

Visual Aspects of Byzantine Music Modes: Exploring the “Ethos” of Byzantine Melopoeia through Acoustic Analysis*

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My contribution will focus on three fundamental terms included in the title of the present paper; that is **Modes, Ethos** and **Melopoeia** of the Byzantine Music. The basic source in Byzantine Music Theory regarding all three above terms is the following quotation from Chrysanthos’ *Great Theory of Music*¹, where one can visually understand (philosophically and musicologically) their existing strong (internal and external) connection; here is what Chrysanthos says:

“Ethe in melopoeia were three, the diastaltic, the systaltic and the hesychastic. They were called ethe, because through them the state of the soul was observed and corrected. Diastaltic ethos is the one through which majesty and virile disposition of the soul, heroic deeds and related passions are expressed. Tragedy uses this ethos mostly and among the others, the ones that preserve this character. This ethos is idiosyncratic of our first and third echos. Systaltic is the ethos by which the soul is driven to humility and to cowardly disposition. This state of soul fits to erotic passions, laments, compassions and the like. This ethos is idiosyncratic of our second echos and all the plagals except the barys. Hesychastic is the one which is followed by serenity of the soul and a state of freedom and peacefulness. It suits to hymns, paeans, songs of praise and the like. This ethos is idiosyncratic of our echos barys and our first echos.”

It’s obvious that we have to explore the sense of *Ethos* (that is the way “the state of the soul is observed and corrected”²) through the structure of *Melopoeia* (that is “the power to create melos”; or – in other words – the composer’s “poetic state”³); but in any case we can understand the differences between the existing Ethe (Chrysanthos names three of them, that is the aforementioned *Diastaltic*, *Systaltic* and *Hesychastic*) through *Modes*, i.e. under the specific *idea* and most of all the unique *sound* of anyone of the eight in total Byzantine Music Modes.

In fact, each one of the above three terms consists of a great Chapter of Byzantine Music Theory and Practice; especially the “*Ethos Chapter*” is generally a crucial issue of Byzantine Music composing technique, about which a philosopher or a theorist of Music could speak for hours⁴; here, however, I prefer to choose a more practical point of view, speaking about the said theme as a singer and interpreter of this specific kind of Music, i.e. Byzantine Music.

I shall indicatively use, as a practical field of my musicological comments, a musical example based on the following well-known *Doxastikon Idiomelon* of the Vespers service dedicated to the feasts of the Holy Fathers of the Holy Synods⁵; here is an English translation of the text of that poem⁶:

Let us praise today the mystical trumpets of the Spirit, the God bearing Fathers, who sang a harmonious melody of theology in the midst of the Church: one Trinity, unchanging Essence and Godhead; the over throwers of delusion, the champions of the Orthodox, who ever intercede with the Lord that he have mercy on our souls.

* Part 1 is written by Achilleas Chaldaeakes, while part 2 is respectively written by Anastasia Georgaki.

¹ *Great Theory of Music by Chrysanthos of Madytos*, translated by Katy Romanou, New York 2010 (The Axion Estin Foundation, New Rochelle), pp. 180–181^{§396-398}.

² *Ibid.*, p. 180^{§396}.

³ *Ibid.*, p. 179^{§389}.

⁴ Cf. Michael Mantzanas, “The Ethos of Octaechia”, *Acta of the III Conference Musicological and Psaltic; Theory and Practice of the Psaltic Art: The Octaechia*, Athens 17–21 October 2006, Athens 2010 (Holy Synod of the Church of Greece-Institute of Byzantine Musicology), pp. 535–541.

⁵ It’s a specific series of ecclesiastical feasts celebrating in Eastern Orthodox Church three times: at July 13th [feast of the Holy Fathers of the 4th Global Synod], at October 11th [feast of the Holy Fathers of the 7th Global Synod] as well as at the 7th Sunday after Easter [feast of the Holy Fathers of the 1st Global Synod]; the Greek text of the said *Doxastikon Idiomelon* of the aforementioned feast’s Vespers service has as follow: Τὰς μουσικὰς σήμερον τοῦ Πνεύματος σάλπιγγας, τοὺς θεοφόρους Πατέρας ἀνευφημήσωμεν· τοὺς μελωδήσαντας ἐν μέσῳ τῆς Ἐκκλησίας, μέλος ἑναρμόνιον θεολογίας, Τριάδα μίαν ἀπαράλλακτον, οὐσίαν τε καὶ θεότητα· τοὺς καθαιρέτας τῆς πλάνης καὶ Ὀρθοδόξων προμάχους· τοὺς πρεσβεύοντας πάντοτε Κυρίῳ, ἔλεθθῆναι τὰς ψυχὰς ἡμῶν.

⁶ The above translation is taken from the following website: <http://anastasis.org.uk/FathVes.htm>

I'll examine the individual meanings of the above poem, searching for their *Ethos* and *Aesthetics*, using here a specific -extremely popular and widespread- melody of it, lately (during 20th century) composed by Konstantinos Pringos (+ 1964)⁷; here is a copy of that composition, transcribed into both Byzantine and Staff Notation⁸:

Ἦχος ᾠδῆς Πα

Tas - mi sti - kas si - me ron tu ra - - - la - - kton u si - - an -
 pne - vma - tos sa - - lpi - - - gas - - - te ke - - - the o - - - - - ti -
 tus the o fo - rus - - - pa te - - - - - ta tus ka the re - tas - - - - -
 ras a ne - - fi mi - - - - - so - - - - - tis pla - - - nis ke or tho -
 - - - - men tus me - lo - di - - do xon - - - pro - ma - - - chus -
 - - - - sa - ntas en me - so - tus pre sve - - vo - - ntas pa - nto -
 tis - - e - - kli si - - as - - - te - - - ki ri - - - o e le i
 me - - - - los - - - e na rmo - - thi ne tas - - psi chas - - i - - - - mon
 ni e nar mo - ni - on - - - the o - lo - - gi - - - as
 tri a - - - da - mi - an - - - a pa

⁷ About the man cf. Stamates Papamanolakes, "Konstantinos Pringos; Master Protopsalt of the Great Church of Christ 1892–1964", The Chanters of the Ecumenical Patriarchate; First series; Iakovos Nafpliotis; Efsthathios Viggopoulos; Konstantinos Pringos; Thrasylvoulos Stanitsas; Vasileios Nikolaides; Nikolaos Daniilides, Athens 1996 (Association of Athens Graduates from "Megali tou Genous Scholi"), pp. 53–75; Manolis K. Hadjigiakoumes, Mixed of Ecclesiastical Music 7 & 8; 20th century Constantinopolitan composers' Leitourgika at eight modes; Chants father Georgios Tsetses, *Great Archpriest of the Ecumenical Patriarchate*, Athens 2003 (Center of Researches and Publications), pp. 37–38 (of the submitted leaflet).

⁸ The musical text of the said composition is taken here from the following musical edition, an own one of Konstantinos Pringos (Master Protopsalt of the Great Church of Christ) himself (recently republished by Georgios N. Konstantinou): *Musical Bliester*, 1st volume, Athens 2007 (Apostolic Ministry of the Church of Greece), pp. 185–187 [July's feast].

The intervallic environment of the said composition is a *chromatic* one, since its melody is composed in *second plagal mode*. The scale of that mode includes two identical disjunct tetrachords, the lower and the higher one (separated through a major tone, seemed like an ideal “musical bridge”), while each of them is developed by three (both ascending and descending) steps: semitone | augmented tone | semitone.

In addition, an interpreter’s attention and a researcher’s mind cannot avoid focusing on the following five remarkable points of the entire composition:

1. At the phrase *the mystical*, with which compositions starts, precisely by a surprising overthrow: specifically, the melody here, turning from plagal to the *authentic second mode*, develops below the base of the initial plagal mode, an unusual phenomenon for plagal modes structure and identity; music on that phrase (*the mystical*) seems like whispering a secret that should remain an unknown piece of information, even if it is sung through a loud voice!



2. At the phrase *trumpets of the Spirit*, where an imitation of the sound of trumpets appears in melody, through a change in modality genus, whilst the chromatic second plagal mode is changing here to the *diatonic four authentic mode* (the so-called *Hagia*).



3. At the verb *sang*, where melodic development describes the sense of chanting (included in the meaning of the said verb) using also the diatonic intervals of the brilliant *first mode*.



4. At the phrase *a harmonious melody of theology*; one can easily observe that at this specific point of the composition the composing idea is developed word by word, using three different modes (a separate one for each word), in order to help any audience to understand immediately what the entire phrase means: it is like *theology* (i.e. the way we speak about religion and God himself), a meaning described here through – plausible – the *first mode*, being a *melody* (and on the word “melody” the *third mode* evolves) and especially a *harmonious* one (composer shows the latter meaning – *harmonious* – using an enharmonic genus mode, the so-called *barys*).

me - - - - - los - - - e na rmo - -
 ni e nar mo - ni - on - - - the o -
 lo - - - gi - - - - - - - - - as

5. At the phrase *the champions of the Orthodox*, where melody (remaining at the initial second plagal mode) approaches the 8th of its scale, that is the pick, the top of the entire melody (i.e., symbolically speaking, the appropriate point for *the champions of the Orthodox*).

ke or tho -
 do xon - - - pro - - ma - - - chus -

To sum up: into an a priori **Systaltic** environment, *Ethos* of specific composition includes a lowtone additional *Systaltic* musical passage at the beginning (*the mystical*), balancing with another one also additional *Systaltic* musical mention at its end (*the champions of the Orthodox*), a hightone one in this case; this way, *the soul is driven to humility, fitted to compassions*⁹. In the middle, one can easily observe: on the one hand, two **Diastaltic** *Ethos* changes, the first one based on **G** (*trumpets of the Spirit*) and the second on **a** (*sang*), through a transposition and alteration from the initial second plagal to fourth and first mode respectively; this way, *majesty and virile disposition of the soul, along with heroic deeds are expressed*¹⁰; on the other hand, after the mentioned double *Diastaltic* part, a **Hesychnastic** one is added (undoubtedly the most indicative of the entire composition, developed on the phrase *a harmonious melody of theology*), consecutively transferring the melody to the third and barys modes; this way, *serenity of the soul and a state of freedom and peacefulness are expressed*, feelings totally appropriate for the specific part of this *hymn and song of praise*, a part which is clearly a *paean*¹¹.

Systaltic	Let us praise today <i>the mystical trumpets</i>
Diastaltic	<i>of the Spirit</i> , the God bearing Fathers, <i>who sang a harmonious melody of theology</i>
Hesychnastic	<i>in the midst of the Church: one Trinity, unchanging Essence and Godhead; the over throwers of delusion, the champions of the Orthodox, who ever intercede with the Lord that he have mercy on our souls.</i>
Systaltic	

Given all the above observations, observations which are something usual and already known for researchers of Byzantine Music tradition, my colleague Anastasia Georgaki is going to explore in the following part of our paper the above commented functionality of Byzantine Music Modes through a spectral analysis in the PRAAT environment (open source), connecting the visual and sound aspects of the aforementioned modes

⁹ Cf. *Great Theory of Music* by Chrysanthos of Madytos, *ibid.*, p. 180^{§397}.

¹⁰ *Ibid.*, p. 180^{§396}.

¹¹ *Ibid.*, pp. 180–181^{§398}.

which represent different moods (“Ethe”). The analysis will be focused on the common energy of each mode as well as on the composing structure of any individual melodic phrases, while taking into account the particular intervallic variety and expressive analysis, obtained when performing and decoding the Byzantine notation.

We believe that visualizing Byzantine Music Modes through Acoustic Analysis, having as a main source the performer’s voice, we would create an excellent Media, helping our colleagues and especially any potential student all over the world to understand the functionality of Byzantine Music Modes and their aesthetical relationship with the sense of the so-called “Ethos” of the Byzantine Melopoeia in a better way.

2

One of the major obstacles to appreciating Byzantine Music is that extensive training is required in order to understand the special music notation, as also the way of pronunciation and singing of the sacred text towards comprehending the thoughts behind the musical work. On the other hand, musical ethos (mood) in Byzantine Music has always been left to the chanter’s interpretation according to their education and origin.

In this section of the paper, we propose a first approach on a visualization solution to reveal firstly the semantic structure in Byzantine singing, such that users can gain insights into musical structure and understand better what ethos means by acoustic parameters taking as case study the troparion analyzed above by Professor A. Chaldaeakes.

In this direction we focus on the visualization of ethos from special melodic contours, intensity curves, spectral variations and energy rates¹², which indicate the emotional state of the performer (respecting the music notation) trying to interpret the indicated mood by a concrete melismatic approach.

More precisely in our approach we will attempt both structural and performance analysis as a first step in order to understand the different changes of the ethos in the macrostructure of the piece and by the micro-variations of the pitch contour of the voice understand the functionality of the sang mode.

Before presenting our methodology on an attempt to visualize the ethos of the Byzantine music by acoustic parameters we will present current techniques of the last years, proposed by various researchers, for the visualization of music in order to clarify our approach:

Music visualizing methodologies: from structure to performance

Most of the music visualization approaches are mathematical as the advent of new technologies offers new software which can represent the melodic curves, intensity, spectral variations and so on, as also the possibility to see the piece both in its micro and macro-structure.

Another advantage of the visualization of music through new software is that we can analyze the human interpretation of the musical structure and extract information about different musical behaviors which refer to one score.

There are two main approaches of music visualization: augmented score¹³ and performance visualization.

a) Augmented score: The visualization of musical structure has been discussed mostly for classical music and in some cases in ethnomusicological essays by converting the symbolic score into MIDI files. New approaches have been developed to extract the special qualitative features of music structure based on the traditional score like Arc Diagram¹⁴, Isochords¹⁵, ImproViz¹⁶, etc. as also 3d music visualization¹⁷ (the possibility of visualizing music using color and 3D space).

b) Performance expression visualization focuses on the expressions brought by different audio performances of the same score. These expressive attributes do not appear in the original musical scores concisely, or are often added by the individual performer. The objective is to visualize the depth of performance so that users can

¹² According to Patrik Juslin-Petri Laukka, “Communication of Emotions in Vocal Expression and Music Performance: Different Channels, Same Code?”, http://www.brainmusic.org/EducationalActivitiesFolder/Juslin_emotion2003.pdf. There is a group of perceived correlates who have their correspondents in acoustic cues like: pitch, intonation contour, pitch perturbations, loudness of speech, rapidity of voice onsets, velocity of speech, amount of silence in speech, voice quality, articulatory effort.

¹³ Augmented score: composers can notate their expressive intentions on a musical score and performers can get assistance in learning a musical piece.

¹⁴ Arc Diagrams visualize complex patterns of repetitions in string data by connecting a translucent arc between a pair of matching (Martin Wattenberg, “Arc diagrams: Visualizing structure in strings”, *INFOVIS’02: Proceedings of the IEEE Symposium on Information Visualization 2002*, p. 110, 2002).

¹⁵ Tony Bergstrom in <http://social.cs.uiuc.edu/people/bergstrom/projects/isochords/>, 2007.

¹⁶ ImproViz, “Visual explorations of jazz improvisations”, *CHI’05: Extended Abstracts on Human Factors in Computing Systems*, pp. 1805–1808, 2005.

¹⁷ Sean M. Smith and Glen N. Williams, “A visualization of music”, *VIS’97: Proceedings of the 8th conference on Visualization 1997*, pp. 499–503, 1997.

compare and learn from distinct performances. One of the methodologies used in music performance visualization is to quantify elements include tempo change, articulation, and dynamics change were chosen as they can be appreciated qualitatively and have an affinity with music cognition. Other musical features should also be incorporated to increase the effectiveness. Animation should also be explored to amplify listeners' cognition.

Other methodologies deal with the Chernoff face¹⁸ and the hierarchical approaches and by Cone Trees layout which are used to visualize the musical structure of recursive hierarchies including form, section, phrase and motif. Furthermore, a number of commercial software proposes different solutions on the visualization of MIDI files especially for educators or listeners like Music Animation Machine¹⁹ or Hyperscore²⁰.

Visualisation aspects for sketching the ethos of the Byzantine melopoieia

As we have already mentioned musical mood is subjective and is usually left to the performer's and listeners' interpretation²¹. In our approach the notion of 'ethos', expressed via 'statistical parameters', corresponds to Juslin's acoustic cues: "*When listeners or critics describe music as sad, happy, angry, elated, and so on, [these states] are delineated by the action of what I have called the 'statistical parameters'. These aspects of sound vary in amount or degree – for example, register (lower–higher), dynamic level (louder–softer), speed (faster–slower), continuity (gradual–abrupt), and so forth*"²².

In Byzantine Music, the mood is indicated by the several modes and the genera annotated by the *Great Theory of Music* by Chrysanthos²³, where the melody is sung according the meaning of the sacred text show gratitude, admiration, pride, sadness, vigilance or anticipation, or else²⁴.

a) Augmented score based on audio performance: the map of ethos

Our first approach is based on the augmented score where the visualization outline of the overall structure of the piece is described by special annotation of audio files that we have done in the PRAAT platform²⁵ (opensource software) by coloring the change of the mood of music from the underlying musical elements. We formulate the semantic structure into macro-level layer interactions, micro-level theme variations, and macro-micro relationship between themes and layers.

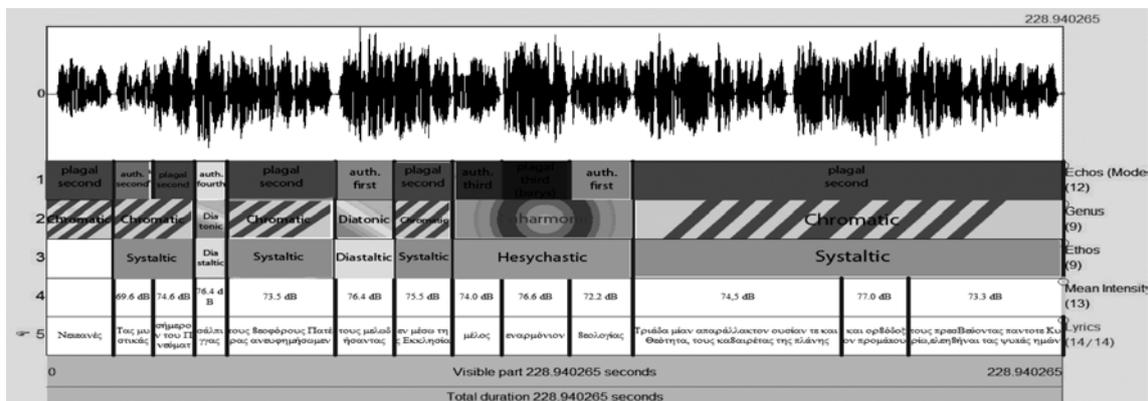


Figure 1. Augmented score of the music ethos (macrostructure)

In this augmented score we can observe 5 different layers which indicate the mood variations closely related to the modes (echos), the genera (genus), the mean intensity of the voice and the lyrics and according to the notion of ethos that has been presented in the first part of this article.

¹⁸ Herman Chernoff, "The use of faces to represent points in k-dimensional space graphically", *Journal of the American Statistical Association* 68(342): 361–368, 1973.

¹⁹ <http://www.musanim.com/player/>

²⁰ <http://hyperscore.wordpress.com/>

²¹ a) We have recorded Professor's Chaldaiakis interpretation on a this troparion b) we have implemented the prosodic feature extraction in order to get several features that describe performative model of the prosody c) we give a description about the prosodic analysis of this recorded fragment and implementation details using the [Praat Program](#) for sound and textgrid tiers of syllabus and words, sound and raw pitch contour (Pitch Tier), sound and stylised pitch contour (Pitch Tier), sound and raw intensity contour (Intensity Tier).

²² Patrik Juslin-Petri Laukka, "Communication of emotions in vocal expression and music performance. Different channels, same code?", in *Psychological* 2003, vol. 129, No. 5, 770-814 (http://www.brainmusic.org/EducationalActivitiesFolder/Juslin_emotion2003.pdf)

²³ See footnote 1 in the first part.

²⁴ Plutchik, R., "The Nature of Emotions", *American Scientist*. Retrieved 14 April 2011 (<http://www.emotionalcompetency.com/papers/plutchiknatureofemotions%202001.pdf>)

²⁵ <http://www.fon.hum.uva.nl/praat/>

b) Visualization of ethos through melodic contours and intensity levels

The second approach is based on a snapshot of two certain phrases that have been already analyzed by the coauthor above (phrase 3 and 4), where the ethos is visualized by special melodic contours indicating the emotional state of the performer (respecting the music notation). Since mood is generated not only from a melody but from all the notes sung in the musical section, out of the score, the figure includes further information. Subjective evaluation of the proposed figure by subjects is a prerequisite for the next step of our research.

In this case the performer (Professor Chaldaeakes) tries to interpret the indicated mood by a concrete melismatic approach which fits to the mode of enharmonic genus as he has explained above.

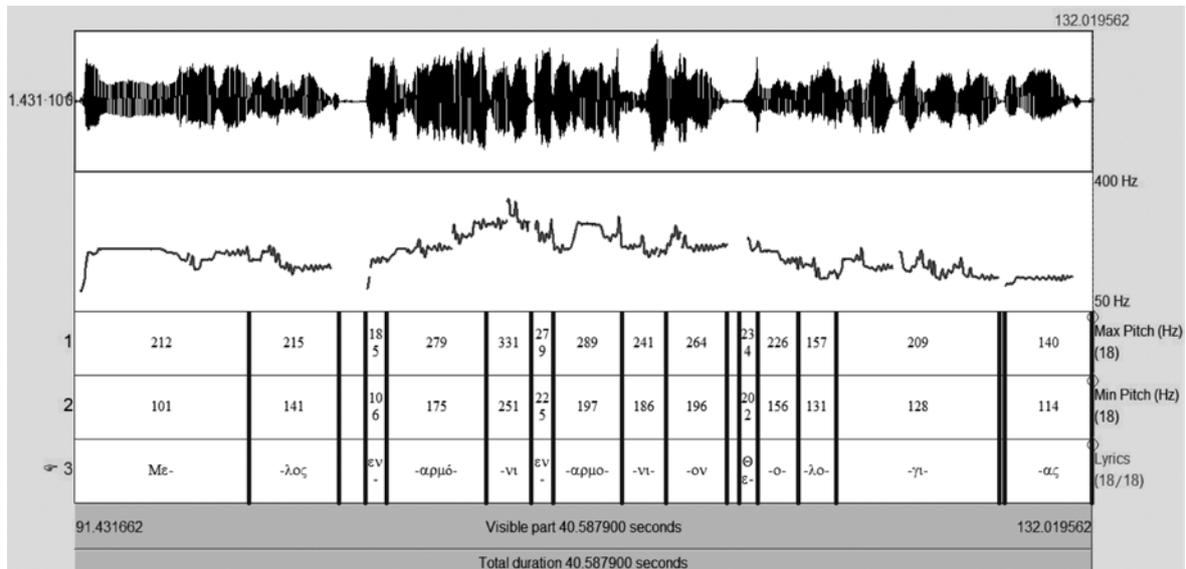


Figure 2. Melodic contour of the Phrase “harmonious melody” (melos enharmonion)

By analyzing the microvariations of the melodic contour of the phrase “*tous melodisantas*” (the verb *sang*), we can see the melodic development on micro intervals of the brilliant first mode (included in the meaning of the verb *sang*) and the diatonic genus related the pitch, intonation contour, pitch perturbations, loudness of the voice, overall intensity which is one of the higher along the piece.

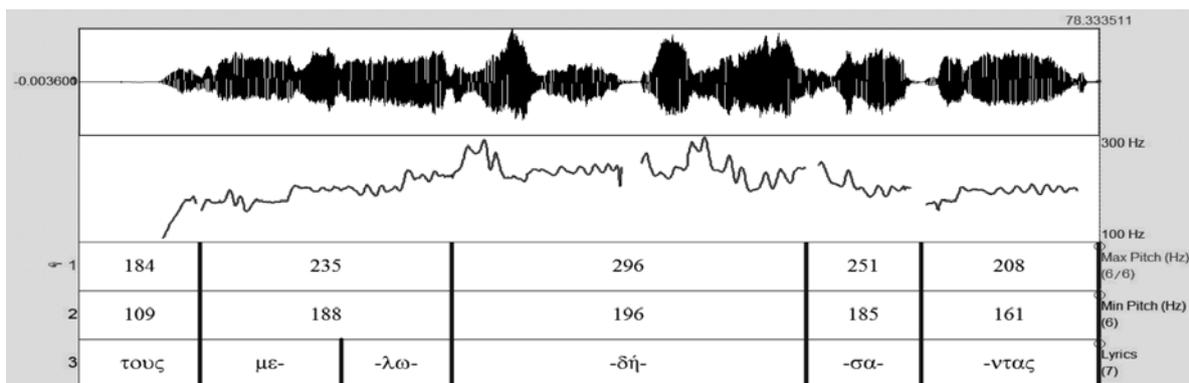


Figure 3. Melodic contour of the verb “sang” (*tous melodisantas*)

c) Visualization of the spectral aspects of the verb “sang” (*tous melodisantas*) on the quality of the voice

The following image has special information in 5 layers (score in Western notation, score in Byzantine notation, waveform, formant transitions, spectre and melodic contours). This augmented score gives more information about the interpretation of the phrase “*tous melodisantas*” apart pitch, intonation contour, and pitch perturbations on the voice quality by formantic transitions and the overall sonogram.

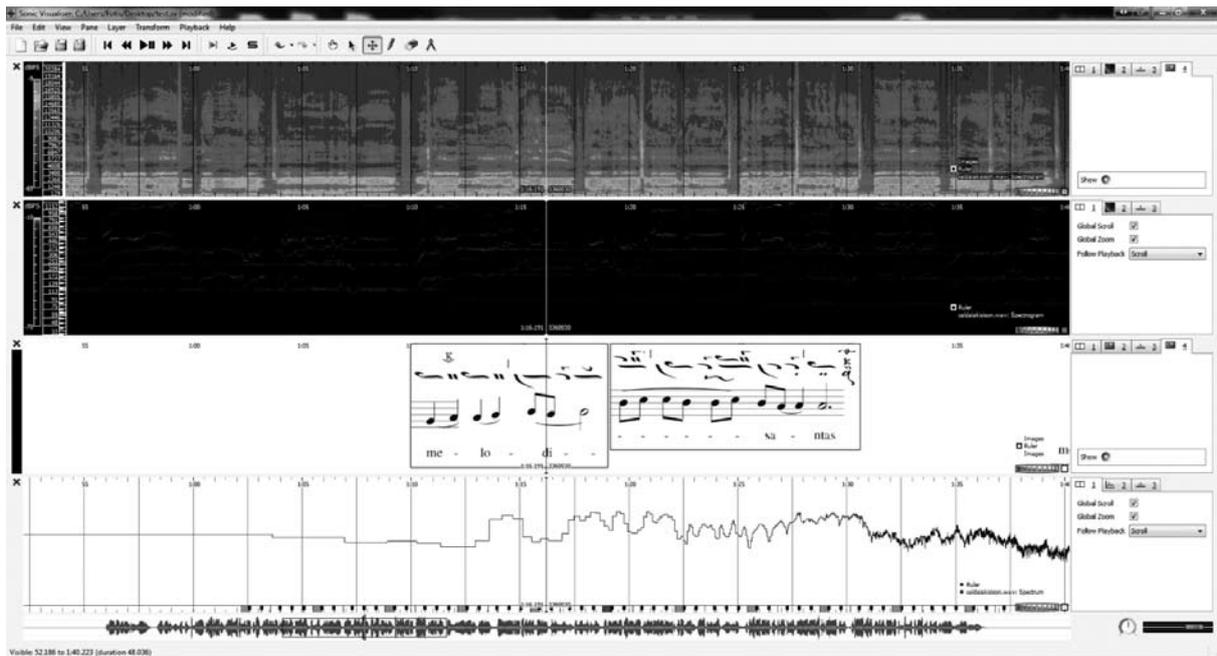


Figure 4. Spectral aspects of “melodisantas” in the environment of Sonic visualizer

Conclusion

The philosophy behind performance visualization is to display qualitative musical characteristics by acoustic cues in order to get more information than the score itself indicates. In our case, we propose a methodology in order to visualize musical mood related to modes (*echoi*) and genera on a performance of Byzantine Music composition (troparion) through the observation of acoustic parameters. The visualized mood is a clue with less ambiguity and subjectivity than verbal tags, because figures are drawn with expressive elements obtained from performance data.

We hope that this methodology on the analysis on complementary feedback with visual data will help in the future young singers and chanters to understand their own performances and interpret the annotated ethos according to the indications of the score. Last, in the close future we intend to evaluate this kind of visualization by developing experiments with students and experts of Byzantine Music (feedback) in order to demonstrate the effectiveness of our approach.

Santrauka

Bizantijos muzikos dermių vizualiniai aspektai: bizantinės melopėjos etoso tyrinėjimai akustinės analizės pagrindu

Chrysantho „Didžiojoje muzikos teorijoje“ rašoma, kad „melopėjos etosai buvo trys: diastaltinis, sistaltinis ir hesichastinis. Jie buvo vadinami etosais, nes pagal juos būdavo nustatomas ir koreguojamas sielos būvis. **Diastaltiniu etosu** išreiškiamas sielos didingumas ir vyriškumas, herojiniai žygdarbiai ir su jais susijusios aistros. Šis etosas daugiausia naudojamas tragedijose ir ten, kur perteikiamas atitinkamas charakteris. Šis etosas yra idiosinkratiškas mūsų **pirmajai ir trečiajai dermei**. **Sistaltinis** – tai etosas, kai siela nuolanki ir baikšti. Tokia jos būseną tinka erotinėms aistroms, raudoms, užuojautoms ir panašiai. Šis etosas yra idiosinkratiškas mūsų **antrajai dermei** ir visoms plagalinėms, išskyrus **barys**. **Hesichastinį** etosą lydi sielos liūdesys ir laisvės bei taikos pojūtis. Jis tinka himnams, pergalės giesmėms, šlovinančioms dainoms ir pan. Šis etosas yra idiosinkratiškas mūsų **barys** ir **pirmajai dermei**.“

Iš šių pastebėjimų galima daryti išvadą, kad egzistuoja vidinė (stiprioji) sąsaja tarp tam tikrų Bizantijos melopėjos etosų ir kai kurių Bizantijos muzikos dermių. Šiame straipsnyje, pasitelkus spektrinę analizę PRAAT aplinkoje (atviras šaltinis), susiejus vizualinius ir garsinius skirtingų nuotaių (etosų) dermių aspektus, nagrinėjamas Bizantijos muzikos dermių funkcionalumas. Daugiausia dėmesio skiriama būdingai kiekvienos dermės energetikai bei konkrečių melodijų kompozicinėms struktūroms, įvertinama ypatinga intervalikos įvairovė, analizuojamas atlikimo išraiškingumas bei bizantiškosios notacijos iššifravimas. Manome, kad, akustinės analizės pagrindu vizualizuojat Bizantijos muzikos dermes ir pagrindiniu šaltiniu laikant atlikėjo balsą, galima rasti puikų būdą padėti studentams geriau suprasti, kaip funkcionuoja Bizantijos muzikos dermės ir kokios yra jų estetinės sąsajos su vadinamųjų Bizantijos melopėjos etosų prasmėmis.