The application of GTTM on 20th century modal music: Research based on the analysis of Yannis Constantinidis’s “44 Greek miniatures for piano”

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• ABSTRACT
This paper examines the adaptation and expansion of Lerdahl’ s & Jackendoff’ s Generative Theory of Tonal Music so that it may be applied on the analysis of 20th century modal music. Based on the premise that a considerable part of the theory’s rules are universal — meaning that the principles of music perception and cognition are the same for all experienced listeners regardless of the musical idiom in which they are experienced — the application of GTTM to musical idioms other than the Western classical one requires formulation of idiom-specific well-formedness and preference rules, and description of the special tonal hierarchy. These tasks may be accomplished through the analytical study of a considerable quantity of music representing a certain idiom, and the description of its features in relation to the four parts of the GTTM methodology. The chosen analytical object — 44 Greek miniatures for piano — is representative of the musical idiom deriving from the amalgamation of Greek modal music and 20th century harmonization techniques, distinctive of the musical style of Greek composer Yannis Constantinidis. An inductive methodological process was used for the individual and comparative analysis of all 44 pieces. This paper includes three complete GTTM sample analyses from the 44 piano pieces, a summary of the stylistic characteristics of the analyzed music, and the formulation of the special well-formedness and preference rules, introduced as either new rules to the theory or adaptations of the existing ones.

Keywords: Generative Theory of Tonal Music, 20th century modal music, Greek music, Yannis Constantinidis, 44 miniatures for piano.
INTRODUCTION

The *Generative Theory of Tonal Music* (GTTM, Lerdahl & Jackendoff, 1983) places music theory among the cognitive sciences by examining issues concerning the perception and cognition of musical structure, namely the mental representation of music. According to the theory, a listener experienced in a musical idiom organizes the musical sounds (musical surface) into coherent mental structures and correlates music cognition with language cognition, arriving at the formulation of a *musical grammar*: a system of rules that construct the hierarchical structure that the experienced listener assigns to a musical surface. There are two basic categories of musical grammar rules: the *well-formedness rules*, determining the grammatically correct possible structural descriptions of a piece, and the *preference rules*, determining which of all possible structures are most coherent and relevant to the listener's mental representation. The analytical theory is *reductional*, since the analytical results are presented in multiple hierarchical levels of four integrated types (grouping structure, metrical structure, time-span reduction and prolongational reduction), which start from the musical surface (specific level) and progress gradually to the structural skeleton (abstract level).

Originally (1983), the theory applied to music of the Western tonal idiom only. However, its authors claim (GTTM, ch. 11, pp. 278-89) that a considerable part of the theory's rules has *universal* validity and that, by modifying the existing or adding new *idiom specific rules*, the theory could be used for the musical analysis of different musical idioms. Defining *musical universals*, Lerdahl & Jackendoff refer to the basic principles of music cognition used by all experienced listeners for the organization of perceived musical surfaces, regardless of the musical idiom in which they are experienced. These principles relate to the human cognitive capacity and ability which are mainly innate, and independent of cultural, geographical, or historical factors.

The present research involves adaptation and expansion of the *Generative Theory of Tonal Music* so as to render it applicable to the analysis of 20th century modal...
music. However, due to the multiplicity and diversity of 20th century modal idioms still being developed into the 21st century, a general approach to contemporary modality was not preferred. Instead, a modal idiom was selected, which represents the essentially diatonic modal music of the early 20th century and incorporates most of the features of its era’s neotonality and with which the author is familiar. The idiom chosen for the research is Yannis Constantinidis’s musical style, as expressed in his 44 Greek miniatures for piano; the research results include the stylistic characteristics of the chosen musical idiom and the formulation of the new or modified musical grammar rules that correspond to this idiom.

Of course the present paper is not the first attempt for the partial or total expansion of the theory. In the 25 years that passed since the theory was published, many research projects have contributed to the enrichment of its principles. The most relevant to the present project are:

- Costas Tsougras’s Modal Pitch Space model (2003). This model is an expansion of Lerdahl’s Tonal Pitch Space, aiming at a more accurate description of the situations involved in the analysis of diatonic modal music. The model calculates the stability of pitches, chords, modal regions, as well as melodic and chordal attraction values in various cadence types within the modal context. The same author has also presented research (Tsougras, 2009) on the use of the GTTM on 20th century chromatic modal music, focusing on pitch space and prolongational issues and analyzing excerpts of selected modal idioms (by Debussy, Bartók and Messiaen).
- David Temperley’s Preference-Rule approach to modeling meter and harmony (1996, 2001). In “The Cognition of Basic Musical Structures” (2001), he implements computationally — through dynamic programming — six systems of preference rules (metrical structure, phrase structure, contrapuntal structure, tonal pitch-class representation, harmonic structure and key structure), and uses this model to analyze a wide range of music genres, including modal rock music.

However, none of the above research projects has delved into detailed analysis of a modal musical style through the study of a complete analytical corpus. This is what the present study attempts to accomplish. Emphasis is given on the use of GTTM as an analytical theory per se, and not as a background for research on music cognition principles.

(3) Other smaller scale projects involving the use of GTTM on modal music are T. Auvinen’s (1995) analysis of Arvo Pärt’s Fratres (introducing also elements from semiotic analysis) and C. Tsougras’s (1999) analysis of Manolis Kalomiris’s Chant du Soir.
BACKGROUND

The basic principles of the theory, that are considered universal and idiom independent are:

• Musical intuitions are organized along four hierarchical dimensions, each including every pitch-event in a piece: grouping, metrical structure, time-span reduction and prolongational reduction.
• The structure of a piece in each component is determined by the interaction of well-formedness rules, preference rules and transformational rules.
• The four components interrelate as following:
  - Grouping and meter are independent.
  - Time-span reduction depends on meter at small levels, grouping at large levels and the combination of the two at intermediate levels.
  - Time-span reduction depends on a combination of pitch stability and time-span segmentation.
  - Prolongational regions and prolongational importance are determined largely in terms of time-span importance and stability of pitch connection.
• In order for the two reductional components to be completed, there must exist criteria for the relative stability of pitch events. This means that a musical idiom must supply a tonal center for a piece and a scale of distance of other pitch-events from it, namely a tonal hierarchy.
• Structural beginnings and endings of groups form significant articulation of a piece’s structure; structural endings are marked by conventional formulas (cadences of some kind).

Therefore, apart from adhering to the above universal principles, the extension of the theory’s use to idioms other than the Western tonal one — assuming the existence of a tonal center and a tonal hierarchy — should also provide:
- formulation of the special conditions that describe the specific idiom as expressed in special well-formedness and preference rules and
- formulation of the special tonal hierarchy and special cadence formulas.

These tasks can be accomplished through both specific and comparative study of a representative specimen of a musical idiom, for the inductive extraction of general

(4) Lerdahl & Jackendoff 1983, p. 278: “We claim a rule to be universal if it applies in the same way in every idiom that employs the distinctions to which the rule is sensitive”.
(5) GTTM, p. 280.
(6) GTTM, p. 99: “One should construct formalisms that are adequate to express the facts of other idioms and try to localize the similarities and differences between idioms in the statements of particular rules. These differences represent what one must learn about an idiom to become an experienced listener”.

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conclusions about the idiom and its relation to the four methodological components of the theory.

The above conditions apply to the use of the theory for the analysis of the works of Yannis Constantinidis (1903-1984), whose style is a special integration of diatonic modality and 20th century compositional techniques. As all music composed by Constantinidis, the 44 Greek miniatures for piano are elaborations of authentic Greek folk tunes and dances. Written during the period 1949-51, this three-volume collection comprising forty-four processed folk melodies from all over Greece is among his first mature works and possibly the most decisive for the creation of his compositional style. Among the composers of the Greek National School, Constantinidis displayed a uniquely non-romantic attitude, influenced by French composers and Bartok’s use of folk material and consciously keeping his distance from the post-romantic exuberant style of Manolis Kalomiris. Rather than subjecting folk melodies to development, he repeats them in subtly transformed contexts, exploring their various harmonic implications or varying them ornamentally. Thus, he attains a style unmistakably personal and remotely associable with Ravel’s impressionism. The most distinctive characteristic of Constantinidis’s music is that the original tune is strictly unalterable and functions as a type of cantus firmus while the processing occurs in the harmonic and rhythmic domain. The artistic value of his output stems from his austere, sensitive, and transparent harmonization technique, which projects authentic Greek music through an artistically profound personal filter.

At this point a short reference to the concept of “mode” might be useful. According to Mantle Hood (Ethnomusicologist 1971, p. 324) the concept of mode encompasses four features that fully cover the range between generalized scale and particularized melody: “Basic features of Mode seem to include: 1) a gapped scale, 2) a hierarchy of principal pitches, 3) the usage of ornamental pitches and 4) extra-musical association”. So, a mode is a complex entity that, apart from the pitch classes

(7) The work was published in New York by Rongwen Music (1957) and, in Greece, initially by the composer (1978) and later by Papagrigoriou-Nakas (1996). The pieces were recorded and published commercially in 1988 (G. Hadjinikos) and 1995 (Domna Eunouchidou).
(8) The pieces progress to more complex musical textures and more difficult performance levels through the three volumes.
(9) Leotsakos (article in Grove Music Online). For a detailed overview of Constantinidis’s life and music see G. Sakallieros’s PhD (2005).
(10) “His music gives a new expressional dimension to Greek folk music without betraying its deeper essence and its ethos” (Liavas, 1995).
(11) From the article Mode: V. Mode as a musicological concept in the New Grove (1980, v. 12, p. 423).
(12) A gapped scale is a discontinuous pitch structure, where pitches (scale degrees) are separated by musical intervals.
of a scale, includes a pitch hierarchy, typical cadence formulas and melodic figurations and semantic references. In the context of the present analytical corpus, these properties are important, as they enrich the cognitive dimension of the folk melodies used as primary material for the 44 pieces. The modal system of Greek folk music\(^{13}\) consists mainly of heptatonic modes, akin but not identical to the Byzantine modes; tetratonic or pentatonic modes are also included. The heptatonic modes are diatonic (containing major or minor seconds) or chromatic (containing augmented seconds also); they consist of conjunct or disjunct tetrachords and pentachords and include certain characteristic chromatic alterations. The most common structural scale degrees are \(\hat{1}\) (tonic, tonal center), \(\hat{7}\) (subtonic, generally one major second below the tonic) and \(\hat{4}\) (one perfect fourth above the tonic). Every mode includes characteristic cadential intervals (melodic intervals used for the approach of the cadential tonic pitch: commonly upward major 2\(^{nd}\)s or downward 2\(^{nd}\), 3\(^{rd}\) and 4\(^{th}\)), cadential formulas, among which the most typical\(^{14}\) are \(\hat{3}\)–\(\hat{2}\)–\(\hat{1}\)–\(\hat{7}\)–\(\hat{1}\) and \(\hat{4}\)–\(\hat{3}\)–\(\hat{1}\), and typical melodic embellishment patterns.

The above contradict the concept of modality adopted in 20\(^{th}\) century music, according to which modes are just scale types and the adoption of folk tunes is just an element of ethnic character. Due to the work’s dual essence, both concepts were applicable in the analysis of the 44 miniatures. However, in the following GTTM analyses the standard 20\(^{th}\) century concept will be adopted\(^{15}\), and the standard terminology\(^{16}\) used, for reasons of clarity and conformity.

**Methodology**

A more precise definition of the present paper’s aims may now be provided. The research has two branches of equal importance, from a musicological point of view: one that pertains to style and one that pertains to methodology. Correspondingly, the research’s target is dual: it aspires to function firstly on the stylistic and secondarily on the methodological level, the latter presupposing the completion of the former.

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\(^{14}\) Chianis 1980: 681 (from article “Greece” in the NGD).

\(^{15}\) The current research focuses on 20\(^{th}\) century modality and separates itself from the ethnomusicological applications of reductional methodologies (e.g. Stock, 1996). However, the original modal structure of the melodies is still important in Constantinidis’s idiom.

\(^{16}\) See Williams (1997), ch. 10 for a discussion on 20\(^{th}\) cent. modality and the corresponding terminology.
The first branch concerns the study of Yannis Constantinidis’s style, as it emerges through the analysis of the 44 miniatures. The study is accomplished through the GTTM analysis of the pieces and the extraction of their grouping structure, metrical structure, time-span reduction and prolongational reduction. It was considered necessary for all 44 pieces to be analyzed, for the sake of completeness of the inductive analytical process; however in the present paper only three analyses are presented. For each one of the pieces, two diagrams are constructed: the first depicts grouping structure, metrical structure, and time-span reduction and the second depicts prolongational reduction. An explanatory text is included, to illuminate the choices made during the reduction processes. This branch of the research is fulfilled by the detailed description of the pieces’ stylistic characteristics and compositional features.

The second branch provides not only the verification of the validity of the rules considered to be universal, but also a systematic expansion of the analytical method, in order to enable its use for the specified modal idiom. This expansion is made by correlating the features of the pieces, namely the results of the first branch, to the four components of the analytical method. Fulfillment of this research branch is expressed in the formulation of the special tonal hierarchy and of the special well-formedness and preference rules.

It is obvious that the two research branches overlap and their results interact. Stylistic conclusions lead to methodological conclusions; at the same time, the comparative study and subsequent analyses of the 44 pieces reflect the application of the methodological results. This research loop indicates the existence of a cross-relationship between the two research branches: the data collected during the analytical process continuously intersect with the feedback from the developing methodological adaptations, until the two categories of results combined comprise a complete and coherent formal system.

However, for reasons of methodological clarity (optimal organization of the paper in chapters), the presentation of the research results was organized linearly in three successive stages: a) annotated GTTM analyses (chapter entitled “Analysis Examples”), b) summary of stylistic features (chapter entitled “Stylistic Characteristics”) and c) formulation of new or modified GTTM rules (chapter entitled “Methodological Results”). Due to the bi-directional nature of the research, this linear presentation does not exclude cross references between chapters and does not interfere with the argument flow. Furthermore, this choice presents some methodological problems

(17) Inductive processes are indispensable in style analysis research (e.g. Jan LaRue’s Guidelines for Style Analysis, 1970 or Charles Rosen’s Sonata Forms, 1980). And it goes without saying that a formal theory or a formal extension to a theory is impossible to do without the examination of a large analytical sample.
(e.g. certain analysis points or preference rules are presented before the reasoning behind them); therefore, a need for non-linear reading of the paper arises occasionally.

**Analysis Examples**

In the present paper, the analyses of three (out of a total of 44) pieces, one from each book, will be presented in full\(^{(18)}\), in an attempt to provide an optimally representative sample of Constantinidis's style in relation to GTTM methodology\(^{(19)}\). The main criterion for the choice of these three pieces was the type of modality used: piece VII is based on a diatonic melody and is harmonized diatonically; piece XXVII is based on a diatonic melody but contains chromatic elements in its harmonization; piece XL is based on a melody that uses a chromatic mode and comes with an idiomatically chromatic harmonization.

**Piece VII (from book I)**

**Grouping Structure:** The piece comprises two repeated four-bar phrases A and B. The eight-bar segment BB’ can be considered a period, due to the different cadences at the end of the phrases. Every phrase starts with an upbeat and consists of two 2-bar sub-phrases (a-a’, b-b’), each sub-phase functioning as either antecedent or consequent. The last a’ sub-phase functions as a codetta af B’. The form can be described as following:

\[
\begin{align*}
    a & - a' - a - a' - b - b' - b - b' - a' \\
     \bar{A} & \quad \bar{A} & \quad \bar{B} & \quad \bar{B}' & \quad \bar{c} \\
     \text{a} & \quad \text{b} & \quad \text{c} \\
\end{align*}
\]

**Metrical Structure:** This piece has a 7/8 metrical signature, an element that, in the Greek folk music context, almost always denotes the “kalamatianos” dance. The seven 8\(^{\text{th}}\)-notes are metrically grouped at level g as 3+2+2, and as 3+4 at level f. The tactus level can not be the 8\(^{\text{th}}\)-note due to the fast tempo of the dance\(^{(20)}\). So, an

\(^{(18)}\) The analysis of pieces in their entirety was preferred against analysis of selected excerpts because: a) all the pieces are short enough to be presented in one page and b) only a full analysis can adequately describe the elements of the prolongational structure and is compatible with the basic principle of GTTM, regarding the mental representation of the full piece in the experienced listener’s mind.

\(^{(19)}\) The full body of analyses and the corresponding 88 TSR and PR diagrams may be found in the author’s PhD thesis (Tsougras, 2002 [in Greek]).

\(^{(20)}\) According to Lerdahl & Jackendoff (GTTM, p. 73), tactus level corresponds to 40-160 bpm. Parncutt (1994) has proved that the ideal tactus is between 80-90 bmp.
Figure 1.
TSR diagram of Piece VII.
Figure 2. PR diagram of Piece VII.
irregular tactus level emerges at level g, where strong beats are either 2 or 3 beats apart and metrical units are unequal (\(\frac{\text{\textbullet}}{\text{\textbullet}}\)). This violates MWFR 4, but it can be justified as idiom-specific (see chapter “Research Results” of this paper). Metrical periodicity and regularity return at the measure level, and the metrical structure is binary at deeper levels.

**Time Span Reduction - Prolongational Reduction**
- Both the melody and the harmony of the piece are in the A Phrygian mode. The main characteristic of the mode is the descending leading note (2\(\rightarrow\)1).
- An interesting fusion occurs in b. 1: the initial melodic note (A in the upbeat) is fused with the C of b. 1 forming the tonic chord A minor, the structural beginning of the piece. Another fusion occurs in b. 10 and 14 at level e: in order to maintain the continuity of the melodic voice-leading (D-C-B\(_b\)-A), the A minor chord in the downbeat fuses with the melodic C that is heard as part of the next chord at level f.
- In b. 7 the A minor 7\(^{th}\) chord is considered to be less stable at level e despite the fact that it is the tonic chord because, due to its place in the musical flow of the phrase, it functions as a preparation of the cadential chord D-F-B\(_b\) and not as a tonic weak prolongation. This instance has to do with the prolongational functions of the harmonic events; the final A-E-A carries a tonic function (T), the D-F-B\(_b\) a dominant function (D), and the previously mentioned A minor 7\(^{th}\) a pre-dominant (subdominant) function (S), left-branching to the dominant chord.
- All voices of the musical texture create horizontal diatonic planing. The intervals used for the parallel motions are perfect 4\(^{th}\), perfect 5\(^{th}\) and 3\(^{rd}\). This procedure yields parallel 3-voice 6\(^{th}\) chords in the first part, and parallel 4-voice 7\(^{th}\) chords in the second part.
- All cadences occur at the central chord of the Phrygian mode (A minor) except for the cadence at the VI chordal degree (F major) in b. 12. At the last 2-bar sub-phrase, immediately after the structural ending, the melody is transferred to the lower voice (left hand). This creates a Phrygian cadence of the type (7\(\rightarrow\)1) and has a coda character. The main cadence type is the progression from the minor vii degree of the Phrygian mode to the i degree (without 3\(^{rd}\), open 5\(^{th}\) chord), creating contrary motion between the outer voices:

\[
\begin{align*}
\text{B}\(_b\) & - \text{A} \\
\text{G} & - \text{A}
\end{align*}
\]

- In b. 12, there occurs the only cadence to a chord other than the tonic. The F major 7\(^{th}\) chord arrives after a B\(_b\) chord, which is attached to the preceding G minor chord as a left (relaxing) branch at the PR, creating a local normative form.
- A weak prolongation occurs at the deepest prolongation al levels c and b’, which corresponds to a *Ursatz* type structural counterpoint in the context of the Phrygian mode.
Piece XXVII (from Book 2)

Grouping Structure
The basic theme is a six-bar period A, with a two-bar antecedent phrase a and a four-bar consequent phrase b+b′. The period is repeated, with a harmonically different antecedent phrase a′ in its second statement.

\[ \hat{3} \rightarrow \hat{2}b \rightarrow \hat{1} \]
I → VII → I

Metrical Structure
At the tactus level (\( \text{t} \)) a regular binary succession of strong and weak beats occurs. This stands for the half-note level (\( \text{h} \)) as well, except for the bars 3-4 and 9-10 where a ternary hyper-meter occurs, due to the expanded last event of the group. The next level (\( \text{w} \)) returns to binary regularity.

Time-Span Reduction, Prolongational Reduction
- There is a constant occurrence of seventh chords, except for the endings of the phrase groups where open 5th chords are used. The sevenths are introduced without any preparation of the dissonance and do not yield a standard resolution.
- Harmonic planing is very frequent as a voice leading feature, and it occurs at all TSR levels. The main intervals of the parallel motion are 4ths and 5ths. At level e an interval mixture takes place (B-E → G-D → F-C → F#-B → E-A) that is reduced to parallel 4ths at level b (B-E → F#-B → E-A).
- In b. 4 and 11 transformational fusion phenomena occur: the chords F-C-A-D and G-D-G-B at level f are fused into G-D-G-D at level e, a sonority that contains the most stable melodic pitch D and the most stable accompanying sonority G-D. The choice of D as a stable pitch is strengthened by the linear voice leading to which it contributes (TSRPr 6): \( \hat{5} \rightarrow \hat{4} \rightarrow \hat{3} \rightarrow \hat{2} \rightarrow \hat{1} \). The projected linear structural melody E-D-C-B-A clarifies the cadence elements by creating linear closure.

(21) Harmonic planing is the result of parallel voice leading. In 20th century harmony it can incorporate every type of interval above or below a melodic line. Harmonic planing is a coloring enhancement of the main melodic line, rather than a harmonization of it. It can be "diatonic" (using pitches of a certain diatonic collection), "real" (with the sonorities exactly transposed) or "mixed" (combination of the above).
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Figure 3. TSR diagram of Piece nr. XXVII.
Figure 4. PR diagram of Piece nr. XXVII.
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- The choice of the more stable events for the transition form level g to level f is based mainly on metrical position and distance from the local center.
- The second period (b. 7-12) differs from the first only in its opening two bars. Main events in this subphrase are the A major chord and the melodic pitch E.
- The original melody makes use of all the pitches of the A Dorian mode. The composer uses the same mode as a harmonization base, embellishing it in multiple ways. The first half of the theme could also be considered to belong to the E Dorian mode (because of the A major chord). The A Aeolian mode is also used (with F natural) at the bars preceding the modal cadence. These can be considered instances of modal transpositions or interchanges (see chapter "Research Results").
- The main mode (A Dorian) is revealed unambiguously at the deeper reductional levels, yet, at the levels closer to the musical surface, several chromatic elements appear: the A major chord in bars 2, 8 (as major tonic or as major IV of the implied E Dorian mode), the F major chord in bar 1 (creating a modal mixture by implying the A Aeolian mode), the F minor chord in bars 3, 9 (elaborating the C major chord as a minor subdominant), the Bb major chord in bars 7, 8 (elaborating the A major chord as a chordal appoggiatura at level g) and the F# major chord in bar 8 (elaborating the A major chord as a chromatic mediant chord at level e). The chromatic embellishment of the A major in b. 7 and 8 is quite interesting because it occurs at two different levels and is categorically different in each case.
- The C major 7th chord of the first bar (3rd beat) was preferred as a structural beginning against the E minor 7th chord (1st beat) because: a) it contributes to the formation of the structural voice leading mentioned above (TSRPR 6)22 since its top note — the melodic E — is the onset of the structural melodic line, and b) at the next appearance of the same theme in b. 7, there is no harmonization in the first half of the bar (parallelism preference rule, TSRPR 4)23. The choice of the E minor 7th chord is favored by its metrical position and by the fact that it prolongs to the downbeat of bar 2 (a relationship that the choice of C major 7th chord blocks). However, the combination of the other two criteria (structural line continuation and parallelism) is considered stronger in this context, and the choice of C major 7th as superordinate is favored.
- There is a difference between b. 2 and 8 at TSR levels g and e: in b. 2, the chosen pitch is G (part of E minor chord) and, in b. 8, the chosen pitch is F# (part of F# major chord). The parallelism preference rule is dropped here in favor of the harmonic stability of the evolving chords; however, the dissonant sonority C#-F#-A#-G is still a possibility, because G is a structural pitch in the original melody at level e.

(22) TSRPR 6 (Prolongational Stability): In choosing the head of a time-span T, prefer a choice that results in more stable choice of metrical structure.
(23) TSRPR 4 (Parallelism): If two or more time-spans can be construed as motivically and/or rhythmically parallel, preferably assign them parallel heads.
- The cadence of this piece can be considered a variation of the plagal cadence in the context of the Dorian mode (ii₆ → I: D-F#-B → A-E-A). This chord is prepared with a left branching by its next to the left chord at level g (A-C-E-G, tonic chord functioning as an embellishment to the dominant functioning chord) and by the chord A-D-F-C of the previous bar at level e.

- A structural melodic line of the type 5 – 4 – 3 – 2 – 1 emerges in the prolongational reductions of both periods. This line is formed at level e of the PR, with the first structural pitch E being prolonged for three bars as the underlying harmony changes, and with the members of the descending line following until the end of the cadence.

- At level b’ of the prolongational reduction the chords C-G-B-E (bar 1) and E-A-C#-E (bar 7) are connected. The second chord is considered a prolongation of the first, because it marks the start of the original melody’s recapitulation, however the underlying harmony is different. This is an instance of a special type of weak prolongation, notated by a filled circle in parentheses.

- Finally, in this piece, the structural beginning and the structural ending do not coincide; as a result, a progression instead of a prolongation occurs at the deepest level b.

Piece XL (book 3)

Grouping Structure: The examination of motivic content reveals two types of melodic phrases in this piece. The first phrase (A) has a 4-bar duration, with a 5/4 time signature and consists of two 2-bar sub-phrases a and a’, bound in an antecedent-consequent relationship. The second phrase (B) has also a 4-bar duration but with a 2/4 time signature (can be also heard as 2-bar and 4/4 time signature) and consists of two slightly varied repetitions of a 2-bar sub-phrase. The form of the piece is AA’ BA’’BB, where A’ and A’’ are different harmonizations of the A melodic phrase. Schematically:

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Metrical Structure: At the sub-tactus (●) and tactus (●) levels, binary regularity is established throughout the piece. However, at the next level, a continuous shift between binary and ternary metrical structure occurs at A-type phrases due to the irregular metrical signature (5/4 = ● + ●), while at B-type phrases binary regularity prevails (4/4 = ● + ●). It has to be noticed that the time signature used in the analysis for B-type phrases is 4/4 instead of the score’s 2/4, because this contributes to a more homogenous comparison of the metrical structures of both phrases. At deeper metrical and hypermetrical levels, binary regularity returns.
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Costas Tsougras

Figure 5.
TSR diagram of Piece nr. XL.
Figure 6. PR diagram of Piece nr. XL.
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Time-Span Reduction - Prolongational Reduction

- An extra TSR level g between levels h (♩♩♩♩♩) and f (♩♩♩♩♩) was considered useful for the clarification of the harmonization, and was inserted in the TSR analysis. This level is described as ♪♩♩♩♩ and its metrical structure is considered ternary (elided 6/4 and not expanded 4/4).

- The chromatic chord C-E♭-F♯-Ab is frequently used in cadences. Its members belong to the idiomatic chromatic scale of the piece and they are always used as leading tones, bringing the tonic G major chord through semitonal motion: C→B, E♭→D, F♯→G, Ab→G. This chord can either be explained as a chromatically altered vii7 (F♯-Ab-C-E♭) or a phrygian II♭ with an added minor 7th spelled as augmented 6th (Ab-C-E♭-F♯). The latter explanation will be preferred because it provides a uniform cadence type for this piece, stressing its Phrygian quality through the parallelism between the chromatic cadences in b. 7 and 8 with the cadence in b. 14, which does not integrate the use of F♯.

- Fusion occurs at level g in b. 3-4, 7-8 and 13-14, where melodic intervals (thirds) yield verticalities that create linear voice leading at deeper levels. Also, in b. 1 at level e, the fusion of pitches G, B and D yields a G major chord, the structural beginning of the piece.

- At b. 11-12 the melodic phrase A is harmonized differently, with the use of two minor chords in chromatic mediant relationship. These chords are B minor and G♯ minor and emerge in the analysis (TSR level g) after the enharmonic spelling of Ab and Eb as G♯ and D♯. This chromatic mediant relationship (minor chords one minor 3rd apart) is rather infrequent in Constantinidis’s harmonizations (he strongly prefers major chords one minor 3rd apart), but perhaps its use is implied by the chromatic scale used in this piece. In b. 13 the mediant progression concludes with the appearance of the F minor chord, the next downward chord with the same mediant relationship. The overall progression is: B minor - G♯ minor - F minor.

- The G major chord of b. 14 is selected as the structural end of the piece, due to the parallelism with the conclusion of the first part and to the double pedal notes G-D that follow in the lower voices, prolonging the final chord. This choice is based mainly on harmonic criteria, since it allows the ensuing bars to function as coda; however, if the stress was placed on melodic criteria, perhaps the end of bar 16 would be a stronger structural arrival.

- The cadence type of the piece is the progression from Ab major to G major in b. 14. This is a Phrygian cadence, but with a major final chord. Chromatic variations of this cadence are found frequently in the piece, as already mentioned.

- The scale used in this piece does not belong to the set of diatonic modes and consists of the following pitch classes: G-Ab-B-C-D-E♭-F♯-G. The scale has two augmented 2nds between the melodic degrees ♯2–3 and ♩5–7. As is obvious from the TSR, harmonic processing is limited — perhaps due to the chromaticism of the scale — and the accompaniment has an essentially rhythmic rather than harmonic role (this may also be observed in piece nr. XXIV, also in a chromatic mode).
- In b. 11-13 the harmonization escapes from the continuous use of embellished arpeggiations of the tonic chord and introduces — as already mentioned — new triadic chords stemming from the verticalization of the scale: B minor, A♭ minor, F minor (chromatic mediant relationships). The dissonant chord D♭-F-G-B in b. 13, although it has a fermata assigned to it, is considered a right progression (Dep function) of the F minor chord that precedes it. This choice is strengthened by preference for the continuation of the structural melodic line D-C-B (♯5 – 4 – 3) at level e (b. 11-14) as part of the main cadence; the complete closure pattern includes the F minor chord as an elaboration of the cadential A♭ major chord, which functions as Dominant.

- In b. 5-8 the melody is transferred to the left hand; as a result, the dotted slur that describes the prolongational connection of the structural melodic beginning (b. 1) to the onset of phrase A’ (b. 5) at level d, changes stave. At the deeper level c-a of the PR diagram, the melodic pitches of the A’ phrase are transferred to the upper stave.

- The overall structure is a weak prolongation that can be described as:

\[
\begin{align*}
\text{♯5} & \rightarrow \text{4} \rightarrow \text{3} \\
\text{I} & \rightarrow \text{II} \rightarrow \text{I}
\end{align*}
\]

The final chord is a complete triad (includes its 3rd).

- The B minor chord in b. 11 was transferred to level b’ through the interaction principle, although the transfer involves two prolongational levels, because this is the exact point where the main melody reappears. This is considered a special weak right prolongation of the structural beginning (same melodic pitch, different harmony) and it is noted with a black circle in parentheses.

**Research results**

Although both the stylistic and methodological results were produced by the same interactive inductive process, they will be presented separately for clarity.

(24) “Dep” in terms of the prolongational functions theory (see TPS ch. 5, pp. 215-16) denotes departure from a prolongationally superordinate event by a right-branching progression (tension-creating progression). Dep function is used for a wide range of right progressions but not for half cadences to the dominant-functioning event, where D (Dominant) function is preferred.

(25) Interaction Principle (Lerdahl & Jackendoff, 1983, p. 228): The head e, of a prolongational region (e-e) must be chosen from the events in the two most important levels of time-span reduction represented in (e-e). The interaction principle allows a flexible relation between TSR and PR: as a result the main difference between the two reductions is in the way events connect, not in their levels of hierarchical importance (TPS 16-17).
STYLISTIC CHARACTERISTICS
The most important characteristics of Yannis Constantinidis’s processing of original Greek folk tunes, as they emerge from the GTTM analyses of the 44 Greek miniatures and in relation to its four components, are:

**Global feature (relates to all four components)**
- The original folk tune is always preserved, in both its morphological and pitch-interval structure. Constantinidis abstains systematically from any alteration of the original mode, meter, rhythm or formal design.

**Grouping structure**
- The 44 pieces adhere to the morphological types of the original songs and dances, which are mainly one-part forms or simple (binary or ternary) lied forms\(^{(26)}\). Occasionally, a rhythmical intro or a coda is inserted. Upon repetition of the melody, a different harmonization and/or different rhythmical accompaniment pattern is suggested, thus yielding simple variation forms. All thematic or motivic transformation is avoided and no developmental sections are used as extensions to the forms.

**Metrical structure**
- Most pieces have simple meter signatures of 2/4, 3/4 and 4/4, but irregular tactus level metrical structures also appear, described by time signatures as 7/8, 5/8 or 5/4 (see fig. 7 or pieces VII and XL above). As explained by Lerdahl & Jackendoff (GTTM pp. 97-8 citing Singer, 1974)\(^{(27)}\), in such cases MWFR 4 (equally spaced beats at tactus level) must be dropped and metrical asymmetry must be considered a viable deviation (see also special metrical rule in chapter “Methodological Results”).
- The accompaniment rhythmic patterns are developed according to the rhythmic character of the original song or dance. However, quite often these patterns display phase differences with the initial rhythmic structure, creating metrical ambiguities (two conflicting metrical structures). For example, in fig. 7 during the first two bars, the accompaniment is in phase with the melody’s 7/8 (3+2+2) metrical structure; in the next two bars, it acquires a 9/8 (3+3+3) structure, which creates a sense of polymeter. In such cases the metrical structure of the original melody is considered more stable, and functions as a guide for the Time-Span Reduction (TSR).

**TSR and PR - Modal harmonization features**
- The harmonization is consistently modal; namely, references to tonal functions of the dominant-tonic type are avoided, as are chord types that characterize the tonal idiom, like the major chord with minor 7\(^{th}\) or the diminished 7\(^{th}\) chord. Free use of

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\(^{(26)}\) “A group of small-scale forms all of which exhibit balanced musical phraseology, a modulatory scheme and cadential parallelism, within overall closure” (Bent, *Grove Music Online*).

\(^{(27)}\) Singer (1974) analyzed the metrical structure of Macedonian dances using two basic metrical patterns: Q (binary) and S (ternary).
diatonic and chromatic 3-voice and 4-voice tertian chords that stem from the
diatonic modes is employed, as well as frequent use of symmetrical 4-voice chords
(minor triads with minor seventh and major triads with major seventh). There seems
to be no restriction concerning chord inversions, other than their intrinsic stability
scaling. Every possible (non-functional) type of chord progression is permissible,
resulting in an increased ambiguity factor in the choice of the most stable chordal
events for the construction of the TSR and PR trees. Within this framework,
dissonant intervals (mainly 7ths) are neither prepared nor necessarily solved by
downward step. The choice of non-chord notes is also ambiguous, because of the free
use of dissonance. Use of non-tertian sonorities is restricted and mainly confined to
open 5th chords (see fig. 8 as an example for the above harmonization features).

- Parallel voice leading above or below the main melody, is very common and it
results in diatonic or chromatic (real) parallel harmonic motion (harmonic planing).
All types of intervals are used except 2nds, 3rds, 4ths, 5ths, 6ths and 7ths and the chords
formed are mainly major or minor triads (less frequently augmented triads and
almost never diminished chords). Diatonic planing (current mode’s pitches —
variable intervallic content) is more frequently employed than real planing (stable
intervallic content, use of non-mode pitches). A very frequent idiomatic type of

Figure 7.
Piece nr. XXVIII, b. 5-8.
parallel voicing is the chromatic progression of two major thirds having a distance of a minor third between them (chromatic mediant relationship). This phenomenon occurs mainly as chromatic planing, but may also be considered a chord progression, if full triads in root position are employed. In fig. 9 the original melody is harmonized with diatonic parallel $\frac{5}{3}$ chords, while in fig. 10 with chromatic mediant $3^{rd}$ (also note the phase difference of one $8^{th}$-note between melody and harmony in both examples). In TSR parallel voice leading is considered an enhanced melodic motion and melodic rather than harmonic stability conditions are taken into account. Parallel verticalities tend to obscure the harmonic-functional role of harmony and stress its coloristic melodic role.

Figure 9.

Piece nr. XVII, b. 1-5.

Figure 10.

Piece nr. XVII, 5 last bars.

Pedal notes frequently emphasize permanent or temporary modal centers, mainly in the lower voice, but also in the higher or middle voices. In fig. 11 low A underlines the modal center of the bass; however, interestingly, it is placed at weak metrical beats creating a local poly-meter phenomenon.

Forty two of the pieces are based on diatonic modes and only two on chromatic ones. Most diatonic melodies are based on minor tonic (Aeolian, Dorian, Phrygian)
or major tonic (Ionian and Mixolydian) modes. Lydian and Locrian are not used in these pieces. In several instances, the 6th degree of the minor modes or the 7th degree of the major modes are not used in the original melody: thus, modal types are determined by the harmonization. Although pentatonic modes are not used in this collection, on several occasions pentatonic structures are disclosed at deeper TSR levels. Three types of modal regions are also used within global modes: a) relative modal regions (same pitch collection, different modal center), b) parallel modal regions (same tonic, different pitch collection — modal interchange), c) regions with different modal center and different pitch collection. The second and third type create chromaticism. Two parallel modes appear either consecutively (modal interchange-mixture, frequently) or simultaneously (poly-modality, rarely). These phenomena are associated mainly with pitches which are not part of the original melody (for a modal interchange example involving the use of F and F# - A Aeolian or A Dorian, see fig. 8). Bi-modal (or poly-modal) instances may create poly-chords (a rare chordal feature in Constantinidis’s style).

- Diatonic modes normally function as structural background of the harmonic processing; chromatic elements are added at levels closer to the musical surface, but instances of chromaticism exist even at the deepest levels. The diatonic elements stem directly from the modes of the original melodies and their dominant (most stable) pitches. They also appear at cadences and contribute to the clarification of the form. Chromaticism appears as a result of modal interchange or modulation, free use of chromatic chords (e.g. chromatic mediants), chromatic inflections or bimodality.

- A wide range of modal cadence types (notated as [ c ] in the TSR diagrams) is encountered; their diversity refers to the interval distance between the roots of the central chord and the dominant chord (meaning the chord preparing the tonic and carrying a dominant function). The cadences may be modal variations of the perfect of plagal tonal cadences or free modal cadences combining various melodic closure formulas (e.g. 2-1, 7-1, 3-1) and their harmonizations. The chords with dominant function may be diatonic or chromatic, may have a 5th, 3rd or 2nd root relation with the tonic chord (they are not necessarily close through the circle of 5ths to the tonic),
and define a broad category of free structural chords\(^{28}\). Frequently the cadence is of purely linear-melodic nature and the harmonization is also linear-contrapuntal.

- In many of the pieces, non-congruence of the structural beginning and the structural ending occurs; this results in a progression, rather than a prolongation, at the deepest reductional level (PR). As a result, the prolongational basic form\(^{29}\) does not apply in these cases. However, the five-part normative structure\(^{30}\) is always present at the deepest PR level, encompassing the modal cadence variety mentioned above.

- In several pieces, the recapitulation of the a phrase of the original melody in formal types \(aa'ba''\) occurs with a different harmonization, either diatonic or chromatic. In these cases, a special weak prolongation type notated as (•) is considered to apply in combination with the interaction principle for the connection of a and \(a''\), due to the importance of the melody in this idiom (see analysis of piece XXVII).

- Most pieces end at stable open 5\(^{th}\) chords without a 3\(^{rd}\) (see fig. 8 for an example), except for the rare occasions where there are strong tonal characteristics in the harmonization.

Of course, Constantinidis’s style is not entirely original. His harmonic language was definitely influenced by the mainstream European neotonal compositional styles, developed in the first half of the 20\(^{th}\) century. The use of 7\(^{th}\) chords as stable sonorities and parallel voice leading became common practice, after its initiation by French impressionist composers (Debussy, Ravel). Use of modal scale formations (pentatonic or diatonic) and loosening of functional relationships occurred in nearly every European national style, depending on how deeply each style was connected with the use of processed and subsequently transformed traditional modal melodies\(^{31}\).

\(^{28}\) Felix Salzer has used the term Contrapuntal-Structural chords — CS chords — and used them in structural analysis of pre-tonal or post-tonal music, see Salzer 1962: 161.

\(^{29}\) Prolongational Basic Form (see GTTM, p. 189 for a schematic representation) is a model prolongational structure that pertains to a weak prolongation of the basic harmonic element of a piece and encompasses a cadence type (left-branching preparation of the final event).

\(^{30}\) Normative Prolongational Structure (Lerdahl & Jackendoff 1983, p. 234): A cadenced group preferably contains four (five) elements in its prolongational structure: a. a prolongational beginning, b. a prolongational ending, c. a right-branching prolongation as the most important direct elaboration of the prolongational beginning, d. a right-branching progression as the (next) most important direct elaboration of the prolongational beginning, e. a left-branching “subdominant” progression as the most important elaboration of the first element of the cadence.

\(^{31}\) Perhaps the deepest influence for Constantinidis was Bela Bartók’s use of folk material, especially in works such as the latter’s “For children” and “44 violin duos”. However, Constantinidis used a more restricted set of rhythmic and harmonic devices to create his style; then, once he arrived there, he used it consistently and with minor deviation. On the other hand, Bartók continuously enriched his compositional language until he developed a very broad in harmonic and modal devices system, which he used in his free compositions but not in his folk-song harmonizations (see
On the contrary, he was not in the least interested in the techniques frequently used by a number of Greek or European national composers, such as romantic and post-romantic chromatic tonal harmony, motet-type polyphonic processing of Greek folk tunes, or pan-diatonic textures; none of these elements is found in his music.

**Methodological results**

The methodological research results can be categorized as follows:

**a) Addition of new rules**

- The new special rules refer almost exclusively to the structural importance of the original traditional melody in the 44 miniatures. Five new special preference rules have been added for the four components of the theory that favor the choice of pitches, grouping, metrical structure, chords or modes that are part of the original melody. These rules are introduced because: a) the original melodies and their modal structure can be considered *schemata*, deeply rooted in the experienced, mainly native listener’s mind and b) the composer persists in leaving them intact during the harmonization and the elaboration process. The original melody can thus be perceived as a primary auditory stream which interacts with its harmonizations (one or more other auditory streams). Specifically, the new rules are:

**SGPR (Special Grouping Preference Rule):** Prefer, as more stable, the grouping structure of the original melody at the first hierarchical level of grouping in cases where, regarding the original melody and the accompaniment:

- either two different simultaneous grouping structures exist,
- or two simultaneous instances of the same grouping structure exist, but with a difference of phase between them.

**SMPR (Special Metrical Preference Rule):** Prefer as more stable the metrical structure of the original melody in cases where, regarding the original melody and the accompaniment:

- either two different simultaneous metrical structures exist,
- or two simultaneous instances of the same metrical structure exist, but with a difference of phase between them.

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Antokoletz, 1984). In the context of the present research, it would be very difficult to formalize Bartók’s style in relation to GTTM.

(32) *Schema theory* in psychology describes the way humans organize their sensory experience into structured categories. It was introduced by F. Bartlett (*Remembering*, CUP 1932) and revived in the seventies. In the classical Western musical idiom, several *schemata* rooted in the listener’s memory contribute to its cognition, e.g. the sonata or rondo forms or the functional harmonic progression S-D-T.

(33) According to the *Auditory Stream Theory*, introduced by A. Bregman (*Auditory Scene Analysis*, 1990), the cognition of complex sounds is accomplished through a subconscious separation to simpler acoustical streams. The theory was generally accepted and became the basis of many research projects in music psychology [see for example recent work by Huron (2001) or Cambouropoulos (2008)].
a) either two different simultaneous metrical structures exist,
b) or two simultaneous instances of the same metrical structure exist, but with a
difference of phase between them.

**STSRPR 1 (Special Time-Span Reduction Preference Rule 1):** During the reductive
process, prefer the choice of pitches that correspond to the more stable pitches of the
original monophonic melody. Accordingly, prefer the choice of chords that contain
the more stable pitches of the original melody.

**STSRPR 2 (Special Time-Span Reduction Preference Rule 2):** During the reductive
process, prefer the choice of chords that belong to the mode of the original melody.

**SPRPR (Special Prolongational Reduction Preference Rule):** Prefer the prolongational
connection of music events which contain the most stable events of the original
monophonic melody.

- The only new preference rule not related to the structural role of the original
melody refers to the preferred choice of a chord with omitted third at the ending of
a piece.

**STSRPR 3 (Special Time-Span Reduction Preference Rule 3):** Prefer a open-5th chord as
the structural end of a piece.

**b) Modification or expansion of existing rules**
- The special metrical well-formedness rule is an expansion of the original MWFR 4
and allows the existence of variable tactus at certain circumstances.

**SMWFR (Special Metrical Well-Formedness Rule – expansion of MWFR 4):** The tactus
or the immediately larger metrical level may consist of beats unequally spaced, under
the following conditions:
a) If the irregularity occurs at the tactus level (variable tactus phenomenon), then,
at the sub-tactus metrical level, beats must be equally spaced and strong beats (the
ones creating the tactus level) must be spaced either two or three beats apart. If the
irregularity occurs at the hyper-tactus level (immediately larger level), then the tactus
level may be regular or irregular.

(34) Examples for the variable tactus phenomenon in the present context could be the “kalamatianos”
type of 7/8 metrical structure (7 = 3e + 2e + 2e + 2e + 2e + 2e + 2e) referred to in the analysis of piece VII, or the
“karsilamas” type of 9/8 metrical structure (9 = 3e + 2e + 2e + 2e + 2e).
(35) Example for the [irregular hyper-tactus + regular tactus] case: the 5/4 (5 = 2e + 3e = 2e + 2e + 2e + 2e + 2e) tactus
is [] metrical structure of piece XL. Example for the [irregular hyper-tactus + irregular tactus] case: the
hyper-tactus level (3e + 4e = 2e + 2e) in 7/8 (kalamatianos) pieces (e.g. level f in piece VII).
b) Periodicity (equally spaced regular beats) is established at either one or two metrical levels above the tactus level (this is typically the measure level in the score).

- The TSR well-formedness rules 3d and 4 (cadence) and the TSR preference rule 7 (cadential retention) and 7 (cadential retention) of the original theory keep the same formulation but alter their implementation as they refer to the idiomatically expanded modal cadence phenomenon.
- The TSR preference rules 2 (local harmony) and 6b (harmonic progression) apply within the special tonal hierarchy. Specifically, TSRPR 2 refers to the stability of 7th chords and 64 chords, and TSRPR 6b to the relative stability of subordinate chords and modal regions, where diatonic chords and regions are more stable than their chromatic counterparts.
- The special prolongational well-formedness rule is an expansion of the original PRWFR 2 and adds a special type of weak prolongation to the repertory of progression types.

**SPRWFR (Special Prolongational Reduction Well-Formedness Rule – expansion of PRWFR 2):** An event $e_i$ can be a direct elaboration of another event $e_j$ in any of the following ways:

a) $e_i$ is a strong prolongation of $e_j$ if the roots, bass notes, and melodic notes of the two events are identical.

b) $e_i$ is a weak prolongation of $e_j$ if the roots of the two events are identical but the bass and/or melodic notes differ.

c) $e_i$ is a special weak prolongation of $e_j$ if the melodic parts of the two events which correspond to the same morphological part of the processed original melody, are identical but the bass and/or melodic notes differ.

d) $e_i$ is a progression to or from $e_j$ if the harmonic roots of the two events are different.

- The special stability condition of prolongational connection is a modification of the fourth original stability condition, allowing the separation between the harmonic-functional and the melodic-linear progressions.36

**SPSC (Special Prolongational Stability Condition – modification of the original fourth harmonic-condition):**

a) [Distance] A connection between two events is harmonically more stable if their roots are closer on the circle of fifths. An exception refers to the connection of chords

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36 This stability condition relates closely to tonal hierarchy issues. See next sub-chapter for discussion on this topic (last paragraph on ambiguity, stability conditions and TPS calculations).
with mediant relationship, especially major third sonorities with a minor third distance between them, which is considered relatively stable.

b) [Direction] A progression that ascends along the circle of fifths is most stable as a right-branching structure; one that descends along the circle of fifths or produces a subdominant-to-dominant relationship is most stable as a left-branching structure.

c) [Planing] When the connected chords are a result of harmonic planing (addition of fixed intervals above or below an initial melodic line), then their prolongational connection is more stable if the interval between the initial melodic events is smaller. An ascending initial melodic progression is most stable as a right-branching structure; a descending one is most stable as a left-branching structure.

- The PR preference rule 6 (normative prolongational structure) applies as in the original theory, but its second element (prolongational ending) refers to the expanded modal cadence phenomenon.

c) Special tonal hierarchy

a) A modified scaling of stability between the types of chords and their inversions is established, resulting in the increased stability of traditionally dissonant chords. Specifically, the two classifications of decreasing intrinsic stability:

\[
\text{[2-voice open-5th chord} \rightarrow \text{3-voice triad} \rightarrow \text{4-voice 7th chord]} \land
\text{[triad in root position} \rightarrow \text{triad in first inversion} \rightarrow \text{triad in second inversion]}
\]

still apply but their distances in Pitch Space — which can actually be calculated with the use of TPS theory — do not create such exclusive categories in the context of the specific modal idiom, as they would have in the classical Western idiom. The concept of dissonance and its effect is somewhat mitigated and less restricted in its use, so that relatively dissonant chords, such as 2nd inversion triads or 7ths (mainly the symmetrically constructed minor triads with m7 and major triads with M7) can be used as stable structural chords at middle or even deeper levels and can also be subjected to prolongation. However, distinctions still apply, and more stable sonorities (such as open-5ths) are preferred at deeper levels and cadences. The classification may be undoubtedly expanded to other types of more dissonant chords, not so prominent in the examined style. The classification of sonorities by intrinsic dissonance has been the core of a number of compositional systems in the 20th century, among which Hindemith’s harmonic system stands out (many of his pieces end with open-5th chords). Also, the considerable research conducted in psychoacoustics and music

(37) This is analogous to the melodic stability condition. The affinity is justified by the fact that planing does not actually harmonize, but rather reinforces and colorizes the initial melody. In Schenkerian Analysis such cases are called linear progressions (or linear intervallic patterns if they involve melodic-harmonic sequences).
cognition sciences on that issue has yielded successful models (e.g. Terhardt, 1974; Parn Curt, 1989; Temperley 2001). The use of these models in the present analyses could optimally clarify the proposed hierarchy.

b) Chord connections are classified into harmonic and melodic types, depending on the existence (harmonic type) or absence (melodic type) of a functional relationship between the connected chords. The stability of a harmonic progression is determined mainly by the distance of the chords’ roots in the circle of fifths, and that of a melodic progression mainly by the linearity of melodic motion. The breadth of cadence types can be examined within this framework. Parallel voice leading creates melodic-type chord connections, which can be either diatonic or chromatic, with the diatonic parallel chords considered more stable. The most common chromatic device is major 3rd moving by a minor 3rd.

c) Subordinate chords are classified into diatonic and chromatic, depending on whether they can be formed from the pitches of the original mode (diatonic) or not (chromatic). The diatonic type is considered more stable than the chromatic.

d) Subordinate modal regions are classified into three types according to the presence or absence of common tonal center and common key signature, with the region’s stability depending on its pitch space distance from the original mode (measured in steps of the circle of fifths and key signature collections). Regions with common key signature and different center are considered more stable than regions with same center and different key signature; regions with different center and key signature are the least stable. The transition to the three modal region types is considered a diatonic modal transposition, a modal interchange or a chromatic modal transposition respectively.

e) The choice of the most stable pitch, chord, or modal region at all levels of the reductional process is more ambiguous in this special (modal) tonal hierarchy, due to the loosening of the functional relationships, the free use of 7ths as relatively stable intervals, the difficulty in discriminating between chordal and non-chordal tones and the obscurity of tonal centers. So, in this context, preference rules not related to harmony and tonal hierarchy, such as metrical position, parallelism, prolongational stability, cadential retention, etc., gain relative weight for the TSR.

The use of calculations according to Tonal Pitch Space (Lerdahl, 2001) or Modal Pitch Space (Tsougras, 2003) can also clarify certain aspects of this special tonal hierarchy by providing stability conditions (in the form of simple integer numbers) for chord connections, subordinate chord or modal regions proximity, and attraction

(38) According to pitch space calculations (see Tonal Pitch Space theory, ch. 2 and 6), mediant chromatic chords of this type (e.g. C major → A major) have a relatively large distance if calculated as chromatic chords in the diatonic space. However, when calculated as members of the hexatonic space, their distance is considerably smaller and perhaps their perceived affinity in Constantinidis’s modal idiom is an instance of hypermodulation from diatonic to hexatonic space.
values for linear progressions and linear cadences. The same applies for the new preference rules such as the Tonic Finding Rule and the Sensory Consonance Rule, introduced by the Tonal Pitch Space Theory, or for other preference rules’ systems or algorithms (e.g., Temperley, 2001). However, such a task was not pursued in this research due to the amount of calculations that would be needed for such a large analytical corpus. In this context, the intuitive approach of weighing the preference rules with the insight of an experienced listener/analyst was preferred, in place of a computational (TPS) approach. Moreover, we deem that, although TPS calculations may indeed illuminate ambiguous situations or provide the analyst with directions, enlightenment, even argumentation, ambiguity can not be completely dispelled in this modal idiom, due to the complexity of the conflicting harmonic-melodic issues. Therefore, explicitness in the choice of the strongest preference rule is very hard to obtain.

CONCLUSIONS-DISCUSSION

After the addition of the new special rules and the replacement of the modified ones with their expanded versions, the modified-expanded form of the theory is considered usable in the analysis of music belonging to the specific modal musical idiom. Far from leading to an impasse, the initial hypothesis that certain rules of the musical grammar are universal, which functioned as a starting point for the methodological research branch, became a foundation of a formal adaptation and expansion of the original theory. All of the rules and stability conditions that were modified, adhere to the category of idiom-specific rules of the original theory, so that, at least within the present research, there emerges no need to question the validity of the universal rules.

Two topics arise for discussion in this context: the concept of reductional-prolongational analysis in modal music and the concept of ambiguity. Although the implementation of prolongational analysis to post-tonal or atonal music is considered dubious (e.g., Beach, 1985; Baker, 1983; Straus, 1987), its application to modal music is considered viable (e.g., see Salzer, 1962; Stern, 1981; Novack, 1983; Dunsby & Whitall, 1988, pp. 59-61; Stock, 1993) and is mainly conducted through the strengthening of the prolongation concept and the weakening of the fundamental structure concept. The GTTM’s flexibility and the substitution of the a priori

(39) Pitch Space calculations in a similar context were used in Tsougras 2009 (GTTM analysis of chromatic modal music by Debussy, Bartók and Messiaen), but the analyzed material was mainly short excerpts instead of complete works.
(40) Stock (1993, p. 236) concludes that: “The above examples suggest that Schenkerian-format reductive analysis should be an attractive tool for the ethnomusicologist working on reiterative, variation-form music or on repertories based on a common melodic stock”.

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fundamental structure (Ursatz) with the tonally unspecialized and cognitively based normative structure, enable its extensive use beyond its initial analytical range. Another recent enhancement to the theory towards this direction (Tonal Pitch Space 2001: chapter 5) is the expansion of the three basic prolongational types of the original theory (strong prolongation, weak prolongation, progression) to seven general prolongational functions (tonic, dominant, subdominant, departure, return, neighboring, passing) that can be used in different pitch organization contexts and in various idioms, enhancing the theory’s descriptive potential in relation to prolongational structures.

Ambiguity is a major issue in the analysis of modal music (and neotonal music in general, see Williams 1997, p. 230) and perhaps sets limits to what formal analytical theories may accomplish in this context. Of course, ambiguity is a prominent aspect of music because, apart from the importance of grammaticality (i.e., correctness and clarity), diversity in understanding (cognition) of a work among listeners is also significant. In the spirit of David Epstein (1979, ch. 3), William Thomson (1983, p. 3) even considered it a functional aspect: “When a music event projects equivocation, implying no clear syntactic meaning or two or more potential meanings, I call this an instance of functional ambiguity”. It goes without saying that all ambiguous interpretations have to conform to all well-formedness rules, as well as to a number of preference rules pertaining to grammaticality; nevertheless, the significance and relative weight of preference rules in relation to the musical context is defined by the analyst. Within this context, the analyst must rely on personal experience and intuition, in order to complete the analysis by arriving at one “preferred” structure; this is undoubtedly an act of mental subjective interpretation. However, the preference rule approach, proposed by the original GTTM, enhanced by Lerdahl in Tonal Pitch Space (2001) and expanded by Temperley’s Preference Rules System (2001, see ch. 8 on Diachronic and Synchronic Ambiguity) resolves this issue viably, since not only does it provide the tools to clarify ambiguities and even numerically describe each case, but it also leaves room for the analyst to approach the nature of the work based on artistic insight.

There are undoubtedly reservations with regard to generalization of the present results so as to legitimize use of the GTTM — as expanded in the present research — for the analysis of every type of modal music. Due to the special nature of the work studied, which is based mainly on unaltered traditional Greek melodies and contains minimal thematic-motivic development, some aspects of the expanded theory have limited validity outside the context of the specific compositional style; more specifically, this limited validity pertains to the new preference rules SGPR, SMPR, STSRPR 1, 2, 3 (preference rules for the increased stability of the elements

(41) According to Violi & Steiner (1986, p. 23), an ambiguous sentence is one “to which there is assigned more than one structural analysis at the grammatical level of analysis”.
of the traditional tunes and for a final chord without third) and the modified prolongational well-formedness rule SPRWFR (addition of the special type of weak prolongation). It is maintained that all other special rules, especially the stability conditions that stem from the special tonal hierarchy, apply to the analysis of a considerable part of 20th century modal music, even if certain adjustments are needed; the multiplicity of the modality concept in 20th century does not allow any further expansion. However, to substantiate the validity of this claim would require extensive analytic research.

Finally, apart from emphasizing the importance of stylistic features in music analysis through the “experienced listener” principle, one of the aims of this research is to demonstrate that GTTM can successfully be used as a powerful analytical tool and as a flexible and adaptable alternative to the current reductional analytical methodologies.

**Notes**

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Part of the analysis was conducted during my research at Columbia University as a visiting scholar for the 2000 spring semester. I would like to thank Dr. Fred Lerdahl for his help and advice during the development of these ideas.
• References


The application of GTTM on 20th century modal music

COSTAS TSOUGRAS


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• La aplicación de la GTTM a música modal del siglo XX:
  Investigación basada en el análisis de 44 miniaturas griegas para piano
  de Yannis Constantinidis

Este texto examina la adaptación y la expansión de la Teoría Generativa de la Música Tonal de Lerdahl y Jackendoff para que pueda ser aplicada al análisis de música modal del siglo XX. Basándose en la premisa de que una parte considerable de las reglas de la teoría son universales —es decir, que los principios de percepción musical y cognición son los mismos para todos los oyentes experimentados, independientemente del idioma musical en el que tienen experiencia—, la aplicación de la GTTM a idiomas musicales diferentes al de la música clásica occidental requiere la formulación de reglas de corrección gramatical y de preferencia específicas de idioma, y la descripción de la jerarquía tonal especial. Estas tareas pueden ser logradas mediante el estudio analítico de una cantidad considerable de música, que representa un cierto idioma y la descripción de sus rasgos, en relación con las cuatro partes de la metodología GTTM. El objeto analítico escogido —44 miniaturas griegas para piano— es representativo del idioma musical derivado de la amalgama de música griega modal y de técnicas de armonización del siglo XX, distintivas del estilo musical del compositor griego Yannis Constantinidis. Se utilizó un proceso inductivo metodológico para el análisis individual y comparativo de las 44 piezas. Este artículo incluye tres ejemplos completos de análisis GTTM de las 44 piezas de piano, un sumario de las características estilísticas de la música analizada, y la formulación de las reglas especiales de corrección gramatical y de preferencia, introducidas como nuevas reglas a la teoría o adaptaciones de las existentes.

• Applicazione della Teoria Generativa della Musica Tonale (GTTM)
  alla musica modale del Ventesimo secolo: ricerca basata sull’analisi
delle “44 miniature greche per pianoforte” di Yannis Constantinidis

Questo saggio analizza l’adattamento e l’espansione della Teoria Generativa della Musica Tonal di Lerdahl e Jackendoff in modo da renderla applicabile all’analisi della musica modale del Ventesimo secolo. Basandosi sulla premessa che una parte considerevole delle regole teoriche è universale — e cioè che i principi della percezione e della cognizione della musica sono gli stessi per qualsiasi ascoltatore indipendentemente dal linguaggio musicale di cui hanno esperienza —, l’applicazione della GTTM a linguaggi musicali diversi da quelli classici occidentali richiede una formulazione di regole strutturate ben formate con un loro linguaggio specifico, e una descrizione della specifica gerarchia tonale. Questi obiettivi possono essere raggiunti attraverso lo studio analittico di una grande quantità di musica che rappresenti un certo linguaggio e la descrizione delle sue caratteristiche in rapporto alle quattro componenti della metodologia GTTM. L’oggetto dell’analisi selezionato — le “44 miniature greche per pianoforte” — è rappresentativo del linguaggio musicale derivante dall’amalgama della musica modale greca e delle tecniche di armonizzazione del Ventesimo secolo, tipico dello stile musicale del compositore
The application of GTTM on 20th century modal music
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greco Yannis Constantinidis. E’ stato intrapreso un percorso metodologico introduttivo per l’analisi individuale e comparata di tutti e 44 i pezzi. Questo saggio comprende l’analisi di tre esempi completi di GTTM dai 44 pezzi per pianoforte, una sintesi delle caratteristiche stilistiche della musica analizzata, e la formulazione delle regole ben formate e strutturate presentate sia come regole nuove di questa teoria sia come un adattamento delle regole già esistenti.

• L’application de la théorie générative de la musique tonale (GTTM) sur la musique modale du 20e siècle : recherche basée sur l’analyse des «44 pièces enfantines pour piano» de Yannis Constantinidis

Cet article étudie l’adaptation et le développement de la théorie générative de la musique tonale de Lerdahl et Jackendoff en vue de son application à l’analyse de la musique modale du 20e siècle. Partant du postulat qu’une part importante des règles de la théorie sont universelles — ceci voulant dire que les principes de la perception musicale et de la connaissance sont les mêmes pour tous les auditeurs expérimentés, quel que soit leur langage musical habituel — l’application de la GTTM à des langages musicaux autres que la musique classique occidentale requiert la formulation de règles de «bonne formation» et de préférence, spécifiques au langage, ainsi que la description de la hiérarchie tonale particulière. Ces tâches peuvent être accomplies au travers de l’étude analytique d’une quantité considérable de musique, représentant un langage donné et la description de ses caractéristiques, en relation avec les quatre parties de la méthodologie GTTM. L’objet d’analyse choisi — les «44 pièces enfantines pour piano» — est représentatif du langage musical dérivé de l’amalgame de la musique modale grecque et des techniques d’harmonisation du 20e siècle, amalgame caractéristique du style musical du compositeur grec Yannis Constantinidis. Un processus méthodologique inductif a été utilisé pour l’analyse individuelle et comparative de l’ensemble des 44 pièces. Cet article contient trois exemples complets de l’analyse par GTTM des 44 pièces enfantines, un résumé des caractéristiques stylisées de la musique analysée, et la formulation des règles spécifiques « bien formées » et des règles de préférence, présentées soit comme de nouvelles règles pour la théorie soit comme des adaptations des règles existantes.

• Die Anwendung der GTTM auf modale Musik des 20. Jahrhunderts: Forschung basierend auf der Analyse von Yannis Constantinidis „44 Greek miniatures for piano“

Dieser Aufsatz untersucht die mögliche Adaptation und Erweiterung von Lerdahls & Jackendoffs Generative Theorie der Tonalen Musik auf die Analyse von modaler Musik des 20. Jh. Vorausgesetzt, dass ein großer Teil der theoretischen Regeln universal sind, das bedeutet, dass die Prinzipien der Musikwahrnehmung und -verarbeitung die gleichen sind für alle erfahrenen Hörer, ganz gleich welches musikalische Idiom sie erfahren haben, erfordert die Anwendung der GTTM für