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Research Article

Examination of Ulvi Cemal Erkin's Piano Concerto with GTTM[1]

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Abstract

In the first half of the 20th-century, our composers, who mix the usûl, scale and variety structures of Turkish makam music sound materials with Western music sound system and harmony techniques, form, resorted to scale-based approaches. It is consider that Erkin was composed Piano Concerto in these approachs. However, in the common practice of the sonata allegro or the rondo form in the classical period, there is a systematic plan in the harmonic progression. The aim of this study is to examine Ulvi Cemal Erkin's style of harmony through the example of the Piano Concerto. In this context, it will be tried to determine the harmonic path, the tension-relaxtion regions and points in the melodic and the harmonic progression that the composer constructed in this work. Our main concern will be the tonal/modal construct that Erkin establishes while handling these forms. Our sub-problem is to investigate whether there is a systematic relationship between sections in Erkin's Piano Concerto in the context of tonal/modal constructs. Specifically, we will examine whether Erkin adhered to the harmonic progressions commonly used in the Classical period while handling the sonata allegro and rondo forms. If not, we will try to find the tonal/modal setups he employed. In this study, answers will be sought to the questions of what are the qualities of the scales as the sound material used. This study was employed a literature review and musical analysis method. A Generative Theory of Tonal Music (GTTM) was used as a musical analysis method. The literature review was carried out in theses, articles, reviews, and biographical publications on Erkin's works and The Piano Concerto, as well as papers, articles, and theses on GTTM. As a result of the study, harmonic progression that we defined in global regions in the Erkin's Piano Concerto coincide with strong prolongation and weak prolongation patterns, except for two regions and repetitions of regions. In this direction, we consider that while composing this work, Erkin adhered to the tonal harmonic progression, and composing the first part of the work in the form of sonata allegro form and the fourth part in the rondo-chain form. However, a specific harmonic construct was designed in both sections. In this dissertation, it has been observed that Erkin used tetratonic, pentatonic and heptatonic scales, which are sound materials used in Turkish makam music and Western music in the 20th century. In our dissertation, four rule proposals and one rule revision were made for GTTM in the context of the Erkin's Piano Concerto.

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Introduction

In 20th-century, Western music tradition was different than in previous generation. While composing tonal music continued, some composer have created and used new harmonic ideas, techniques in terms of their guide such as atonality, polytonality, neotonality and twelve-tone methods. "It was a time of competig styles, from impressionism and expressionism to neoclassicism, minimalism, and neo-Romanticism..." (Burkholder et al., 2010, p. 771). After World

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War I, Nationalism was effective in culture, politics, the arts, so in music. Composers were expected to compose about their national identity and drew on regional traditionals. Under the influence of Nationalism, composer had elements exhibited their own cultural traditions. They synthesized "a personal style from the diverse mix of national and foreign influences and of old and new music that surrounded them" (Burkholder et al., 2010, p. 786).

The first generation of composers in our country realized their works under the influence of the education they received abroad, the Modernism movement and Turkish music. In this context, it is observed that our composers reinterpreted tonality under the influence of Impressionism and neo-classicism in their early works. We can say that *"Rey and Erkin, who studied in France, were closer to the Impressionist movement, while Akses and Saygun were under the influence of neo-classicism"* (Çöloğlu, 2005, p. 16). In the first half of the 20th-century, our composers, who blended the *usûl*, scale and variety structures of Turkish *makam* music sound materials with Western music sound system and harmony techniques, resorted to scale-based approaches. In the production of the Turkish Five, the avoidance of tonality and functional harmony, as well as an element such as a chord or pitch that characterizes the center and a scale approach that ensures centrality, make themselves felt (Çöloğlu, 2005, p. 33).

About the works of Erkin, who was a member of Turkish Five, such as String Quartet, Piano Concerto, First and Second Symphony and Violin Concerto were published in the domestic and foreign press (Çalgan, 1992). The common point of these opinions is that Erkin was influenced by the French and Impressionist movements, combined the rhythms of Turkish *Makam* Music and folk dances (*Horon*, *Zeybek*, etc.), included *taksim*, and used Anatolian melodies with an individual understanding of modality. According to these foreign and domestic critics, Erkin mixed his vocal material with Western music forms and imitated the timbres of folk music instruments (especially the Black Sea *kemençe*) in the orchestration.

While Erkin dealt with Western music forms, especially in his large-form works such as concertos and symphonies, he adhered to the form elements of the Classical period by applying a plan in which he included a sonata allegro in the first movement, influenced by Western music, an adagio section in the second movement, influenced by traditional Turkish music with a mystical atmosphere, a scherzo in the third movement, influenced by folk dance rhythms especially from the Black Sea region, and a rondo form in the fourth movement (Aydın, 2003; Çalgan, 1992). His Piano Concerto (1943) is among the works in which he exhibited these form elements.

There are opinions on the form, orchestration and sound material of the work in magazines, national and local newspapers, books, articles and theses about this work. The common point of these opinions is that the composer "did not depart from the classical [Western music] style" and "adhered to national values" (N., 20 February 1950, Cumhuriyet Newspaper, p. 3), "making extensive use of our folk and art music" (Çiçekoğlu, 31 May 1950, Akşam Newspaper), "incorporating the richness of our folk music" and becoming original by filtering Western and Turkish music through his own filter (22 February 1950, Akşam Newspaper), and "a work that is faithful to the elements of classical form but melodically and rhythmically enriched with elements of folk music" (23 October 1966, Yeni Newspaper).

Common oppinions about form of the work are that first movement is the sonata allegro form, the second movement is the lied form (ABA), the third movement is the trio form, the last movement is the rondo form (ABACA) (Çalgan, 1992; Sayın, 2018). According to Çınar (2015) key of the firts movement is Re minor. It is consider that affect of *makam* music is perceived in the second movement (Çınar, 2015). It is thought to be "not quite *[S]aba* [*makam*], but very resembling of *[S]aba*" (Çalgan, 1992). Karadeniz consider that the second movement isn't Saba maqam, and is not only resembling of scale of *Hüzzam makam* but also close to sound elements of the tradational *Çargâh makam* (Karadeniz, 2019, pp. 174-179).

GTTM will be used as a musical analysis method. GTTM is a theory that aims to describe the listener's musical intuition, to reflect and analyze certain aspects of the tonal music. One of the functions of this theory is 'the study of prolongation processes and deep structures in a piece of music'. In this context, in addition to the listener's cognitive intuition, one can get an idea about a piece of music. GTTM is a method used to analyze deep-root structures or

prolongation processes in Western music composed in the 20th-century as well as in tonal music. In this context, Lerdahl and Tsougras extended the conditions and principles of GTTM.

GTTM was first introduced in 1977 (Lerdahl & Jackendoff, 1977). Then, the theoretical content was explained in 1980 (Jackendoff & Lerdahl, 1980). The grouping structure, the *formal theory* and connection with the *Gestalt psychology* approach of GTTM were discussed in 1981. (Lerdahl & Jackendoff, 1981a). The metric structure of GTTM and the basic metrical concepts in music were explained in 1981, as well (Lerdahl & Jackendoff, 1981b). The time-span reduction of GTTM and relationship some part of phonological theory to GTTM was explained in 1982 (Lerdahl & Jackendoff, 1982). All of these studies came together in the book *A Generative Theory of Tonal Music* in 1983.

Lerdahl adapted the rules of GTTM to atonal music (Lerdahl, 1989). Lerdahl proposed the 'salience conditions' instead of stability conditions. For this purpose, Lerdahl proposed the preference rules for the prolongational importance. Lerdahl focused on the pitch events instead of the chord events in this study. In this case, there was a problem that how dissonance pitches were eleminate among the pitch events. Lerdahl analysed Schonberg's Op. 19, No. 6 and Op. 11, No. 1 in this study. Lerdahl concluded that GTTM wasn't useful for 12-tone music, but that GTTM would be useful for 20th-century music combining tonal and atonal elements and for some of Bartok's work "with a stable conditions variety" (Lerdahl, 1989, p. 84).

Deliège conducted two experiments on two groups of musicians and two groups of non-musicians, in which he tested the grouping structure rules of GTTM with proximity and changing features in terms of musical sense. The experiment focussed on the following problems: Does the grouping structure segmentation by subjects respond to the predictions of the grouping structure rules in all cases? Does the listeners' categorisation of groups coincide with the grouping structure rules? Do the segmentations determined by musician or non-musician subjects correspond to all aspects predicted by the GTTM grouping structure rules? Do the structure group rules correspond to perceptual incongruence (salience)? In the first experiment, the works played were selected from a wide repertoire ranging from Bach to Stravinsky. In the second experiment, "simple melodic sequences", which are contradictory in terms of proximity and change, were played. The results obtained confirmed and confirmed the rules of GTTM (Deliège, 1987).

Dibben discusses the cognitive reality of hierarchic structures through the analysis of time-reduction, which represents the hierarchic structure that the listener infer from the musical surface. Dibben carries out his analysis with three experiments on tonal and atonal music. In the first experiment, three time-span reduced pieces were played to 28 subjects by changing a chord at the reduction level. The subjects were 26 students from City University Music Department and 2 music instructors. The replaced chord was replaced by a chord of hierarchically secondary hierarchic importance that was reduced on the musical surface. For each piece, a reduction passage with one reduction and 5 incorrect chords was played for comparison. The pieces played to the subjects were Handel's Piano Suite No. 1 in G Major (bars 1-8), Brahms' B Minor op. 119 Intermezzo No. 2 (bars 1-16) and Haydn Variations (bars 1-10). In the second experiment, 22 university students were selected as subjects. The same pieces, passages and reduction passages from the first experiment were played. In the third experiment, 27 subjects were used. The subjects were played Schoenberg's op. 11 no. 3 (bars 1-10) and op. 19 no. 2 (track 4) were played. In these atonal pieces, there is a lack of a benchmark to determine the hierarchy and to evaluate the stability between movements. Listeners were able to form a hierarchical representation of musical passages in tonal pieces. According to the results of the experiments, while the tonal system is heard by a listener in the context of strict hierarchical conditions, there is no such hierarchical situation for atonal music (Dibben, 1994).

There is a hierarchic priority in the application of rules in GTTM. Firstly, structure grouping and metric structure should be determined independently. Then, time-span reduction rules are applied according to the result obtained from these two components. Extension reduction rules are applied according to the data obtained from the time-span reduction component. According to Frankland, there are preference rules in the first two components that damage this hierarchical structure: Structure grouping preference rule 7 (stability in terms of time-span and extension) and metric structure preference rule 9 (time-span interaction). Frankland also criticises some rules for the 'circularity' of the theory: time-span reduction preference rules 5 (metric stability) and 6 (extension stability), extension reduction preference rule

1. According to Frankland, Lerdahl and Jackendoff are aware of this ambiguity. However, they attribute the ambiguity to "lack of knowledge" (Frankland, 1998, pp. 72–73).

According to Frankland, due to the hierarchical structure of the theory, "any grouping boundary at a higher level must also be a grouping boundary at the lowest level...units at the lowest level are the fundamental building blocks of later structures, and these units are delineated by very simple rules that pertain to the surface structure." (Frankland, 1998, p. 73). In response to this problem, Frankland has determined quantitative values for the second and third grouping rules. In order to measure the values he determined, he conducted an auditory melody segmentation experiment with forty-one female and sixty-one female subjects from the departments of music and psychology. In this way, he tried to measure the validity of the quantitative values given to the rules. Frankland concluded that GTTM can partially predict melody segmentation and that the application of the grouping structure preference rules 4 and 6 can be improved and extended with the additions he developed (Frankland, 1998).

Frankland and Cohen, aimed to test the grouping structure rules of GTTM related to the es (GPR 2a), movement point (GPR 2b), register (GPR 3a) and length (GPR 3d) conditions. Two experiments were conducted in the study. In the first experiment, listeners with different types of musical training were played two familiar children's song melodies and one unfamiliar tonal melody, each played three times. Listeners indicated the location of the boundaries between the units by pressing a key during each listening. The second experiment involved a change of the stimuli of the first experiment. The melody of a familiar and unfamiliar children's song and a tonal melody from the classical Western music repertoire were played. The results generally favoured some aspects of the GTTM, while indicating that some modifications might be beneficial. According to Frankland and Cohen, the rest and slur conditions should not be combined into a single rule as in GPR 2a. While slur is concerned with the span between notes, rest is concerned with the absence of any sound in the position that can be created by any note, for a duration similar to that of the notes. It seems appropriate to combine the slur condition with the articulatory alternation rule (GPR 3c), which includes staccato and legato. This point of view is consistent with Deliège's (1987) observation that for es it is a party-specific element, whereas for ligature it is an element of performance. In addition, it was suggested that the attack point and length condition could be combined in a rule and evaluated under the same conditions. As a result of these two experiments, the grouping structure rules of the GTTM have some predictive validity (Frankland & Cohen, 2004).

Hjortkjær conducted two experiments to investigate the hierarchical perception of tonal and atonal melodies. The hierarchical structure of tonal melodies was inspired by GTTM. The experiments were designed to quantitatively evaluate different aspects of time-span reduction in GTTM. The experiments used what the author calls "original" long and unfamiliar short tonal melodies. These were pairs of melodies in the form structure AA, BB or AB, BA. In the experiment with tonal melodies, the detection rate of melodic deviations was found to be strongly related to the level of the time-span. Then atonal and poorly constructed tonal melodies were played. The subjects' detection rates were not low for the poorly constructed tonal melody, but they were low for the atonal melody. In general, "the correlation of responses with reductional level was found to be much stronger than with alternative musical parameters that could be thought to influence detection rate, such as metrical position." Quantitative measurements of detected hierarchical levels have been found in experiments to be subject to variations not normally anticipated by music analysis (Hjortkjær, 2009).

The first movement of Hindemith's flute and piano sonata Ordonana and Laucirica was played to the performers/performers and they were asked to determine the group boundaries with the grouping structure rules of the GTTM. These performers/performers are students and relatively professional musicians. The reason for choosing this sonata movement is that it is thought having tonal ambiguity in the melody. Three professional musicians and three women were selected as performers or performers from among intermediate level students at the conservatory. The recordings played were commercial recordings of professional musicians. In the study, the selections of both groups were compared. Differences were found in the boundary determinations of the two groups. The reason for the differences in preferences may be due to the skill level, technique and experience of the performers. The determined group boundaries do not contradict the grouping structure rules of GTTM. As a result of the study, the partitions made by professional

and student performers/performers are clearly related to the grouping rules of GTTM. The study concluded that although there were differences in partitioning preferences, the applicability of the GTTM rules was concluded (Ordoñana & Laucirica, 2010).

Hirata, Tojo and Hamanaka conducted a study to measure the similarities in melodies with the theoretically proposed similarities in GTTM and the reliability in listening experience experimentally and by algebraic calculations. In the study, the similarity between the variations in Mozart's Ah vous diraije, maman, K. 265/300e was compared experimentally. Eleven undergraduate students took part as subjects. The study is perceptually important in terms of calculating the exact time-span distance. As a result of the study, it was revealed that the theoretically constructed representation of the time-span branch diagram and their algebraic calculations can support perceptual similarities to some extent (Hirata et al., 2014).

Bigand conducted a study aiming to test the time-span reduction and prolongation reduction components of the GTTM. In his study, four melodies with different rhythmic and melodic organisation but the same important structure were played to musician and non-musician subjects in certain stages. At the end of the experiment, it was concluded that the two reduction components made positive predictions (Bigand, 1990).

Tsougras adapted some rules of GTTM to modal music in 2002 (Tsougras, 2002). Tsougras added some new rules and supplemented the existing rules to rules of GTTM. In this way, Tsougras proposed an analysis approach for the modal music idiom, adding 'specific rules category'. Tsougras consider that although the prolongational analyses in atonal music are considered to be questionable, these analyses are suitable for modal music (Tsougras, 2010).

The thesis studies on Erkin (Altınsoy, 2017; Belce, 2018; Çınar, 2015; Güldoğan, 1999; Kalın, 2019; Sayın, 2018) have identified the form structures of some works and the *makam* elements as sound material. However, they have not discussed the relationship between the tonal/modal plan or the tonic as a center. Our study differs from others by defining the modulation of scales and modal construction as sound material and examining its relationship with musical form. In addition, in the literature, it is seen that the works analyzed in the context of A Generative Theory of Tonal Music (GTTM) are small-form works. This study is the first to apply GTTM to a large-form work such as a concerto.

Problem of Study

The aim of this study is to analysis Ulvi Cemal Erkin's understanding of harmony through the example of his Piano Concerto. In this direction, the harmonic road map constructed by the composer in this work will be tried to be determined, and the tension-relaxation regions and points in the melodic and harmonic progression. In this way, it will be tried to reach the representation of the musical development and harmonic progression in this work. In this context, our sub-problem is as follows:

- Is there a systematic relationship between sections or divisions in Erkin's Piano Concerto in terms of tonal/modal plan or construction?
- What are the qualities of scales and chords as sound materials used in the Erkin's Piano Concerto?

Method

This study was employed a literature review and musical analysis method. *A Generative Theory of Tonal Music* (GTTM) was used as a musical analysis method. The literature review was carried out in theses, articles, reviews, and biographical publications on the Erkin's works and The Piano Concerto, as well as papers, articles, and theses on GTTM. Considering the chord structures, the modes used, tonic and the elements of form, the conditions of GTTM developed by Lerdahl and Tsougras will be used to identify the prolongation processes in the U. C. Erkin's Piano Concerto. Based on the findings obtained from the analysis, it will be attempted to identify the tension-relaxation regions in the work. Set theory method is used to identify the sequence regions.

In this study, it will be analysed of form, harmonic and metric structure of Ulvi Cemal Erkin's Piano Concerto. In this way, it will be tried to determined such factors as tonic regions, cadance events, and key/mode regions. While a scale of a given region is determined, first of all tonic will be determined. After that all of the pitches will be organized from bottom to top according to tonic. It will be evaluated whether or not our identified factors are consistent or sufficient

with GTTM's conditions (stability, hierarchy, etc.) and components (grouping structure, metric structure, etc.) and rules (preference rules, transformational rules, etc.). As GTTM's rules and/or component conditions do not correspond to the condition of the work, we will propose a new rule/rules for GTTM.

In the first part of the study, brief historical information about the Erkin's Piano Concerto and GTTM will be given. Then, the reduction approach in atonal music will be explained; the principles we propose for GTTM in the analysis of the work and the set theory method we use for the identification of the scale regions will be stated. In the rest of the study, the related studies in the field and the findings obtained as a result of the analysis are evaluated. The study complied with research and publication ethics.

Ulvi Cemal Erkin's Piano Concerto

Some opinions were published in the domestic and foreign press about Erkin's works such as String Quartet, Piano Concerto, First and Second Symphony and Violin Concerto (Çalgan, 1992). The common point of these opinions is that Erkin was influenced by the Impressionist movement and French composers, that he combined the rhythms of Turkish *Makam* Music and folk dances (Horon, Zeybek, etc.), included intermediate taxis, and used Anatolian melodies with an original modality. In the eyes of these foreign and domestic critics, Erkin blends his vocal material with Western music forms and imitates the timbres of folk music instruments (especially the Black Sea fiddle) in orchestration. Especially in his large-form works such as concertos and symphonies, he remained faithful to the formal elements of the Classical period by applying a plan in which he included the sonata allegro in the first movement, an adagio section with a mystical atmosphere in the second movement, a scherzo in the third movement influenced by the rhythms of folk dances, especially from the Black Sea region, and a rondo form in the fourth movement. One of the examples of these traces he remained faithful to is his Piano Concerto.

According to Erkin about his Piano Concerto was that it "contains our riches" and that it was "the most successful" work he had written up to that date. The first performance of the work was on March 11, 1943. It was performed by pianist Ferhunde Erkin accompanied by the Riyaset-i Cumhur Philharmonic Orchestra under the direction of Dr. Ernst Praetorius. In 1938, Frenchman Alfret Cortot visited the Ankara State Conservatory and listened to Erkin's String Quartet. After listening to this work, Cortot suggested Erkin to write a piano concerto. Upon this suggestion, Erkin begins to work on the concerto. He completed the Piano Concerto in 1943 for the composition competition organized by the Republican People's Party in 1943. According to Çalgan, the first movement is a sonata allegro and "the second movement is in lied form. In the second movement, alaturka *makam*s are utilized. Although the *makam* that strikes the ear here is not exactly *saba*, it is very reminiscent of *saba*" (Çalgan, 1992, p. 63). Çalgan's opinion on the other sections is as follows:

> "*The third part resembles a Black Sea region melodies. It is not a repetition of any existing melodies; similar melodies of these melodies were created in the composition. In the middle of this part, a clarinet taksim is also placed, giving the piece a special characteristic. The folk dance becomes more and more emotionalise and at its most emotionalised point it is suddenly interrupted and the third part ends... The fourth part is in the form of a rondo. This part is mostly inspired by motives in folk dances. After these continue for a while, the fourth part ends with the introduction at the beginning of the first part.*" (Çalgan, 1992, p. 63).

Another opinion about the work belongs to Halid Fahri Ozansoy:

> "*It is a concerto in the modern school style. Some parts of the piece evoke of the Russian school, and it is a bit choreographic...In the modern school, it is not easy to sense the inspiration of a composer. We have to admit, we had a hard time in this regard. In the last parts of the piece, we remembered our Black Sea region and sensed Romanian music.*" (Ozansoy, 1943, Son Posta Newspaper; cited in Çalgan, 1992, p. 67).

A Generative Theory of Tonal Music (GTTM)

Fred Lerdahl (composer) and Ray Jackendoff (linguist) developed a theory of music in the context of music affected from Gestalt Psychology, Chomskian model of generative grammar and Schenkerian Analysis (Lerdahl & Jackendoff, 1977, 1981b, 1983a). In this theory which is based on the analogy between linguistic and music analysis, Schenkerian

Analysis is an important factor. Questions such as "Does music have a deep structure?" and "Is there a universal existence in music?" influenced the composer in the 1970s. The opinions of Lerdahl and Jackendoff which had begun with a chapter of papers since 1977, concluded with GTTM (1983). This theory was designed in order to understand the mental process behind music cognition (Lerdahl & Jackendoff, 1977, p. 114).

The goals of Lerdahl and Jackendoff with GTTM is to be "formal description of the musical intuitions of a listener who is experienced in a musical idiom." (Lerdahl & Jackendoff, 1983a, p. 1). Beside "the theory seeks to describe an idealized final state of understanding rather than how music is processed in real time." (Lerdahl, 2015, p. 87). Rules of this theory designed for classiccal Western tonal music. One of the goals of this theory is to obtain a particular way of classical Western a tonal music, and to set a systematic model for discussing about of this pieces of music. GTTM seek to "*how adequately it describes musical intuition, what it enables us to say of interest about particular pieces of music, whatit enables us t osay about te nature of tonal music and of music in general, and how well it dovetails with broader issues of cognitive theory.*" (Lerdahl & Jackendoff, 1983, p. 4). With GTTM a, it is sought out "prolongational models and 'deeper structures' in a given piece of music." (Baysal, 2011, p. 9). Reduction approach utilized in GTTM. In this approach a nonchord note such as passing note, appoggiatura and neighbouring note, and a given chord or functional chord which are structurally relatively secondary in importance are eleminated according to stable conditions. Reduction was generated from figure/ground principle of Gestalt Psychology. With reduction approach, it is attempted to reach the shape of the melodic skeletons which work is "*generated*", in other words core structure which relatively important pitches. Tension-resolution region is shown with tree diagram on score in work. Tree diagram or tree notation is utilized to represent to hierarchy among pitch.

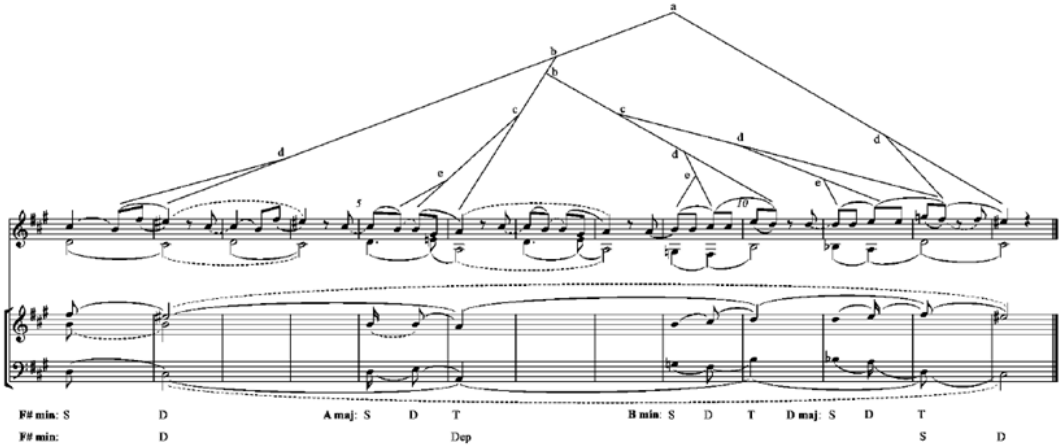

Figure 1. A tree diagram in GTTM. (Lerdhal, 2015, p. 356).

According to GTTM, music which listened is musical surface structure level at score. This level analysis with GTTM's rules. These rules designed hierarchically. This hierarchy can be related to consonance or dissonance in the context of one of the scale, function, chord type and key region. For example tonic is the most important degree in major or minor scale in tonal music. There are three others hierarchic levels. The second hierarchic level is 3rd or 5th degree in diatonic major key. Third level is 4th or 6th or 7th degree. And last hierarchic level in scale is chromatics ones (Knauss, 2011, p. 16). "*The importance of pitchs that make up scale according to a certain tonality is also related to chords formed on these pitchs or relations of the chords with eash other.*" (Nemutlu & Manav, 2011, p. 27). This relationship between some pitches and chords in tonal music creates a hierarchical relationship in the context of evoking a sense of stability, cadence, going somewhere, reaching a certain conclusion. In this way, relative tension is created (Nemutlu & Manav, 2011, p. 28). Krumhansl, Barucha & Kessler (1982) and Bharucha & Krumhansl (1983) was a couple of audio experiments on subject. Topic of these experiments is functional hierarchy among chord of seven degree in major or minor scale in tonal music. According to conclusions of experiments, functional hierarchy is I > V > IV > vi > ii > iii > vii among scale degree (Brewer, 2014, p. 14).

In GTTM, by hierarchy are mean "*an organization composed of discrete elements (or regions), such that one element may subsume or contain other elements. The elements cannot overlap; at any given level they must be adjacent; and the relation of subsuming can continue recursively from level to level. The theory identifies and assigns structure for four types of hierarchical organization.*" (Lerdahl, 1987, p. 137). These organizations are grouping structure, metrical structure, time-span reduction and prolongational reduction.

> "*Grouping structure describes the listener's segmentation of the music into units of various sizes. Metrical structure describes the hierarchy of beats that the listener attributes to the music. Time-span reduction establishes the relative structural importance of events within the heard rhythmic units of a piece. Prolongational reduction (which bears some resemblance to Schenkerian reduction) develops a hierarchy of pitch stability in terms of perceived patterns of tension and relaxation.*" (Lerdahl, 1987, p. 137).

Form of GTTM

A flowchart of GTTM's components

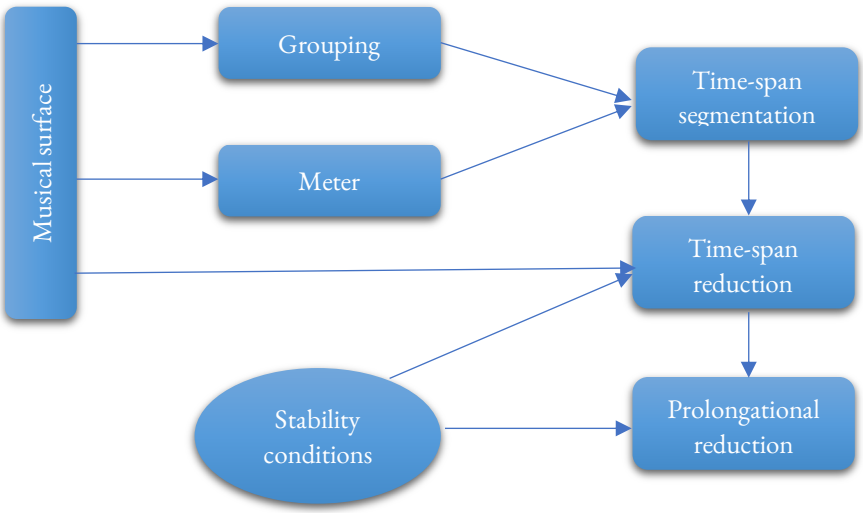

Figure 2. The form of GTTM and its flowchart adapted from Lerdahl (2015:348)

We indicated above that music which listened is musical surface structure level at score in GTTM. This level is the lowest level in context of hierarchy. First of all, musical surface are made segmentation to groups with rules of grouping structure. According to Lerdahl, music has "perceived pitches, chords, and rhythms as its elementary objects" and these objects constitute "psychoacoustic level." (Lerdahl, 2013). But in opinion to Lerdahl "music theory tends to ignore the psychoacoustic level" and these objects "can be referred to as '(pitch) events.' At larger levels, units consist of groupings of events." (Lerdahl, 2013, p. 260). In these group, *head events* are determined among pitch events through stabillty conditions. In two-unit metrical structure which split in two beat, the most stable one of every two events, or in three-unit metrical structure, the most stable one of every three events is determined as head event in the given time span (Figure 3).

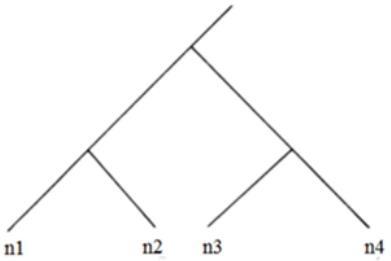

Figure 3. Tree-diagram of head events

This elemination continues in the other reduction level, until reaches event which represent the whole work. This process constitute hierarchic relationship among head events. This relationship is exhibited above the musical surface with tree diagram (or notation) at score. Head events are exhibited below the musical surface level by level on staff (Figure 1).

Musical stability is condution to be on tonic. Stability degree is relation whether a pitch/chord close to tonic or not. Lerdahl seperate stability conditions to four branch: melodic stability, harmonic stability, harmonic progression stability and metric stability. Tho most stable pitch is tonic in melodic stability. Harmonic stability "define the relative stability among possible vetical combination of pitches." (Lerdahl, 1983, p. 296). Harmonic progression stability is "horizontal and vertical dimensions combine such as relatedness by the circle of fifths." (Lerdahl, 1983, p. 296). The most stable function is tonic. Stability of others chords are determined according to their distance from tonic chord on the cicrle of fifths. Downbeat is relatively the most stable condution at bar in metric stability.

According to Lerdahl & Jackendoff, *"generative music theory, unlike a generative linguistic theory, must not only assign structural descriptions to a piece, but must alsı differentiate them along a scale of coherence, weighting them as more or less 'preferred' interpretations."* (Lerdahl & Jackendoff, 1983, s. 9). In this context the rules of theory are divided into three branch: Well-formedness rules, preferences rules and transformational rules. These rules have a strict hierarchical form. Well-formedness rules "specify the possible structural descriptions." These rule type are inspired by the function of recursive sentence structure rules from the generative linguistics approach. Transformational rules "accounting for phenomena (e.g. elisions) conflicting with the well-formedness conditions by describing how an underlying structure can in some cases be transformed into an alternative surface structure." (Hansen, 2011, p. 35). In this way, while analysing conditions that are considered to be relatively non-well-formedness, such as overlapping sentence structures on the musical surface, it aims to transform them into a relatively well-formedness form in the background. Preference rules focus on the best preference among factor determinated by well-formedness rules. Beside they focus on perceiving grouping in acoustic context such as the elements of similarity and proximity in Gestalt pschology. By preference rules "registers particular aspects of presented musical surfaces and selects which well-formed or transformed structures in fact apply to those surfaces." (Lerdahl, 1992, p. 103). Function of preference rules is to select the maximally stable structure. "They define what assignments of structure to a musical surface are perceptually 'good'. Thus thepreference rules in effect constitute an explicit statement of the Law of *Prägnanz* as it applies to musical perception." (Lerdahl & Jackendoff, 1983, p. 304).

By well-formedness rules and preference rules, musical surface is been interpretation. And these rules constitute two major rule systems of the musical grammar. (Lerdahl & Jackendoff, 1981a, p. 86). It is predicted that archetypal patterns in musical structure will emerge through preference rules of the musical grammar[3] proposed in GTTM (Lerdahl ve Jackendoff, 1983, p. 288).

In the grouping structure, musical totality which listener infer from musical surface is segmented. This segmentation is made principle of similarity and proximity. Motive, sentence, period and section which are accepted structural

[3] "The result is a theory formulated in terms of rules of musical grammar. LİIke the rules of linguistic theory, these are not meant to be prescriptions telling the reader how one should hear pieces of music or how music may be organized according to some abstract mathematical schema. Rather, it is evident that a listener perceives music as more than a mere sequence of notes with different pitches and durations; one hears music in organized patterns. Eash rule of musical grammar is intended to eexxpress a generalization about the organization that the listener attributes to the music he hears. The grammar is formulated in such a way as to permit the description of devergent intuitions about the organization of a piece." (Lerdahl & Jackendoff, 1983, p. x).

elements of a given work are accepted as groups of structure. In this way, the form of musical surface and subcomponent of musical phrase can be analysed. So that, work is segmented by hierarchiaclly. Note, motive, phrase and section is gradually degree ascending order in this hierarchy. While this hierarchy is made, relatively big groups are constituted such as phrase at *global level*, by combining small note groups at *local level*. While grouping, it is considered such factors as attack-point, slur/rest, change of register, change of timber, change of articulation, change of dynamics and cadence. Broads of group are shown below of staff with slur. There should be no ocerlapping of groups at the same level, except for the region where occur on the musical surface.

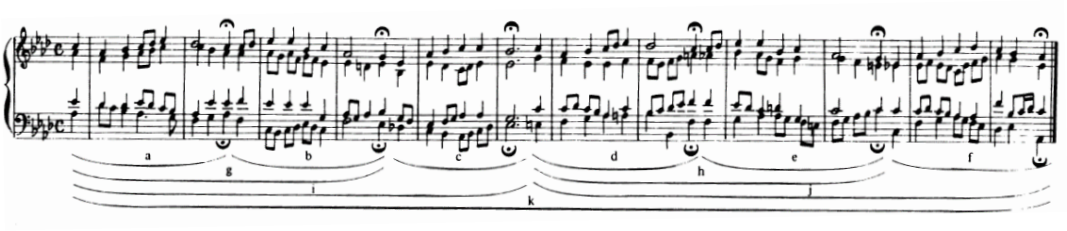

Figure 4. The Grouping Structure (Lerdahl & Jackendoff, 1983b, p. 233).

Metric structure try to predict or identify hierarchically beat pattern corresponding to relatively on strong and weak beats and the intuition in the alternation pattern of these beats. In the metric structure, strong and weak beats are grouped in a bar, time spans in a bar and time spans which are larger than a bar. This is done hierarchically. According to Lerdahl and Jackendoff, "listener instinctively infers a regular pattern of strong and weak beats...for these patterns of beats is *meter*." (Lerdahl & Jackendoff, 1983a, p. 12).

In metric structure, the hierarchy of beats are shown by the amount of dots at each levels, shown vertically in diagram. First level which is close the staff is the lowest level. This level represent *tactus* in work (Figure 4).

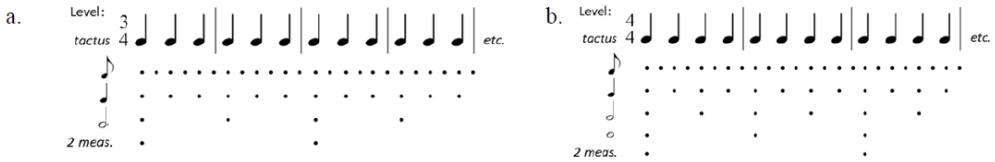

Figure 5. The metric structure levels (Lerdahl & Halle, 2017, p. 5)

The time-span reduction "accommodates the notion that each (small-scale) metrical and (large-scale) grouping segment of a piece is dominated by a particular event." (Harvey, 1985, p. 293). A time-span is a process that starst at a given beat and then continues to the starting point of the next beat. The reduction is applied by datas obtained from grouping structure and metric structure in GTTM. The most important events that are relatively preferred as dominant hierarchically determine in the context of stability. In this way, data is constituted for prolongational reduction by relatively important events been obtained from the relatively complicated musical surface. Beside, a diagram is made which predicts how experienced listener perceives harmonic progression in the context of cognitive of music. Thus, deep structures and archetypal pattern can be obtained from the analysed musical surface. For this purpose, *head events* are determined. The head events are determined by embellishment and non-chord tone eleminate in groups which obtained from grouping structure and metric structure. This process is made according to the principles of the structural hierarchy of importance. For this purpose, the relatively metric or harmonic or melodic consonant event is considered as a head event.

The prolongational reduction represents the global harmonic intuition in a time-span. This reduction is made by the tonal hierarchy approach. Prolongational reduction predicts to reflect a harmonic and/or melodic tension-relaxation pattern, and musical intuition of pitch, hierarchically, on the listener in musical process. In this component, it is considered that there are tension and relaxation points in a given work or piece. Thus, aim is to represent of musical progress and prolongation. "The degree of tension or relaxation between two events depends on the degree of continuity between them" (Lerdahl, 2001, p. 14). For this component, the most important events are determined among datas

which determined by time-span reduction. These events are utilized to form a tree-diagram that relatively represents the work.

Repeating events are prolongation of their first event in the harmonic progression. According to Lerdahl, this approach close to Schenker's approach. In prolongational reduction, the stability of between two events is represented with prolongational tree-diagram (Figure 6). This also represents the way of tension and relaxation. Head events which determined with time-span reduction are utilized for this diagram. This diagram try to represent abstract or 'basic form' of work.

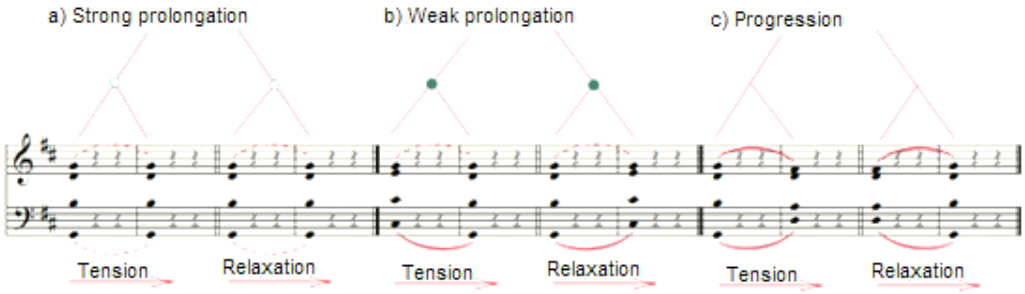

Figure 6. A prolongational reduction tree diagram

While a tree-diagram forms, a special elaboration is utilized with prolongational reduction rules. In prolongational reduction, the reduction is made from global region and the top level to musical surface. There are tree condition at tree-diagram: strong prolongation, weak prolongation and progression. Strong prolongation is the most stable condition and represents repetition and prolongation of bass and melodic treble line (Figure 6a). Strong prolongation is shown with white dot on the joining of branches. Weak prolongation represents repetition or prolongation of bass or melodic treble line (Figure 6b). Weak prolongation is shown with black dot on the joining of branches. Progression represents connection between two different chord sequence. All of the conditions, pitches which tepetition are shown with dashed slur, pitches which not tepetition are shown with slur on diagram (Figure 6). Progression is not stabil.

In the classical Western music, there are not any choice or application that "a phrase or piece begins in utmost tension and proceeds more or less uniformly toward relaxation" (Lerdahl & Jackendoff, 1983a, p. 197) (Figure 7a) or reverse (Figure 7b), or "begins and ends in tension with a relaxed midpoint" (Lerdahl & Jackendoff, 1983a, p. 197) (Figure 7c). "Rather, a tonal phrase or piece almost always begins in relative repose, builds toward tension, and relaxes into a resolving cadence." (Lerdahl & Jackendoff, 1983a, p. 198) (Figure 7d).

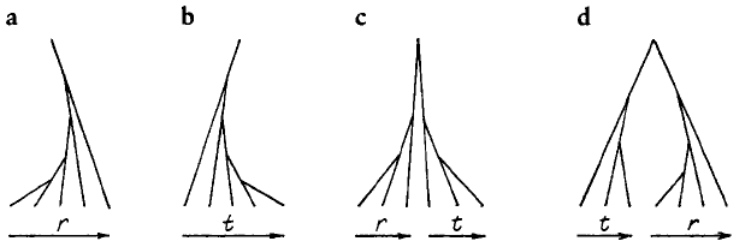

Figure 7. The tension and relaxation tree-diagram conditions

In the last condition above, a shape like 'a diamond' is obtained in the middle of the shape (Figure 8). The most basic form of this condition is called *normative prolongational structure* for the tension and relaxation pattern in tonal music (Figure 9). Normative prolongational structure shows tension-relaxation pattern which ends cadence in a given group. "[T]his pattern is an organizing principle for the listener and thus states it as a PR that influences branching formations." (Lerdahl, 2001, p. 25–26).

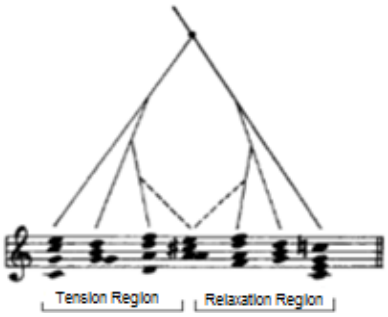

Figure 8. A tension-relaxation tree-diagram (Lerdahl ve Jackendoff, 1983, p. 189)

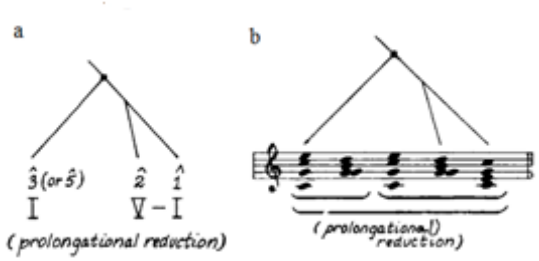

Figure 9. The normative structure (Lerdahl ve Jackendoff, 1983, p. 189)

Reduction

A reduction is to eleminate systemically the relative structural more less important pitches than others, non-chord notes, embellishments etc. on the music score. In this way, an archetype pattern of pitch events which is relatively attributed importance by relevant music theory is obtained in analysed work.

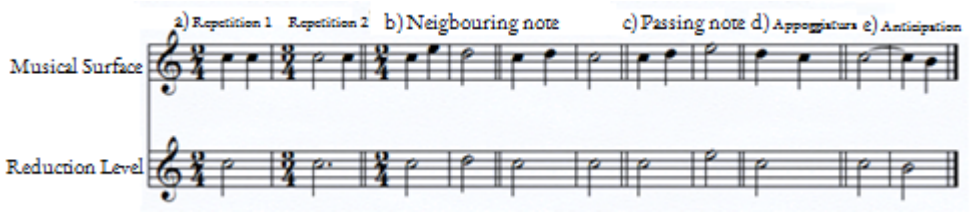

Figure 10. The eleminated embellishment conditions on the reduction approach

In GTTM, the reduction method try to be represent the structure that the intuition of listener perceives relatively from a piece of music. According to Lerdahl and Jackendoff, a listener does not perceive an aria or its variations as different pieces, as in Bach's Goldberg Variations (Bent & Pople, 2001). In this context, Lerdahl and Jackendoff proposed two conditions for the reduction in order to reach the archetype pattern percieved from a given work: "a. Pitch-events are heard in a strict hierarchy. b. Structurally less important events are not heard simply as insertions, but in a specified relationship to surrounding more important events." (Lerdahl & Jackendoff, 1983a, p. 106). These conditions are called 'Strong Reduction Hypothesis' in GTTM. The Strong Reduction Hypothesis has three branch: "(1) what the criteria of relative structural importance are, (2) what relationships may obtain between more important and less important events, and (3) precisely what musical intuitions are conveyed by the reduction as a result of 1 and 2." (Lerdahl & Jackendoff, 1983a, pp. 106–107) The criteria of structural importance in this hypothesis are circle of fifths, root and inversion chords, triad chords, consonance and dissonance chords, and major or minor key. A relationship of importance among pitch events is considered as ornament process in the sequence of pitch events. In this approach, a pitch such as tonic or dominant attributed relative structural importance is been elaboration with neighbour ornament conditions. It is considered that there is hierarchical relationship between tonic events and ornament events. The ornament events have secondary importance in this condition. An event attributed relative structural importance is a *head event*, neighbour and ornament events are elaborations of head events.

There are four different type in reduction: ordinary reduction, fusion reduction, transformational reduction and cadential retention. Head event is determined with the ordinary reduction in a given time-span. Non-seperation multiple events such as arpegion is combined with the fusion reduction. The chord tones of the two most structural important events are transformed into a more stable event by combined them into a single chord with the transformational reduction. Two or three events in the cadence pattern are shown as one unit with the cadential retention until a specific level without reduction (Lerdahl & Jackendoff, 1983a, pp. 154–158). The reduction is made with stability conditions (Figure 2). In this context, the factors for the stability conditions are as follows (Lerdahl & Jackendoff, 1983a, pp. 117–118):

- The regional consonance is more stable than the regional dissonance.
- The root chord is more stable than the inverted chord.
- Tonic is the most stable degree in the scale.
- The stable state between two chords depends on the distance of the root from the tonic in the circle of fifths.
- For the principles of good voice -leading, a given "conjunct linear connections are more stable than disjunct ones." (Lerdahl & Jackendoff, 1983a, p. 118)
- In metric strucutre, the events on strong beats are more stable than the events on weak beats.

Reduction in the atonal music

We have just said about stability conditions in tonal music for reduction. But in chromatism the tonal stability conditions lose their weight. According to Lerdahl in these conditions, salience conditions comes to important position. Even though events being on the strong beat or having long in duration is dissonant, they can be more stable in salience conditions. Such salience conditions as the long in duration events, structural important of event, being metric position and being end of group can attribute structural important to events in monodic linear melody (Lerdahl, 2001, p. 315).

According to Lerdahl, the psychoacoustic salience plays important role in determining prolongational structure in chromatism. "GTTM's time-span reductional PRs can be divided into two categories, those that compare relative pitch stability of the events within a given span or region and those that compare the relative salience of events." (Lerdahl, 2001, pp. 313–315).

According to Lerdahl, Psychoacoustic salience "is not always obvious which pitches in a melodic line are harmonic and which are nonharmonic." (Lerdahl, 2001, p. 316). In this case, temporally adjacent sequential pitches with intervals smaller than minor third in melody can be consider together as a group or as a chord arpeggio (Lerdahl, 2001, p. 316). Lerdahl called streaming or 'anchoring' for these principles. He proposed a rule for anchoring principles, and 'salience conditions':

> *"Salience Conditions: Of the possible choices for the head of a time-span T, choose an event that is; (1) attacked within the region, (2)in a relatively strong metrical position, (3)relatively loud, (4)relatively prominent timbrally, (5)in an outer-voice (high or low) registral position, (6)relatively dense (simultaneous attacks), (7)relatively long in duration, (8)next to a (relatively large) grouping boundary, (9)relatively important motivically, (10)paralel to a choice made elsewhere in the analysis.*
> *Anchoring/Reduction Rule: In a melodic sequence, if temporally adjacent pitches in a stream are less than a minor third apart and are comparably dissonant, choose the second pitch."* (Lerdahl, 1989, pp. 73–74, 2001, p. 320).

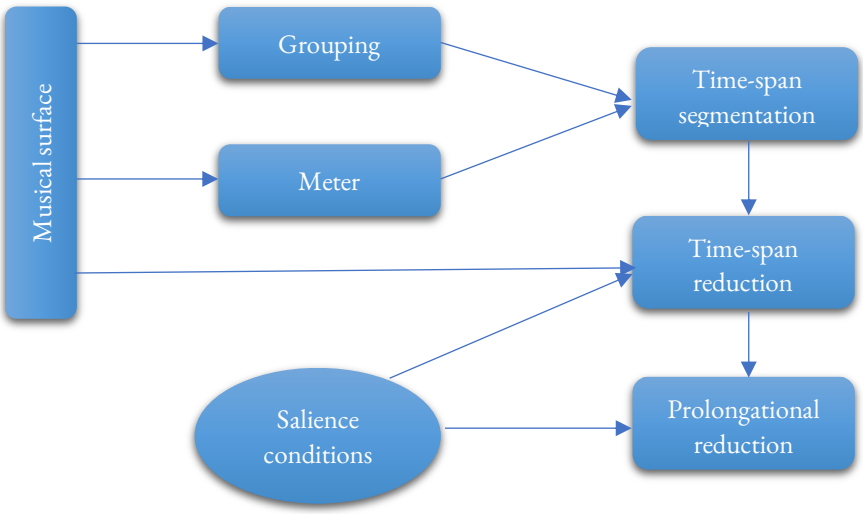

Figure 11. The flowchart of salience conditions in GTTM adapted from Lerdahl & Jackendoff (1983a)

The conditions of salience, such as metrical position, tmbre, loudness, position of register and intensity, and long in duration (conditions a to g) apply to the musical surface at the local level, whereas the conditions of motive significance, position in the group and parallelism (conditions h to i) apply to the conditions of the global level over a large time-span (Lerdahl, 1989, p. 74). In these conditions, moving away from the tonic is represented with right branching and returning to the tonic is represented with left branching.

Approachs for the analysis of Ulvi Cemal Erkin's Piano Concerto

In this study, it was analysed of form, harmonic and metric structure of Ulvi Cemal Erkin's Piano Concerto. In this way, it was tried to determined such factors as tonic regions, cadance events, and key/mode regions. While a scale of a given region is determined, first of all tonic will be determined. After that all of the pitches will be organized from bottom to top according to tonic. It will be evaluated whether or not our identified factors are consistent or sufficient with GTTM's conditions (stability, hierarchy, etc.) and components (grouping structure, metric structure, etc.) and rules (preference rules, transformational rules, etc.). As GTTM's rules and/or component conditions do not correspond to the condition of the work, we will propose a new rule/rules for GTTM. With this approach, grouping structure conditions correspond with Piano Concerto's conditions. The metric structure is 7/8 meter in three movement of work. This condition is dissonant in GTTM. Because, the time-span must be equal between two beat in the tactus level accocrding to Metric Structure Well-Formedness Rule 4 (MWFR 4). In other words, the tactus level must be able to divide to two or three beat. However, Tsougras proposed a specific rule for this dissonant metric condition: *Specific Metrical Well-formedness Rule (SMWFR)*. According to this rule the time-span is not able to be equal between two beat in the tactus level (Tsougras, 2010, p. 183). For these conditions in work, we will use the SMWFR.

While eliminating among events in the time-span reduction and the prolongational reduction, the stability conditions has primarily important for preference In these stability conditions, melodic and harmonic stability were constituted to depend on the tonal functional harmony. However, feature of the functional harmony did not met in the Piano Concerto. In this context, we prefer to use Lerdahl's anchoring rule and salience conditions.

In the first movement of the Piano Concerto the main theme (first theme or opening theme) consist of transposed repetition in the center of e≤ and e in the A section. In the first repetition (bars 14-24), in the melodic line and the bass line are different mode, but enharmonical (Figure 12). The tonic center is d# in bass line, but e≤ the melodic line. This continues until cadence. However, the repetition or changing of pitches affect quality of the harmonic progression when the prolongation is represented in the prolongational reduction (strong prolongation, weak prolongation etc.). For solving this problem, we can purpose a transformational rule. But before proposing, we should prefer one of two modes for represent the layer at lower level. In this context, it is proposed that to prefer the mode which closes the main mode center, taking into account the stability.

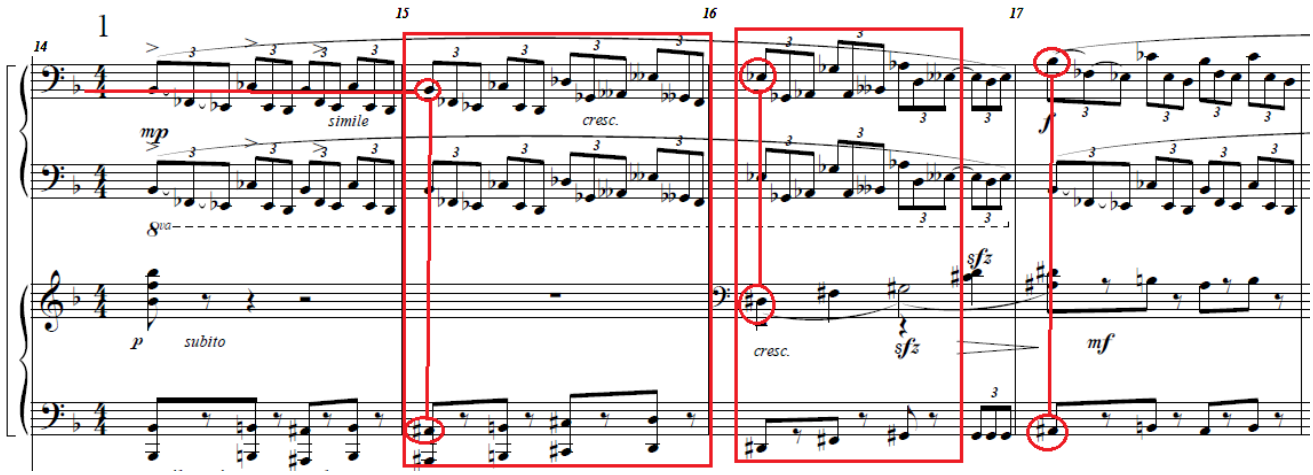

Figure 12. The first movement, bars 14-17

Time-span Reduction Transformational Rule 1 (Enharmonic Interval): If there are different mode center, but enharmonic in the melody and bass line, prefer one of them to transform into mode or key which is the closest to the main mode or key.

Some cadences are open-fifth chord on some cadence point in the work, for example bar 13 in the first movement. The non-triadic chords are unstable in GTTM. Hence, this cadence should unaccepteble as head event. However, Tsougras have proposed a specific rule for the open-fifth chords in modal music:

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

Tsougras have proposed this rule for harmonized orginal melody. In this case, it may be necessary to extend the scope of this rule and propose to a rule:

STSRPR 3 Revise: Prefer a triad or a quartal or a open-fifth chord as the structural end of a piece, in a cadence of a time-span T.

The tonic is different according to the main theme in bars 81-112 in the first movement. The tonic is G note in this passage. However, the main theme begins on the bass line, D is the pedal note on the top line. The theme continues in the sixth bar of the passage on the top line. During the reduction the integrity of the theme will be disturbed and the prolongation will not be shown the structural events of the theme at the lower levels. The same conditions are seen in bars 97-106 (Figure 13). For this purpose, it is necessary to propose a rule.

Time-span Reduction Transformational Rule 2 (Transfer): Transfer the theme exactly to the upper part, when the theme is in lower parts other than the upper part on the musical surface.

For these cases, the reduction which we made in the lower level will be made in the context of 'transfer' rule.

Stable pitch events are prefered as head events according to the main mode and tonic in the bars 1-24 of the third movement. In this passage, the progression occurs in the A section due to modulation to the F# Phrygian mode in prolongational reduction. It occurs $\#\hat{2} \rightarrow \widehat{\#2} \rightarrow \#\hat{2} \rightarrow \hat{5} \rightarrow \hat{1} \rightarrow \hat{1}$ in the melody line and $\hat{3} \rightarrow \hat{3} \rightarrow \#\hat{2} \rightarrow \hat{6} \rightarrow \hat{2} \rightarrow \hat{4}$ in the bass line according to the F# center in the harmonic progression. Even though the main theme is the G# Phrygian mode, due to the modulation in the cadence of section the main mode is shown as the F# Phrygian mode in these harmonic progressions. However, after bar 59, the tendency towards to the G# center make consider that the center of the main mode is the G# in the follow of work. In this case, it is necessary to determine the hierarchy between the G# and the F#, because the G# is prolonged in the global level (Figure 14, bars 1-24). In this case, a salience condition may propose as follow:

Specific Salience Condition 1 (Tonic): Prefer tonic and/or repetitive event in prolongational case.

Lerdahl proposed last three condition for such global level as phrase, period and section in the salience condition. However, a tonic and/or a cadence affect(s) to prefer in the Piano Concerto. In this case, a salience condition is necessary for cadential retention.

Specific Salience Condition 2 (Cadence): If the following conditions obtain in a time-span T, then label the progression as a cadence and strongly prefer to choose it as head:

- The last element of this harmonic progression is the tonic.
- The tonic is at the end of T or is prolonged to the end of T.
- There is a larger group G containing T for which the progression can function as structural ending.

These specific rules which we have proposed for conditions that do not correspond to the rules of GTTM will be utilized in the analysis of the work.

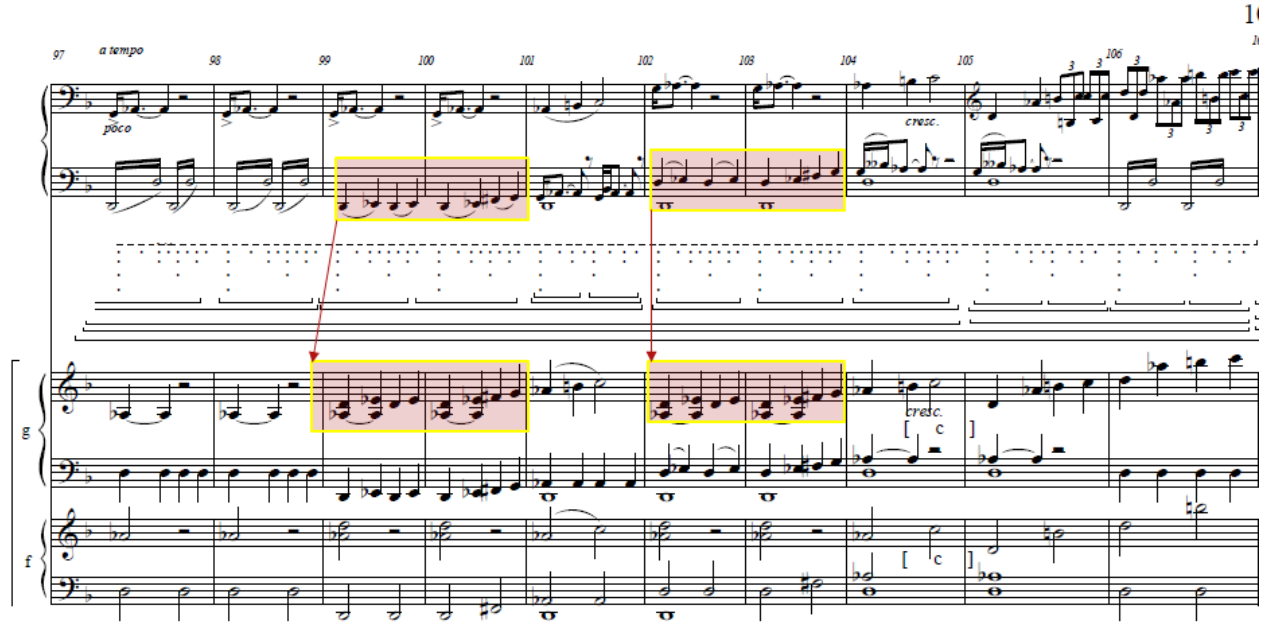

Figure 13. The first movement, bars 97-106.

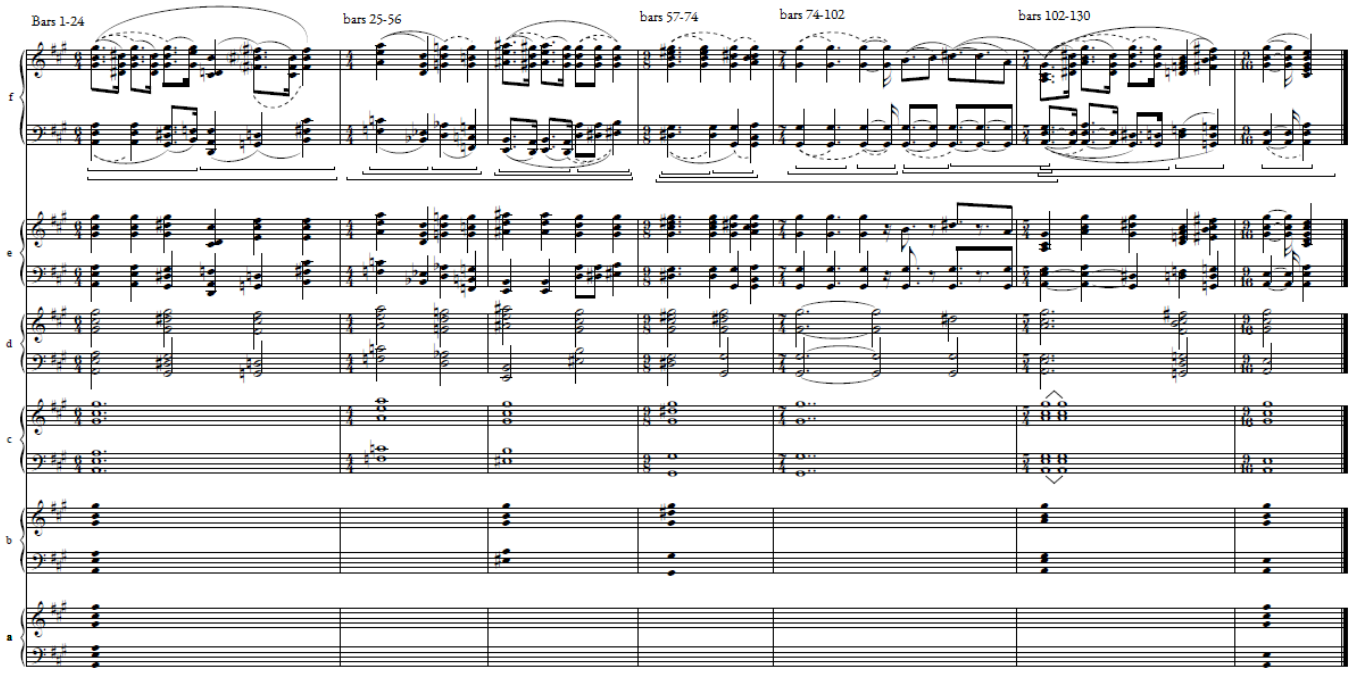

Figure 14. The third movement, the time-span reductions, global level

A Pitch Set Formulation

Identify of the tonic is necessary for determining a tonal/modal region in a given work. For which, a begining chord and a cadence is an importance indicator. Karadeniz (2020) utilized a Pitch Set Technique[4] which has tonic with specifically approach for determining scale in a musical passage for 20th-century chromatic modal music. In this approach, Pitch Set is "a point of focus that is the *warp and woof* of the region to which it is related." (Karadeniz, 2020, p. 4). In other words, it is to determine the sound material or scale used in a musical passage from ascending order, ignoring repetitions. In this case, it is necessary to determine the tonic in order to determine the scale. The formulation of determined scale is idendified by accepting "the distance of adjacent pitches in the pitch set to each other as a chromatic interval, 1 step." (Karadeniz, 2020). For example, C-Db-E-Ab-B-C pitch set formulate as $_c$(13431) in C center. In this formula c is the tonic, the digits represent the sum of 1 step between two adjcent notes. While computing the interval between two adjacent notes, for example E-Ab, four step is written to pitch set.

[4] This technique is not the same with pitch class set theory. Only it is influenced from pitch class set theory.

In the analysed passage, while identifing the tonic and the mode region, first of all begining pitch and ending pitch of group is determined. Then, the scales were constituted from among used pitches in the passage. While constituting pitch set, regions were identified in the groups. Interval class of the pitches in theses regions was identified. First of all, pitch sets and pitches which salience of their loud in the melody and bass line in every region were analysed separately. Then, constituted scale from combination of pitch sets in two part was tried to identify. The constituted scale patterns were compared with the scales in Western music theory and Turkish *makam* music theory. In the passage pitches as the tonic function can be observed as pedal notes or as the most frequently emphasised, intensely observed and melodically oriented pitch, sometimes rhythmically (long duration value, strong time, etc.) or at the boundaries of motive or theme changes which divide large passages. Other pitches are related to the pitch whose intensity is prominent and some pitches may stand out in this relationship.

Results

The Erkin's Piano Concerto has four movements: *Allegro, andante, scherzo, andante-allegro.* The first movement is Re Phrygian mode. The form of this movement is sonata allegro [(Exposition: (A_1B_1)-Development: (A_2C)-Recapitulation: (A_1B_2)] (Figure 15). A section has four sentences (aa'a"b). There is sequence of the 'a' sentence in the exposition. The main theme modulates from D Phrygian to Eb and E Phrygian modes in this sequence. There is a new theme in the b sentence which modulates to the $_{d}$(1213) and the $_{eb}$(1312131). There is a second theme in the B section which modulates to the $_{f}$(3121311) and the $_{db}$(3121311).

In the development, the main theme opens IV degree of the main mode, then, returns to the tonic center. In this context, a development of the main theme is occured by the modulation. There is the cadence section of concerto in the C section. The motives of the main theme and 'b' phrase are developed in this section. A_2 has four sentences (a'a-b'c). The center mode in the main theme (a) is in the G Phrygian mode in the A_2 section, then the D Phrygian mode. The center mode is the $_{c}$(1312131) in the b' sentence and the G Mixolydian mode in the c sentence. In the C section, there is the development of two different themes from the A_1 section. The $_{x}$(121) tetrachord is in four different mode centers, C#, F#, B and G# in this section.

In the Recapitulation, different from exposition, the mode center is the $_{gb}$(3121311) and the $_{d}$(3121311). In this context, there are the Phrygian mode and the $_{x}$(121) tetrachord in the minor region, and the Mixolydian mode and the $_{x}$(1312131) mode in the major region.

Form Table of The First Movement

	Exposition							Development						
	A_1					B_1		A_2						
Rehearsal Nu.	1-2			3	4-5	6-7		8-9			10	11	12-13	14
Theme	Main Theme			Codetta	Theme 2	Theme 3	Transition	Main Theme	Transition	Main Theme	Transition	Theme 2	Theme 4	Transition
Tonic	D	Eb	D	D	D	Db	D	G	F	D	Db	C	G	C#
Orchestra/Solo	Tutti	Tutti	Orch.	Orch.	Tutti	Solo	Orch.	Orch.	Solo	Orch.	Tutti	Tutti	Orch. and Solo	Orch. and Solo
Mode Center	D Phrygian	Eb Phrygian	E Phrygian	D *Pelog* (Pentatonic)	d(1213), eb(1312131)	f(3121311), db(3121311)	D Aeolian	G Phrygian	F Dorian	D Phrygian	c(1312122)	c(1312131)	G *Oriental*, G Mixolydian, A Super Locrian, C Super Locrian	c#(1312131)

	Development						Recapitulation							
	Cadence Section						A_1				B_2		A_3	Coda
Rehearsal Nu.	15-16	16					17	18-19	20		21-22	23	24	25-26
Theme	Main Theme	Main Theme and Theme 2	Transition	Theme 2	Main Theme	Transition	Main Theme			Codetta	Theme 3	Transition	Main Theme	Theme 2
Tonic	F#	F#	D, Bb	Db, F#	E	Ab	D	Eb	D	E	D	D	D	D
Orchestra/Solo	Orch.	Solo				Orch.	Tutti	Tutti	Orch.	Orch.	Solo	Orch.	Tutti	Tutti
Mode Center	c#(121) f#(121)	F# Mixolydian				b(121) ab(121)	D Phrygian	Eb Phrygian	E Phrygian	E Phrygian	gb(3121311), d(3121311)	D Aeolian	D Phrygian	d(1213) D Phrygian

Form Table of The Second Movement

	A		B			C	A
Rehearsal Nu.	26-27	28	29	30	31	32	33-34
Theme	Main Theme	Transition	Theme 2	Theme 2	Geçiş Köprüsü	Theme 3	Coda (Main Theme)
Tonic	C#	C	Eb	D	D	D	C#
Mode Center	g#(121), c#(1213131)	c(1312221)	c(1312131) eb(1312131)	d(1312131)	D Dorian, d(1312122)	G# Aeolian, G# Dorian, g#(2121312), d(2131)	c#(1213131)

Form Table of The Third Movement

	A					B			A'		Coda
Rehearsal Nu.	35	36	36-37	38	39	40	41	42-45	46	47	48
Theme	Main Theme	Main Theme	Transition			Theme 2	Theme 3	Solo	Main Theme	Main Theme	Coda
Tonic	G#	F#	G	A#	G#	G#	G#	G#	G#	F#	A
Mode Center	G# Phrygian, C# Super Locrian	F# Phrygian	A Aeolian, D Aeolian, G *Eunoi* Rotation Mode 1	A# *Hirajoshi* Rotation Mode 1, G# *Eunoi* Rotation Mode 1	G# Dorian	G# Dorian	G# Dorian	G# Phrygian, G# Harmonic Minor, g#(1312131)	G# Phrygian, C# Super Locrian	F# Phrygian	G# Phrygian

Form Table of the Fourth Movement

	Prelude				A1			B		A2		C1	
Rehearsal Nu.	48				49	50	51	52	53	54		55	56
Theme	Prelud			Transition	Main Theme	Main Theme	Transition	Themem 2	Theme 3	Main Theme	Main Theme	Theme 4	Transition
Tonic	G	C#	F#	F#	F#	A	A	Eb	C#	C#	E	B	F
Mode Center	A Locrian, g(1312122)	C# Locrian	F# Locrian	F# Phrygian	f#(1312122)	a(1312122)	a(1222212)	eb(2131221)	C# Macar Minor	c#(1312131)	e(1312122)	B Aeolian	F Macar Minor

	A3			C2		A4		Coda
Rehearsal Nu.	57	58	59	59	60-61	62	63	64
Theme	Main Theme	Theme 5	Theme 5	Theme 4	Theme 4	Main Theme	Main Theme	Coda
Tonic	G	G	G	C	G	B	D	D
Mode Center	g(1312131)	g(1312131)	G Macar Minor	c(1312131)	E Aeolian, g(1312131)	b(1312131)	d(1312131)	d(1312122)

Figure 15. The form table of the U. C. Erkin's piano concerto

In the 19th-century concerto works, the AB sections in the opening section are traditionally played by the orchestra without modulation an then repeated by the solo instrument (Gauldin, 2004). If the main key is major, the solo instrument modulates to the dominant key in the B section in the repetition played by the solo instrument, and if the main key is minor, the relative major key is modulated. The cadence section is traditionally placed in the coda section at the end of the recapitulation. Erkin did not prefer this traditional practice in the Piano Concerto. In the recapitulation section, section A_1B_1 is played tutti and sect,on B_1 is not repeated by solo instrument. The cadence section does not come again in the coda section at the end of the exposition, but in the C section, and exhibits elements of development. Under these cases, we consider that Erkin expanded the exposition section and displayed an individual approach in the first movement of the concerto works of the 18th and 19th-centuries in his Piano Concerto, considering the traditional practices in the classical period.

Andante, the second movement, has tree main section (ABC). The c#(1213) pentachord dominate in the A section. In the B section, there are modulations of $_x$(1312131) to C, Eb and D pitch center, in the second theme. In the C section, there are modulations of the G# Aeolian mode, the G# Dorian mode, the $_{g\#}$(2121312) mode and the $_d$(2212131) mode. In the coda section, the mode center is the $_{c\#}$(1213131) mode and the main theme is based on a C# pedal note. In these cases, there are the minor-major-minor balance in the second movement. The pitch centers are adjacent C#-D-G#-C# which are related the fourth and the fifth interval.

Scherzo, the third movement, is the ternary form (Figure 15). The main mode is the G# Phrygian mode. Then, the main theme modulates the F# Phrygian mode. In the B section, the mode center is the G# Droian mode. The bass clarinet solo is in the this section. In this solo, the harmonization is bades on a G# pedal note and has the Phrygian mode, Harmonic minor key and a $_{g\#}$(1312131) mode. In repetition of the A section, it is return to the G# Phrygian mode.

In the *Andante-Allegro,* the fourth section, form is the chain-rondo or seven-part rondo (Hepokoski & Darcy, 2006, p. 401): Prelude-$A_1BA_2C_1A_3C_2A_4$. In the prelude section, the main theme is in the Locrian mode with A, C# and F# tonic center. Erkin used the main theme and the second theme in parallel in the A_3 and A_4 sections.

In the 18th and 19th-centuries, it was common-practice in the classical Western music to return to the main key while repeating the main theme in the rondo form. Erkin did not adhere to this practice in the fourth section. In the A sections, there are modulations to $_x$(1312122) and $_x$(1312131) modes. The modal centers are F#-A-C#-E-G-B-D in these sections. There is minor 3rd interval relationship among these adjacent pitches. These pitches occure the D major scale in the D tonic center.

Erkin used the tetratonik, the pentatonic and the heptatonik scale in this work which are used the sound material in the Turkish *makam* music and the 20th-century Western music. There are *tri-hemitonic scales* such as $_x$(1312131), $_x$(1312122) and $_x$(1312212) modes which are resemble Turkish *makam* music scales among the sound materials used by Erkin (App.-I; Table 1).

According to Lerdahl, the normative structure is usually realised in the process of weak prolongation in the context of tension-relaxation. In the Piano Concerto, it was observed not only the normative structure but also the progression and the strong prolongation. In the exposition, the weak prolongation is in the A_1 section, the progression is in both the B_1 and the A_2 sections (App.-II). In the second movement, there is the weak prolongation in the main theme but there are the progression in the other themes. This case shows us that the whole second section is in a process of tension. In the third movement, the tension progression are observed with the strong prolongation and the weak prolongation right-branch tree diagram. In the fourth movement, the left-branch tree diagrams are observed in the period regions. However, the tension progress continues owing to modulation in each section (App.-II).

Table 1. Identified scales in the U. C. Erkin's piano concerto

Movements	Mode	Rehersal Nu. and Tonic
The First Movement	Phrygian	1-2 (D, Eb, E); 8-9 (G, D); 17-20 (D, Eb, E); 24 (D); 25 (D)
	Pelog (Pentatonic)	3 (D)
	Pentachord 2 (1213)	4-5 (D)
	Tetrachord 1 (121)	15-16 (C#, F#)
	Heptatonic Scale (1312131)	5 (Eb); 11 (C)
	Heptatonic Scale (3121311)	6-7 (F, Db); 21-22 (Gb, D)
	Aeolian	7 (D); 23 (D)
	Mixolydian	12 (G), Cadence (F#)
	Oriental	13 (G)
	Super Locrian	13 (A)
The Second Movement	Heptatonic Scale (1213131)	26-28 (G#, C#); 33-34 (C#)
	Tetrachord 1 (121)	26 (G#)
	Heptatonic Scale (1312131)	29 (C); 31 (D)
	Heptatonic Scale (1312122)	29 (Eb); 31 (D)
	Lydian	30 (D)
	Dorian	31 (D); 32 (G#)
	Aeolian	32 (G#)
	Pentachord 1 (2131)	32 (D)
	Heptatonic Scale (2121312)	32 (D)
The Third Movement	Phrygian	35-38 (G#, F#, G, E); 46-47 (G#, F)
	G Kumoi Rotation Mode 1	36 (G), 38 (G#)
	Hirajoshi Rotation Mode 1	38 (A#)
	Aeolian	36 (A, D)
	Dorian	39-41 (G#)
	Harmonic Minor	43 (G#)
	Heptatonic Scale (1312131)	44 (G#)
	Ionian	48 (A)
The Fourth Movement	Locrian	48 (A, C#, F#)
	Phrygian	48 (F#)
	Heptatonic Scale (1312122)	49-50 (F#, A); 54 (E), 64 (D)
	Melodic Minor *Undertone*	51 (A)
	Heptatonic Scale (2131221)	52 (Eb)
	Macar Minor	53 (C#), 59 (G)
	Aeolian	55 (B), 60-61 (A)
	Hepatatonic Scale (1312131)	54 (C#), 57 (G), 58 (G), 59 (C), 62-63 (B, D)

Conclusion

In this study, harmonic approach of Erkin is analysed through the example of his Piano Concerto. In this context, modal plan of the work and the tension-relaxation regions was analysed with GTTM approach. Fisrt of all form of the work, harmonic process and metric structure was analysed, then, the tonic centers, the modal regions, and the chord structures were observed. These elements were compared with GTTM's conditions. We tried to understand that GTTM's conditions correspond to the Piano Concerto's conditions.

Erkin's Piano Concerto has four movements: Allegro, andante, scherzo, andante-allegro. The first movement is Re Phrygian mode. The form of this movement is sonata allegro [(Exposition: (A_1B_1)-Development: (A_2C)-Recapitulation: (A_1B_2)]. In the development section, a development of the main theme is occured by the modulation. In the context of the modulation, relationship of the major-minor mode occures in the A_1 section and B_1 section of the exposition. The common feature of scales in major region is the *tri-hemitonic* scale structure, for example $_x$(131 or $_x$(1312). In the context of form, we consider that Erkin expanded the exposition section and displayed an individual approach in the first movement of the concerto works of the 18th and 19th-centuries in his Piano Concerto, considering the traditional practices in the classical period.

In the Piano Concerto, the tension-relaxation region correspond to GTTM's strong and weak prolongation pattern to a large extent. In this case, we think that Erkin adhered to the harmonic progression under stability conditions.

We can seperate the scales to four branch in the Piano Concerto: The diatonic heptatonic modes, the non-diatonic heptatonic modes, the tetratonic scales and the pentatonic scales. The non-diatonic modes seperates two branch each other: (1) Synthetic scales, (2) the scales of the sound materials used in Turkish *makam* music, which are similar to the well-tampered system of the Western music. In synthetic scale, Erkin used two individual scales: $_{x}$(1222212) and $_{x}$(3121311). The tetratonic scales resemble the Turkish *makam* music sound materials. Pentatonic scales are the anhemtonic and the hemitonic scales. The Far Eastern influence is felt in the anhemitonic pentatonic scales. Erkin not only used the tetratonic and the pentatonic structures to create the sound boundaries in the themes, but also used structures as modulation or temporary modulation.

According to our findings, we can say that Erkin did not adhere to common-practice, the Classical period form elements contrary to the literature. These conditions reveal that Erkin exhibited a neo-tonal style with his individual preferences for sound material, influenced by the Impressionist and innovative movements of 20th-century music, his approach extending the Classical period form elements and considering to harmonic progression.

GTTM, which was designed for tonal music, has been evaluated in the context of Hindustani (North Indian) classical music (Clarke, 2017) and 20th-century modal music (Tsougras, 2002, 2010). Lerdahl and Jackendoff, who are the founders of the GTTM, pioneered this approach. Lerdahl proposed some principles and defined conditions for adapting GTTM to atonal music (Lerdahl, 1989). Lerdahl concluded that the theory does not apply to atonal music but can be adapted to Eastern European native music. Beside, it was observed that GTTM was not used in the literature to analyse such orchestral works as concerto, symphony etc. In these case, while analysing Erkin's Piano Concerto, Lerdahl's 'salience conditions' (Lerdahl, 1989) and 'anchoring principle' (Lerdahl, 2001) were applied, four rule suggestions and one rule revision were made: Time-span Reduction Transformational Rule 1 (Enharmonic Interval), Time-span Reduction Transformational Rule 2 (Transfer), Special Time-Span Reduction Preference Rules (*STSRPR*) 3 Revise, Specific Salience Condition 1 (Tonic), Specific Salience Condition 2 (Cadence).

Recommendations

In the context of the hierarchy in GTTM, we think that the metric hierarchy at the hypermetric level in which the large time intervals such as sentences and periods should be discussed again, and more acoustic experiment studies should be done. It is also suggested to adapt the conditions and rules for GTTM for analysing neo-tonal works, revise existing models or derive new models for representation in the direction of modulation. It may be considered to make studies that observe the composer's aesthetic development process by analysing the modal plan in Erkin's large form work such as symphonies, quintets and sonatas. In this context, it is considered that comparative analysis between periods composers will provide resources for comparative studies.

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Appendix 1. Similarities of non-diatonic modes in Erkin's Piano Concerto with Turkish *makam* music

We can seperate the non-diatonic modes seperates two branch each other in the Piano Concerto: (1) Synthetic scales, (2) the scales of the sound materials used in Turkish *makam* music, which are similar to the well-tampered system of the Western music. These scales and their similarities with *makam* music are as follows:

Heptatonic Mode $_{x}$(1312212): *Makam* of Hicaz and Hicaz Uzzal (Ezgi, 1933a, p. 275; Kutluğ, 2000, pp. 179, 183). Heptatonic Mode $_{x}$(1312122): *Makam* of Hicaz Hümayün (Ezgi, 1933a, p. 275; Kutluğ, 2000, p. 181). Heptatonic Mode $_{x}$(1312131): *Makam* of Zirgüleli/Zengüle Hicaz (Ezgi, 1933a, p. 275; Kutluğ, 2000, p. 185). Heptatonic Mode $_{x}$(2131221): *Makam* of Nikriz (Ezgi, 1933a, p. 273; Kutluğ, 2000, p. 208). Heptatonic Mode $_{x}$(2121312): *Makam* of Karcığar (Ezgi, 1933a, p. 273; Kutluğ, 2000, p. 188). Heptatonic Mode $_{x}$(1213131): *Makam* of Hüzzam (Ezgi, 1933b, p. 229). These scale patterns are defined with different *makam* names in diffirent tonic centers. Here, it is limited to the *makam* at the A pitch, or *Dügâh* pitch in the *makam* music. Moreover, a $_{x}$(121) tetrachord and a $_{x}$(1213) pentachord, which are identified in the Piano Concerto, resemble the *Hüzzam* pentachord, and a $_{x}$(2131) pentachord resembles the *Nikriz* pentachord (Ezgi, 1933a, p. 41).

Appendix 2. Abstracts of The Prolongational Tree-Diagram Patterns in The Erkin's Piano Concerto

Table 2 presents a summary of the prolongational tree-diagram patterns for time-span such as sentence(s) and section(s) defined in the this work. While forming the tree-diagram, the structural beginning event and the structural ending event are prefered in the stated T time-spans. The prolongational processes are exhibited in tables in global levels. The signs are in the table are as follows:

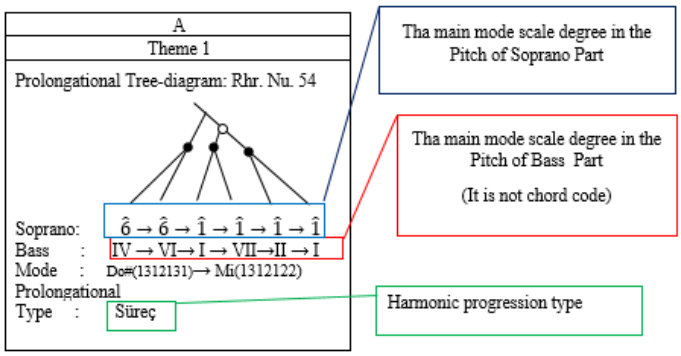


Figure 16. Signs in the Table 2

Table 2. Abstract of the prolongational tree-diagram patterns in the Erkin's piano concerto

The Prolongational Tree-diagram Patterns of The First Movement

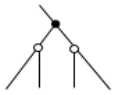
Exposition				
A_1		B_1	A_2	
The Prolongational Tree-diagram: Rhr. Nu. 1-2 (Theme 1)	The Prolongational Tree-diagram: Rhr. Nu. 4-5 (Theme 2)	The Prolongational Tree-diagram: Rhr. Nu. 6-7 (Theme 3)	The Prolongational Tree-diagram: Rhr. Nu. 8-9 (Theme 1)	The Prolongational Tree-diagram: Rhr. Nu. 11-12 (Theme 2 ve 4)
Soprano: $\hat{5} \rightarrow \hat{1} \rightarrow \hat{6} \rightarrow \hat{2} \rightarrow {}_{\flat}\hat{6} \rightarrow \hat{5}$ Bass : V→ I → VI →II →♮VI→ I Mode : D Phry.-Eb Phry.-E Phry.-D tonic The Prolongational Type: Weak Prolongation	Soprano: $\hat{1} \rightarrow \hat{1} \rightarrow \hat{1} \rightarrow \hat{1}$ Bass : V → V → I → I Tonic : d(1213) The Prolongational Type : Weak Prolongation	Soprano: $\hat{b2} \rightarrow \hat{7} \rightarrow \hat{2} \rightarrow \hat{3}$ Bass : II → III→ V → I Mode: f(3121311)→ db(3121311) The Prolongational Type: Progression	Soprano: $\hat{4} \rightarrow \hat{4} \rightarrow \hat{1} \rightarrow \hat{7}$ Bass : VI →VI →I → I Mode : (G Phrygian)-D Phrygian The Prolongational Type: Progression	Soprano: $\hat{4} \rightarrow \hat{2} \rightarrow \hat{1} \rightarrow \hat{1}$ Bass : IV→V→ I → I Mode: c(1312131)→G Mixolydian. The Prolongational Type: Progression

Development				
C	Cadence			
The Prolongational Tree-diagram: Rhr. Nu. 15-16	The Prolongational Tree-diagram: Theme 2	The Prolongational Tree-diagram: Cadence	The Prolongational Tree-diagram: Theme 2	The Prolongational Tree-diagram: Cadence
Spr: $\hat{5} \rightarrow \hat{1} \rightarrow \hat{5} \rightarrow \hat{1} \rightarrow \hat{5} \rightarrow \hat{1} \rightarrow \hat{3}$ Bass: V → I → III→ VI→III→VI→ I Mode : f♯(121) The Prolongational Type: Weak Prolongation	Soprano: $\hat{3} \rightarrow \hat{3} \rightarrow \hat{3} \rightarrow \hat{3}$ Bass : I → II → ♮I → I Tonic : F# Pitch The Prolongational Type : Strong Prolongation	Soprano: $\hat{4} \rightarrow \hat{7} \rightarrow \hat{4} \rightarrow \hat{4} \rightarrow \hat{5} \rightarrow \hat{7}$ Bass : VII→VII→V→bV→IV→ I Tonic : Eb Pitch The Prolongational Type : Progression	Soprano: $\hat{6} \rightarrow \hat{6} \rightarrow \hat{1} \rightarrow \hat{1}$ Bass : VII→VI→II → I Tonic : F# Pitch The Prolongational Type : Progression	Soprano: $\hat{5} \rightarrow \hat{5} \rightarrow \hat{5} \rightarrow \hat{5}$ Bass : V →VI →II → I Tonic : E Pitch The Prolongational Type: Weak Prolongation

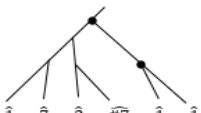
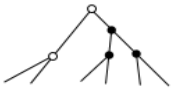
Recapulation		
A_1	B_2	A_2 and Coda
The Prolongational Tree-diagram: Rhr. Nu. 17-20 (Theme 1)	The Prolongational Tree-diagram: Rhr. Nu. 22-23 (Theme 3)	The Prolongational Tree-diagram: Rhr. Nu. 24-26 (Theme 1 ve 2)
Soprano: $\hat{5} \rightarrow \hat{4} \rightarrow \hat{6} \rightarrow \hat{2} \rightarrow {}_{\flat}\hat{6} \rightarrow \hat{5}$ Bass : VI→ I → VI →II →♮VI→ I Mode : D Phry.-Eb Phry.-E Phry.-D The Prolongational Type: Weak Prolongation	Soprano: $\hat{6} \rightarrow \hat{5} \rightarrow {}_{\flat}\hat{3} \rightarrow \hat{3}$ Bass : VII →I→IV→ V Mode: (gb(3121311)→ d(3121311) The Prolongational Type: Progression	Soprano: $\hat{1} \rightarrow \hat{1} \rightarrow \hat{1} \rightarrow \hat{1}$ Bass : V → V → I → I Mode : D Phrygian The Prolongational Type: Weak Prolongation

Table 2. (Continuation)

The Prolongational Tree-diagram Patterns of The Second Movement

A		B		C	A (Koda)
Theme 1	Geçiş Köprüsü	Theme 2	Theme 2	Theme 3	Theme 1
The Prolongational Tree-diagram: Rhr. Nu. 26-27  Soprano: $\hat{5} \rightarrow \hat{5} \rightarrow \hat{1} \rightarrow \hat{1}$ Bass : I → I → I → I Mode : c#(1213131) The Prolongational Type: Weak Prolongation	The Prolongational Tree-diagram: Rhr. Nu. 28  Soprano: $\widehat{b2} \rightarrow \widehat{b2} \rightarrow \hat{4} \rightarrow \hat{1}$ Bass : bII →bII →bII→ I Mode : c#(1213131)→c(1312221) The Prolongational Type: Progression	The Prolongational Tree-diagram: Rhr. Nu. 29  Soprano: $\hat{3} \rightarrow \widehat{b2} \rightarrow \hat{5} \rightarrow \hat{1}$ Bass : III →III → I → I Mode : c(1312131)→eb(1312131) The Prolongational Type: Progression	The Prolongational Tree-diagram: Rhr. Nu. 30  Soprano: $\hat{2} \rightarrow \hat{4} \rightarrow \hat{5} \rightarrow \hat{5}$ Bass : II → II → VI → I Mode: eb(1312131) →d(1312131) The Prolongational Type: Progression	The Prolongational Tree-diagram: Rhr. Nu. 32  Soprano: $\hat{4} \rightarrow \hat{6} \rightarrow \hat{5} \rightarrow \hat{5}$ Bass : IV →IV→ V → I Mode : G# Aeolian→d(2131) The Prolongational Type: Progression	The Prolongational Tree-diagram: Rhr. Nu. 33-34  Soprano: $\hat{5} \rightarrow \hat{5} \rightarrow \hat{5} \rightarrow \hat{1}$ Bass : I → I → I → I Mode : c#(1213131) The Prolongational Type: Weak Prolongation

The Prolongational Tree-diagram Patterns of The Third Movement

A	B		A' ve Koda
Theme 1	Theme 2 ve 3	Solo	Theme 1
The Prolongational Tree-diagram: Rhr. Nu. 35-39  Soprano: $\hat{1} \rightarrow \hat{7} \rightarrow \hat{2} \rightarrow \#\hat{7} \rightarrow \hat{1} \rightarrow \hat{1}$ Bass : II→#VII→bVII→bV→bV→#VI Mode : G# Phrygian→G# Dorian The Prolongational Type: Weak Prolongation	The Prolongational Tree-diagram: Rhr. Nu. 40-41  Soprano: $\hat{1} \rightarrow \hat{1} \rightarrow \hat{1} \rightarrow \hat{1}$ Bass : V → V → I → I Mode : G# Dorian The Prolongational Type: Weak Prolongation	The Prolongational Tree-diagram: Rhr. Nu. 42-45  Soprano: $\hat{1} \rightarrow \hat{1} \rightarrow \hat{7} \rightarrow \hat{4} \rightarrow \hat{5} \rightarrow \hat{1}$ Bass : I → I → I → I → I → I Mode: G# Phry.→G# Min.→G#(1312131) The Prolongational Type: Strong Prolongation	The Prolongational Tree-diagram: Rhr. Nu. 46-48  Soprano: $\hat{1} \rightarrow \hat{1} \rightarrow \hat{7} \rightarrow \hat{7} \rightarrow \hat{1} \rightarrow \hat{3}$ Bass : II → I→#VII→#VII→II →II Mode : G# Phry. →F# Phry.→ G# Phry. The Prolongational Type: Strong Prolongation

The Prolongational Tree-diagram Patterns of The Fourth Movement

Prelude	A_1		B	A_2
	Theme 1	Theme 1	Theme 2- Theme 3	Theme 1
The Prolongational Tree-diagram: Rhr. Nu. 48  Soprano: $\hat{3} \rightarrow \hat{2} \rightarrow \hat{5} \rightarrow \hat{5} \rightarrow \hat{1} \rightarrow \hat{1}$ Bass : VI→ II → V → V→ I → I Mode :g(1312122)→C# Loc. → F# Loc. The Prolongational Type: Progression	The Prolongational Tree-diagram: Rhr. Nu. 49  Soprano: $\hat{1} \rightarrow \hat{1} \rightarrow \hat{1} \rightarrow \hat{1}$ Bass : II → I→ IV → I Mode : f#(1312122) The Prolongational Type: Weak Prolongation	The Prolongational Tree-diagram: Rhr. Nu. 50  Soprano: $\hat{1} \rightarrow \hat{1} \rightarrow \hat{1} \rightarrow \hat{1}$ Bass : I → I → IV→ I Mode : a(1312122) The Prolongational Type: Strong Prolongation	The Prolongational Tree-diagram: Rhr. Nu. 52-53  Soprano: $\hat{3} \rightarrow \hat{3} \rightarrow \hat{1} \rightarrow \hat{1}$ Bass : III →III →I → I Mode: eb(2131221)→C# Macar Min. The Prolongational Type: Progression	The Prolongational Tree-diagram: Rhr. Nu. 54  Soprano: $\hat{6} \rightarrow \hat{6} \rightarrow \hat{1} \rightarrow \hat{1} \rightarrow \hat{1} \rightarrow \hat{1}$ Bass : IV→VI → I → VII→II → I Mode : c#(1312131)→ e(1312122) The Prolongational Type: Strong Prolongation

C_1	A_3	
Theme 4	Theme 1	Theme 5
The Prolongational Tree-diagram: Rhr. Nu. 55  Soprano: $\hat{4} \rightarrow \hat{1} \rightarrow \hat{1} \rightarrow \hat{1}$ Bass : IV → VI → II → II Mode : B Aeolian The Prolongational Type: Progression	The Prolongational Tree-diagram: Rhr. Nu. 57  Soprano: $\hat{5} \rightarrow \hat{5} \rightarrow \hat{3} \rightarrow \hat{1}$ Bass : I →IV→II → I Mode : g(1312131) The Prolongational Type: Weak Prolongation	The Prolongational Tree-diagram: Rhr. Nu. 58-59  Soprano: $\hat{1} \rightarrow \hat{1} \rightarrow \hat{4} \rightarrow \hat{1} \rightarrow \hat{2} \rightarrow \hat{2} \rightarrow \hat{2} \rightarrow \hat{1}$ Bass : VI →VI →VI→I →VI →VI→VI → I Mode : g(1312131) →G Macar Min. The Prolongational Type: Strong Prolongation

C_2		A_4	
Theme 4	Theme 4	Theme 1	Theme 1
The Prolongational Tree-diagram: Rhr. Nu. 59 (221.-237. ölç.)  Soprano: $\hat{5} \rightarrow \hat{1} \rightarrow \hat{7} \rightarrow \hat{7}$ Bass : V → I →VII→ I Mode: G Macar Min.→c(1312131) The Prolongational Type: Weak Prolongation	The Prolongational Tree-diagram: Rhr. Nu. 60-61  Soprano: $\hat{2} \rightarrow \hat{6} \rightarrow \hat{1} \rightarrow \hat{1}$ Bass : II →VI→ IV→IV Mode : E Aeolian→g(1312131) The Prolongational Type: Progression	The Prolongational Tree-diagram: Rhr. Nu. 62  Soprano: $\hat{5} \rightarrow \hat{5} \rightarrow \hat{5} \rightarrow \hat{1}$ Bass : I → I → I → I Mode : b(1312131) The Prolongational Type: Weak Prolongation	The Prolongational Tree-diagram: Rhr. Nu. 63  Soprano: $\hat{5} \rightarrow \hat{5} \rightarrow \hat{3} \rightarrow \hat{1}$ Bass : I → I → I → I Mode : d(1312131) The Prolongational Type: Weak Prolongation