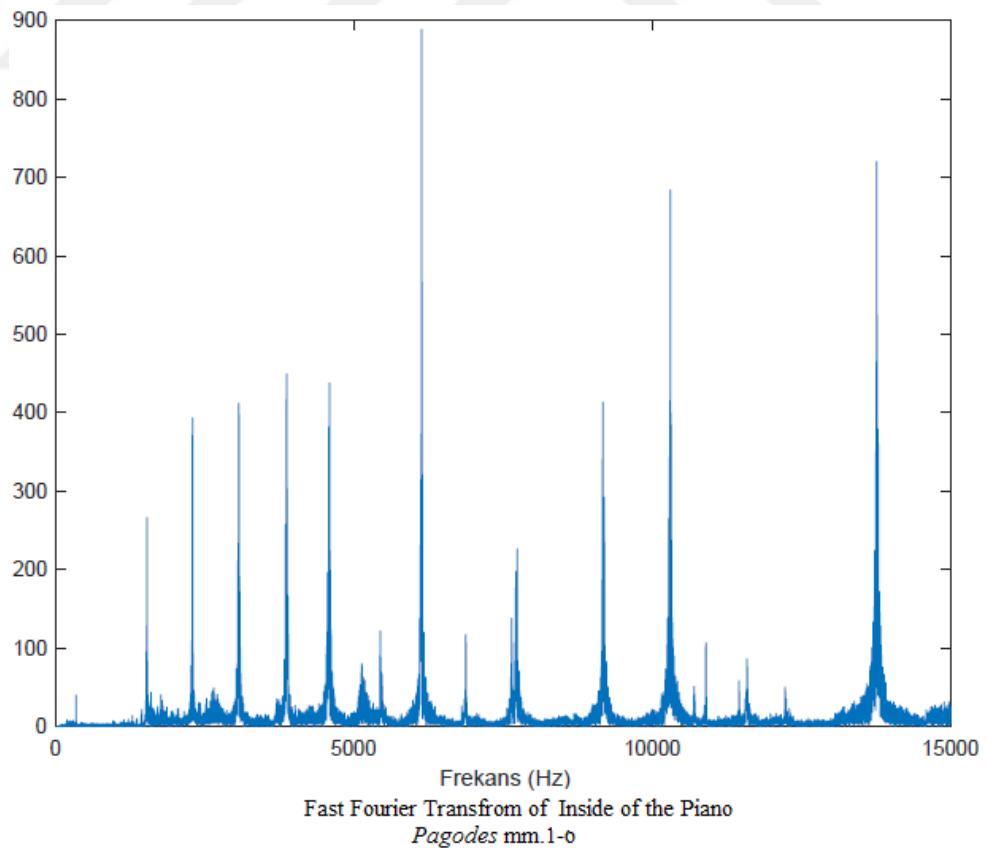


Fast Fourier Transform of the Player  
*Pagodes* mm.1-6

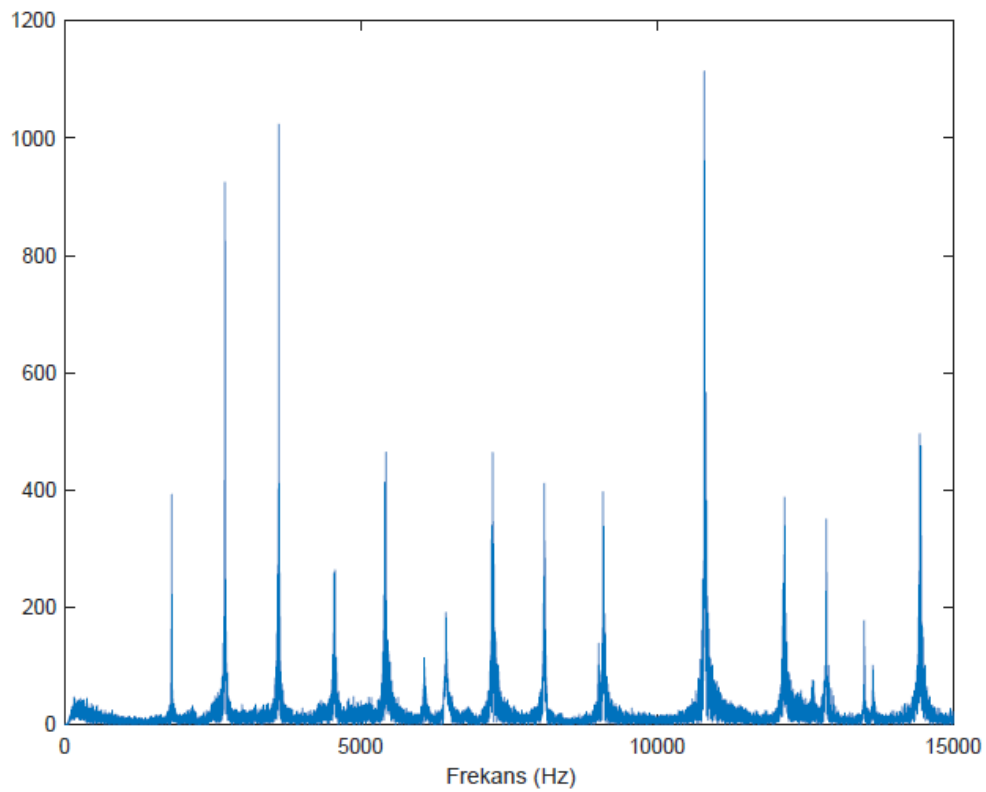
**Figure A.5:** *Pagodes*, mm.1-6.



**Figure A.6:** *Pagodes*, mm.1-6.



**Figure A.7:** *Pagodes*, mm.1-6.



Fast Fourier Transform of the Digital Piano  
*Pagodes* mm.1-6

**Figure A.8:** *Pagodes*, mm.1-6.

**PHOTO**

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