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Parataxis: A Framework of Structure Analysis for Instrumental Folk Music

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Background in Ethnomusicology. By comparing the instrumental music of the Balkans with the music of the Aegean, one can point out a common ground regarding structure, which we shall call 'the technique of *parataxis*': the act of improvising by re-arranging a series of melodic units, hence creating form. Little research has been done regarding this technique. Koglin (2003) depicts the musical structure through special graphs, Theodosopoulou (2005) codifies such repertoire from Crete, while Sarris (2007a) uses tables for analyzing Thracian repertoire.
Background in Computing. Computing is regarded as part of musical scholarship (Parncutt 2007). Knowledge representation of musical data by using tags and metadata has appeared to be of great significance in recent studies (Chryssochoidis, Delviniotis, & Kouroupetroglou, 2007). Data mining and knowledge discovery in databases have attracted a significant amount of attention lately(Fayyad, Piatetsky-Shapiro, & Smyth, 1996). However, a few studies have focused on folk instrumental music by combining annotation based on acoustic analysis and native musicians.
Aims. In this study, we propose a methodological framework for analyzing folk instrumental repertoire that follows the technique of parataxis, which can easily be used by scholars as well as by amateur researchers and folk musicians.
Main contribution. A selected piece is annotated with tags. Segmentation and parameter value set are performed under two different perspectives: from the perspective of an ethnomusicologist using tools of systematic musicological analysis and from the perspective of native informants, who are asked to find parts in the piece that are distinctive and who comment on them, thus producing another group of metadata. The method for the manipulation of the data includes the modeling, designing and developing of a relational Database, based on the entity-relation model that will be produced.
Implications. Our research can hopefully provide a useful tool for the ethnomusicologist in order to analyze and understand instrumental folk music. Folk musicians, teachers, and students can also use it in order to code information transmitted through oral tradition. With all that data lying side by side, research can be more fruitful, thanks to modern computer tools.

Keywords: Instrumental improvisation, instrumental music**,** parataxis, Balkans, Aegean, lira, bagpipe, structure, analysis

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Research about Greek folk music, as well as about folk music of the Balkans in general, has mainly promoted the study of song, whereas the study of instrumental music leaves a lot to be desired. One can explain this phenomenon by the fact that the study of folk song, especially from the early 20th century and onwards, went together with the study of folk poetry, which flourished in the 19th century in the spirit of Romanticism. Therefore, since the study of music was almost exclusively based upon transcriptions, the transcription of a song's melody was considered as a much easier task compared to the transcription of a 'flowing' instrumental piece, which seemed rather complicated in the eyes of a non-native scholar. Unfortunately, the high complexity of music is not the only challenge a prospective scholar has to deal with. Technically speaking, one has to understand the possibilities and the playing technique of the musical instruments used. Ethnographically speaking, one has to figure out the way native musicians conceptualize their repertoire as well as their playing technique. This is a quite difficult task because folk musicians usually have not developed detailed verbal codes in order to describe what they play, or how they play it (Rice, 1980). They comprehend music as something 'floating', which exists for the needs of a *ghléndi* (feast), and they do not feel like considering music as 'pieces', following a logic established by the music industry. It is a usual phenomenon for folk musicians not to be able to recall what they have just played in details. An example of a typical answer is: "I play whatever comes into my mind".

This article proposes an analytical methodology for the analysis of structure, the annotation and the study of folk instrumental music from the Balkans and the Aegean. By using the technique of tagging and by processing annotated data through an online database, it is possible to 'penetrate' into the structure of the music under analysis.

Our methodology combines the perspective of an ethnomusicologist using systematic musicological analysis with the perspective of a native musician or informant. It can hopefully act as a 'bridge' between these different viewpoints. On the one hand, it offers a powerful tool to the scholar in order to analyze systematic analysis data as well as to encode and understand the native's perception. On the other hand, due to the fact that it favours the scholar-informant collaboration, the scholar can have numerous chances to ask focused questions to the informant, hence enlightening the music phenomenon. Analytical data is illuminated through special texts, containing biographical and ethnographical information.

The starting point for our research was the finding that, in the case of various traditions of the Balkans (such as Greek Thrace) as well as in the case of the Aegean, one can point out a common ground regarding structure; musicians' improvisations are based on the creation (or recreation) of melodic units into a sequence, which builds the overall structure of a given instrumental piece. We shall call this phenomenon 'the technique of *parataxis*', after the homonymous literary technique[i].

The technique of *parataxis*

Folk music played by the musical instruments of the abovementioned regions can be divided into two categories in terms of structure: the music pieces that follow a periodic logic, and those that follow the technique of *parataxis*. In the former, a given melody is repeated with some variations, from the beginning to the end of a music piece. Such is the case of songs, in which the instrument accompanies the sung verse[ii]. In the latter, a music piece is built by a sequence of *music segments*. We prefer to use the term 'music segment' after Schoenberg's definition (1972, 57) instead of the commonly used term 'phrase'. 'Music segment' is rather neutral and can be valid for every self-efficient melodic unit, regardless of its internal structure; hence, a music segment can either be a song's melody, or an instrumental phrase, which in turn may be characterized either by motivic logic[iii] or by melodic unfolding[iv]. In other words, music segments are the 'structural units' of the repertoire which follows the technique of *parataxis*. They are complete but not autonomous; they make sense as the units of a sequence, which in turn creates a form. A form can be composed of segments, repeated and played one after the other according to a traditionally established series as well as according to the musician's fancy. A sequence is neither strictly determined nor absolutely free. Each time the music is played, it is recreated in a new form.

The technique of *parataxis* is widely used in the Aegean as well as in Greek Thrace; it is considered to be the 'backbone' of instrumental music. We believe that this is due to the possibilities of the musical instruments used in those areas, especially the 'peasant' ones. Both the *tsaboúna* (bagpipe) and the oldest type of the Aegean *lira* (fiddle), have a range of six notes, whereas both the *gaida* (bagpipe) and the *lira* in Thrace have a range of a ninth, while their most sonorous (and most widely used) part of the instruments' range is a sixth's range as well. Apart from that, the bagpipes' potentials are even more bounded if we take into consideration the side effects of the constant flow of air through the reeds (Sarris, 2007b; Sarris & Tzevelekos, 2008). How is it possible for an instrument with all these 'drawbacks' to be played for hours on end and satisfy the requirements of a whole village's dance? It seems that folk musicians can substitute the poor possibilities of their instruments using their imagination because they have developed a highly sophisticated – almost minimalistic – technique of improvisation, generating melodic variations based upon their poor melodic material.

Although the technique of *parataxis* is central to the instrumental music traditions of Thrace and Aegean, little research has been done. Mark Levy (1985) uses tables to sketch the sequence of songs and instrumental phrases in the Bulgarian Rhodope's *gaida* repertoire. Daniel Koglin (2003) depicts the music structure of a given piece through special graphs. Irene Theodosopoulou (2005) codifies the Cretan paratactic repertoire and investigates the series of music segments and their microstructure through a rather complicated system, while Haris Sarris (2007a) analyzes paratactic genres of the Greek Thracian *gaida*'s repertoire using tables. With regard to

automated methods of extracting data, little attention has been given to traditional Greek music in the field of Music Information Retrieval (Antonopoulos, Pikrakis, & Theodoridis, 2007).

Tagging specifications

The term 'tagging' refers to the act of annotating or labelling a specific part of the recording with coded information values and descriptive tags, which are often called 'tagging metadata'. The idea behind tagging is to add structure that helps improve query and analysis scopes. The concept of tagging sounds is not a new one. Its use is found in a wide area of applications, ranging from common music archiving (Kleedorfer, Harr, & Kreen, 2007) to specific sound corpora (Eide et al., 2004; Kouroupetroglou, Delviniotis, & Chryssochoidis, 2006). Downie suggests that nowadays it is relatively easy to collect music in its audio form than in its symbolic representation (Downie, 2008). Especially with regard to research in ethnomusicology Tzanetakis et al. (2007) argue that humans are extremely effective at recognizing patterns, thus it is important to emphasize that automatic approaches are far away from replacing humans.
In our research methodology not only does tagging provide a fruitful way for different expert or non-expert groups to annotate certain musicological elements inside the recording, but it also helps scholars to examine the annotations from the aforementioned groups. As in relevant studies (e.g., Chryssochoidis, Delviniotis, & Kouroupetroglou, 2007), the main areas of concern in the tagging procedure are: the segmentation of the corpus, the tagging metadata and their encoding, and the software tool used to perform these actions. However, the main novelty in our proposed methodology is that tagging is performed by two different tagger groups: the *scholar/researcher* and the *informant* (with the potential of including more tagger groups).

Scholar's tagging

The scholar tags music segments according to a series of parameters relevant to the systematic musicological analysis. To begin with, a predefined set of such parameters is proposed to the tagger: the *code name* of the segment, its *structural type*, its *mode*, its *range*, and its *tonic* (these parameters are to be analyzed in a following paragraph). We based the choice of these tagging parameters on our previous experience gained from the *Research Programme "Thrace"*[v], where we had the chance of archiving, transcribing and analyzing numerous instrumental and vocal music recordings from Thrace and Eastern Macedonia provinces of Northern Greece. It is worth mentioning that scholars may have a different analytical methodology, may tag in a different way, or even may focus their analysis on different parameters. Although we propose a set of analytical parameters, this set is not stringent. Each scholar/tagger is free to add any analysis parameter he/she wants to include.

Segmentation. The scholar who follows the methodology is supposed to manually segment the music piece into units, each one corresponding to a music segment. The

segmentation reflects the personal view of the specific scholar and could be based on different criteria, such as the analysis on the transcription of the piece or the 'acoustic memory' of repeated music segments as he/she is listening to the piece. Although there are no fixed standards for choosing the music segments and performing the segmentation there are, generally speaking, two options for the transition from one segment to another; in the first case, the segment is repeated and may, or may not, be melodically varied. In the second case, the segment is followed by a new segment. A scholar's segmentation has to indicate the border where that transition takes place.

Tagging metadata and encoding. Each analysis parameter is considered to be a unique *tagging layer*. For every segment, the scholar fills each tagging layer with data, which are the tagging metadata. All data are encoded in order to obtain a viable tagged collection ready for input in a searchable database. The proposed tagging layers are the following:

Code Name: In the first layer, the segment is tagged with a special code name. The name refers to the functionality of the segment in terms of appearance and sequence[vi] within the music piece. For example, an original segment has an original name, whereas a varied segment has a name that is a varied form of the original name. Table 1 shows the encoding used.

Table 1. Encoding for tagging layer *Code Name*

Code	**Explanation**
1, 2, 3...	Code name of an original music segment
1a, 1b...	Slight variations of segment 1 (mainly in terms of ornamentation)
1.#	Segment 1 that evolves to a passage towards the next segment
1#, 2#...	A music segment that acts as a passage
1_#	A segment that can be considered as either the original music segment 1 or a passage
1!, 2!...	Problematic segment, e.g. due to performing error

Structural Type: In the second layer, the segment is tagged for indicating whether its structural type is considered as *motivic* or whether it is characterized by *melodic unfolding*. This kind of data is of great importance because it can offer considerable information about the 'identity' of a music segment. Technically speaking, the motivic repertoire can be considered as a constantly regenerated family of

instrumental segments, composed within the limits of the 'peasant' instruments' capabilities rather than a finite set of songs and tunes, as in the case of the vocal repertoire, which is characterized by melodic unfolding. Segments of motivic character are often reduced into rudimentary motifs, which are merely produced by mechanistic finger movements, rather than being inspired by a melodic line (Sarris, Velegrakis, & Kolydas, forthcoming). At the same time, the motivic technique is highly connected with the dance repertoire as well as with the music of fertility rituals, whose antiquity is fairly well established. Since the motivic repertoire is inseparably connected with the instruments and their possibilities as well as with the instruments' very long historical presence in those areas, it is reasonable to conclude that the motivic repertoire also has a very long history. Hence, the motivic repertoire is a kind of 'time machine', which informs us about an earlier period (Sarris 2007b, 171).

Segments characterized by melodic unfolding usually go beyond the possibilities of the 'peasant' instruments. Sometimes they are instrumental versions of song melodies. It is also possible to be connected with the repertoire of more 'sophisticated' instruments, such as the violin and the clarinet. Generally speaking, it is not secure to categorize a music segment simply through the bipolar motivic/ melodic unfolding. It is highly possible for a motivic segment to be used in modern instruments' repertoire: which may indicate the 'grafting' of the 'old' instrument in the repertoire (as well as the aesthetics) of the 'new' one (Sarris, 2007b). It is also possible for a newly composed song melody, based on the technique of melodic unfolding, to fit into one 'peasant' instrument's possibilities. At the same time, a segment may be 'compressed' to fit into the possibilities of such an instrument. In this case it is extremely interesting to investigate the technique and the logic of such a 'compression'. Hence, inspecting whether a segment is motivic or follows a melodic unfolding is a good starting point for further investigations.

Table 2 shows the encoding used.

Table 2. Encoding for tagging layer *Structural Type*

Code	**Explanation**
M	Motivic music segment
U	Music segment that is characterized by melodic unfolding

Mode: In the third layer, the segment is tagged with special symbols indicating the mode. We follow Spyros Peristeris' system (1968). It is a rather 'neutral' system, compared to other ones appropriate for modal music, such as the makam system, which focuses on delicate subdivisions based upon oral tradition. On the contrary, Peristeris' system offers an abstract and descriptive charting of the melody (range, notes used, tonic) suitable for the paratactic instrumental music of Thrace or the Aegean.

Table 3 shows the encoding used.

Table 3. Encoding for tagging layer *Mode*

Code	**Explanation**
c.dtn, d.dtn, e.dtn...	Diatonic mode of c, d, e...
c.oli, d.oli, e.oli...	Oligotonic mode of c, d, e...
c.anh, d.anh, e.anh...	Anhemitonic mode of c, d, e...
d.chA, d.chB...	A chroa of the diatonic mode of d**,** B chroa of the diatonic mode of d...
!	There is no specific mode (e.g. in the case of pedal notes)
e.dtn_#	Diatonic mode of e in the beginning and then modulation
c.Maj, d.Maj...	c major, d major...
c.min, d.min...	c minor, d minor...
c.chr, d.chr...	Chromatic mode of c, d...
c.min_d.chr	Begins in c minor and ends in d chromatic
c.maj|c.dtn	Can be considered as either c major or c diatonic

Range: In the fourth layer, the segment is tagged with the lowest and highest note occuring in the main melodic line. The octave is indicated as well (a4=440 Hz). By knowing one segment's range, it is possible to shed light on its origin as well as its possible relation with other instruments. Table 4 shows the encoding used.

Table 4. Encoding for tagging layer *Range*

Code	**Explanation**
C4_g4	Melodic line ranging from c4 to g4
C+	c sharp
c-	c flat

Tonic: In the fifth layer, the segment is tagged with an alphabetical symbol, indicating the tonic as well as the octave. Table 5 shows the encoding used. Knowing the tonic and its movement throughout a piece may provide valuable information. Given that melodies in the 'peasant' instruments usually unfold around the instrument's tonic, which is grafted in the acoustic memory of the musicians and their audience, the use of a different note than the tonic gives a very intense effect. Especially in the case of the *gaida*, where the drone gives the tonic two octaves below the chanter, the

displacing of the tonic causes a burst effect. A sonorous note is usually chosen to be the tonic of the segment (e.g., a major third or a fifth above the tonic), as well as the second, which gives the harsh interval of a second with the drone. Some genres of the *gaida*'s music, which we believe to belong to the 'hard core' of the instrument's repertoire, take advantage of this effect. *Gaida* players' 'intercalate' segments with displaced tonic into a piece where the instrument's tonic dominates. This effect is automatically 'transmitted' by the dancers with a more intense dance (Sarris, 2007a, p. 354-362). Figure 6 shows a screenshot of a scholar's annotation.

Table 5. Encoding for tagging layer *Tonic*

Code	**Explanation**
c5, d5,…	The tonic is c5, d5,…

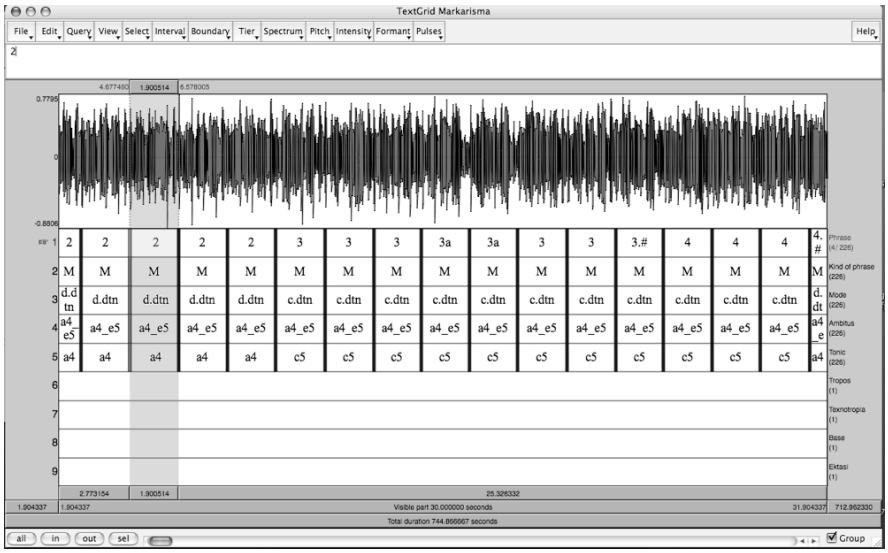

Figure 6. Scholar's annotation screenshot

Informant's tagging

A scholar is supposed to tag by following specific musicological criteria, such as mode, tonic, etc. On the contrary, a native informant may or may not follow these criteria, depending on his/her knowledge of music theory and/or his/her mood. It is reasonable to expect a peasant bagpiper to provide different kind of information compared to a professional musician who knows music theory; the latter is supposed to share technical codes with the scholar, while the former is rather expected to provide extended comments. In both cases, since the informants are bearers of an *emic* way of perceiving the musical phenomenon, it is interesting to tag whatever they think is necessary from their perspective; hence, an informant's tagging may indicate

a sequence of music segments related to a specific musician or a special context, or even segments borrowed from another area or another instrument's repertoire. It is also possible to be a bearer of a mixed way of conceptualizing the musical phenomenon, combining technical elements from music theory with the informant's perspective. In every case, the scholar is given the chance to approach music through the informant, as well as the informant through music.

Segmentation. As in the case of the scholar, each informant is expected to follow his/her own criteria of segmentation. These criteria are more likely to be experiential than technical. Contrary to the scholar's logic, who is supposed to proceed to the tagging after completing the segmentation (which is done by following technical criteria), a native informant is more likely to be led by his/her experience (which is supposed to be codified in the tagging layer) in order to proceed to the segmentation.

Tagging metadata and encoding. It is not appropriate for a non-standardized tagging outline to have a predefined tagging parameter set, as in the case of the scholar tagger group. Empty layers are provided to the informant, who can add free text as tagging metadata. He/she may establish a special parameter set using special layers. He/she may, as well, use some (or even all) of the scholar's layers.

Scholar's and informant's synergy

By using the methods of *Parataxis* project a researcher may work autonomous. It is also possible for two or more researchers to collaborate. On the other hand, a folk performer may or may not be able to operate a computer, and may need assistance from a PRAAT user. In such a case, tagging and annotating can be a part of an interview, where the PRAAT user/researcher annotates what his/her informant comments. In other words, tagging may become an interactive procedure, hence benefiting from an insightful view of the human-music relation. This collaboration can hopefully act as a useful tool for ethnographic research. The PRAAT user has, of course, to take into consideration not to influence the informant in any ways, to inform the database user (see below) about the conditions under which the tagging and annotation took place, as well as to comment on the outcome of the annotation. In Figure 7, one can find a screenshot of an informant's annotation.

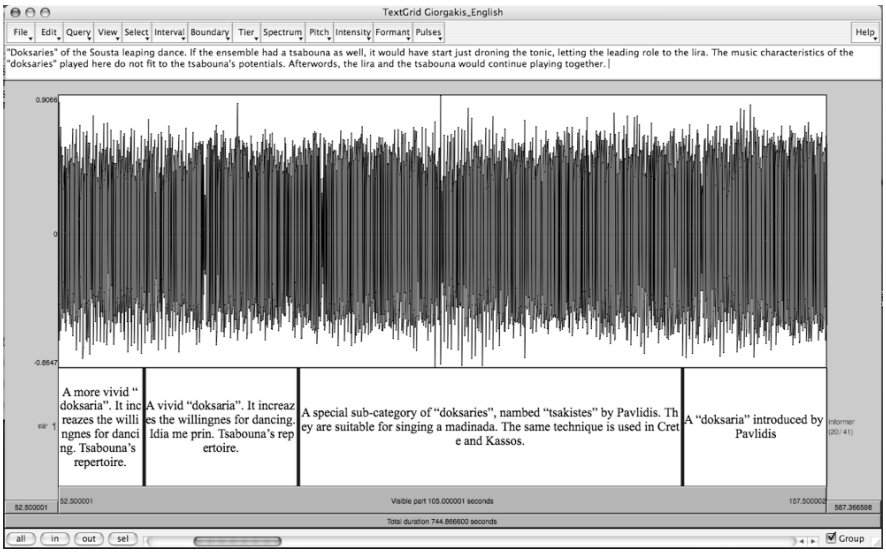

Figure 7. Informant's annotation screenshot

Tagging software tool

In order to proceed with the tagging process, an adequate software tool is required. After tests on several packages, PRAAT software was chosen. PRAAT is specially designed for 'doing phonetics by computer' by P. Boersma and D. Weenink from the Institute of Phonetic Sciences, University of Amsterdam (Boersma & Weenink, 2008). It is well known among voice and music researchers and has been used in numerous studies.

In our case, PRAAT provides an easy and user-friendly procedure for segmentation, tagging and storage of the tagging metadata to a database. Moreover, provided that PRAAT has many possibilities for sound analysis, one may easily use the metadata in a future project so as to analyze segmented music. In the following paragraphs, the entire procedure taken by a researcher and an informant through is described by presenting one example.

Segmentation and tagging metadata

PRAAT software applies an efficient way for segmenting and tagging the chosen audio sample. The *text-grid* object carries all the tagging metadata. Layers are described as *tiers*, while each interval is defined by *boundaries*. Tagging layers appear underneath the sound waveform. The fact that PRAAT offers a wide range of analysis tools (intensity, pitch, spectrum, spectrogram, waveform zoom, etc) makes the segmentation process even easier because one can be very precise on the position

of the boundaries that he/she sets. The aim is not to split the audio file into pieces but to indicate where each segment begins and ends. After the boundaries are set, the tagging process takes place. Metadata tags describe the content of each segment according to the user's opinion. ASCII characters are preferred for maximum compatibility.

Text-grid text file

After the tagging procedure is completed, the *text-grid* object is saved as a text file. This format allows a straightforward manipulation of the tagging metadata. It provides the information that is used by the web application in order to specify the time border for each segment. The structure of the text file is such that it is not difficult to transcribe the metadata into an XML schema for other uses. In fact, the segmentation could be done even without the use of PRAAT software as long as the user could specify the exact time stamp of each segment along with the name of the tag in a properly formatted text file.

Ethnographic data

Biographical information about the informants, as well as ethnographic feedback, is valuable for the evaluation of *Parataxis* project's analytical data. This material can be provided as plain text or even as special web pages, written by the researcher or even by the informant. Although there is not a template for the data gathering, we propose semi-constructed interviews based upon the special questionnaires of Liavas (1999) and Kavouras (1999). These texts can go into detail, varying with the different users. At this point, we shall make clear that the *Parataxis* project is a 'meeting point' for the analysis of music following the technique of *parataxis*. Hence, the abovementioned texts act as supplementary material to the main part of the project, which is the multilateral analysis of recorded music. It is the researcher's responsibility to evaluate both the tagged information as well as the texts provided by the users.

Parataxis web application

General description of the software

Computing is regarded as part of musical scholarship (Parncutt, 2007). The software that has been developed for the needs of this project intends to administer the data that will be produced after the annotation procedure, which was described earlier. It is

part of the suggested methodological tool, given that it does not simply form a data storage space, but a tool to investigate, process and represent data and conclusions. The design of the software intends to be used by Internet users; it is easy to use and incorporates open source technologies.

During this stage, our aim is to provide the methodological framework upon which we will provide a platform for the presentation of folk music sound recordings. Greater emphasis is placed on the formation of the requirements as well as the design of the software, given that the decisions that are taken during the first steps of the development play a significant role on the life cycle and generally the success of the project. The general functions of the software include the user's authentication, the management of the storage space where the sound and annotation files will be stored, the relational data base management, the output of the results on the Internet, as well as the ability to listen to the recorded unit. Users are classified in three groups: scholars, informants (which may be folk musicians, informants, native researchers etc.) and visitors. Every group has different privileges and abilities. Members of the visitor's group can only view general information as well as the annotation that have been classified as ‘public’.

Interface requirements

The user's interface is multimedia-oriented because the main input is a sound file and the output includes visual representation. The usage of the application requires menus formed as hyperlinks. The hardware requirements include a multimedia computer on the client's side, capable of running the software PRAAT and connected to the Internet; on the server's side it includes storage space, capable of storing all the recorded units. PRAAT software is necessary only during the annotation procedure. On the client's side, the software requirements are platform independent. For this reason, the use of the Internet is the best solution. On the server's side, the use of open source software is required. Communication requirements include a broadband connection for the transfer and reproduction of the recorded units.

Functional requirements

The function of administrating users and privileges requires a user authentication system. The user must enter his/her login code and his/her password. Then, access is granted with a set of privileges on using the files on the server. The server is capable of storing sound files and text files. Also, there has to be a way to send files to the server as well as renaming the file names and updating the database. The Relational Data Base Management System holds a significant part of the software, since data mining and knowledge discovery in databases have been attracting a significant amount of attention from researchers, the music industry and the media (Fayyad, Piatetsky-Shapiro, & Smyth, 1996).

With regard to the network services, the creation of a web page on the World Wide Web is necessary. Jobs are preferably executed on the server instead of the client, thus we use server-side programming, a popular web server and a scripting language. Among other things, the ability of communicating with the application author without

using email is required. After providing the annotation data to the application, real-time graph output is generated. The application must be available regardless of the current time or the day (24/7).

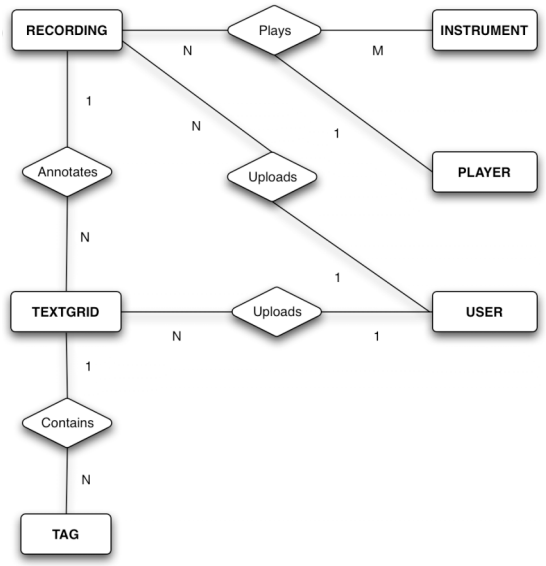

Figure 8. Entities - Relationships Diagram

Design

One of the diagrams that was produced during the design is shown in Figure 8. The database design process resulted in an Entity-Relationships Model containing six main entities: *instrument*, *player*, *recording*, *tag*, *text-grid* and *user*. One or more instruments may participate in every recording as well as one or more players. Every recording may be annotated by one or more *text-grid* files. Every *text-grid* file can be uploaded by only one user, and it contains many separate tags. Every recording is uploaded by only one user, but it may be annotated by several others. Apart from computational data, ethnographic data will be available through the web page. Biographical data derived from semi-structured interviews will be available in relation with each recording.

Implementation

The implementation of the software was established on a Unix-based operating system, an Apache web server, a PHP server-side scripting language, Javascript client-side scripting language, and a MySQL relational database management system. User authentication was implemented using sessions and cookies. After the

identification of the user, privileges management is assigned to the database. Sending files to the server is implemented using the 'post' method through a form. Database queries are handled through PHP scripts. Sound files are presented along with their metadata in a user-friendly interface (see Figure 9). The preferred data type is compressed audio, such as mp3, in order to require as little resources as possible.

Importing the data into the database requires uploading the sound file and the text-grid file. An uploading form is provided for each of the file types. Then, the application renders the data into an easy-to-use interface where the user can either listen to each segment separately or to all segments together as a unit. The application interface is implemented using xhtml together with Javascript for the execution of client-side scripts. The application is available on the web page http://www.parataxis.eu

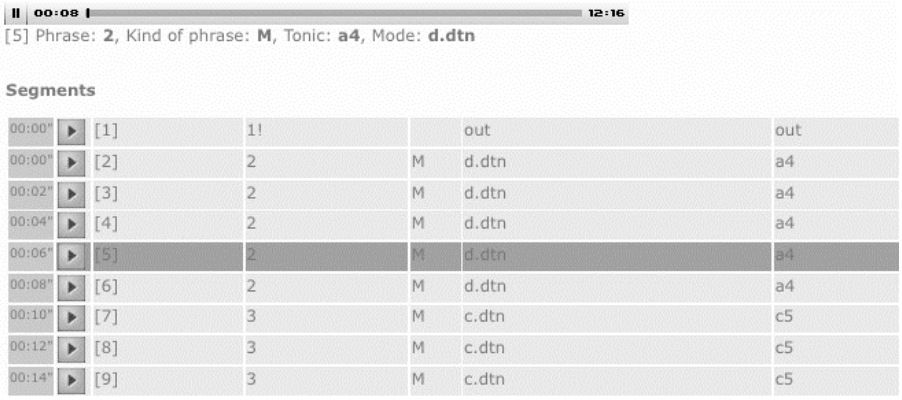

Figure 9. View of the web interface

Using *Parataxis*

In another article (Sarris, Kolydas, & Kostakis, forthcoming), we describe a case study in which the *Parataxis* project's analytical methodology is applied. We analyze a live recording of a *Páno Chorós* leaping dance performance from the village of Olymbos, Karpathos, played by the *lira* and the *laoúto*. The recording took place on *Vroucoúnda* (a peninsula of Northern Karpathos) during the *panigiri* (feast) of St. John in August 1984. The *lira* is played by the late Giannis Pavlidis, one of the most important musicians of his time. This recording has been issued on CD, among other recordings made by Kostis Dais (2005), a researcher of the folk music of Olymbos. We chose this specific recording since it was performed during a feast, and it was tailor-cut for the needs of dancers; hence, it is supposed to offer many chances for informants' comments, compared to a de-contextualized recording in a studio. At the same time, the village of Olymbos, as well as the *panigiri* of St. John, have been widely studied through bibliography (Kavouras, 1992). On the other hand, the *Páno*

Chorós dance is usually played by the *lirotsábouna* ensemble (*lira, tsaboúna, laoúto*), which is still in use in Karpathos. The study of this ensemble's repertoire, as well as the special playing techniques used both by the *lira* and the *tsaboúna*, can offer us hints about the introduction of the *lira* in the Aegean, which 'conformed' in the music environment of the *tsaboúna* (Sarris, 2007b). What is interesting in this specific example is that, since there is no *tsaboúna* in the ensemble, the *lira* player can 'divagate' from the *lirotsábouna* possibilities, and use music segments borrowed from the violin repertoire of the Aegean, which directly points to repertoire of the Asia Minor. These two separate worlds are evident through the scholar's annotation (made by Haris Sarris), which is found on our webpage. Hence, this piece is suitable for the study of a wide palette of music influences, which are 'filtered' through a specific instrument. In order to investigate this tangle of influences, repertoires and instruments, we use music network analysis. We consider the musical instruments involved in our recording, directly or indirectly, as the 'branches' of a network, while the recording is considered to be a 'knob': a conjunction point of great analytical importance, from which we can investigate the local, as well as the supra-local, relations of the network's branches.

The information retrieval is based on the musicological analysis of each segment, which is performed empirically. Regarding range and tonic, we rely on our analytical experience as well as on the knowledge of the possibilities of the music instruments involved. The notes mentioned here do not refer to the absolute pitch, but rather to the transposed pitch, given that the first string of the *lira* is tuned at A4 (440 Hz). The information about the mode is derived from the notes involved in each segment and from their melodic movement, according to Peristeri's theory (1968). Finally, the structural type is built from melodic analysis. On the other hand, the recording was tagged and annotated by four musicians from Olymbos, who provided four different views of the material under analysis (see our webpage). The tagging took place in three phases; in the first, both the informants and the researcher listened to the recording, making comments about technical issues. A free conversation followed about the musicians, the music, as well as the *ghléndi* etiquette. The segmentation took place in the second phase. The researcher, except for one case, used the PRAAT software. Finally, the third phase was the tagging. Through informant-researcher collaboration, the latter coded the information provided by the former. Hence, data gathered through the *Parataxis* project's methodology, combined with organological and ethnological data gave considerable clues regarding the interconnection between the musical instruments, the repertoire, and the social transformations that took place in Olymbos during the first post-War decades.

Epilogue

The technique of *parataxis* is strongly connected with instruments such as the *tsaboúna,* the *lira*, the *gaida*, etc. The improvising skill of the musicians is related to their instruments' limited possibilities on the one hand, and the need to keep the dance going, on the other. However, the skill of using the technique of *parataxis* in instrumental improvisations has faded among most of the younger generation's musicians. In the context of rapid urbanization, especially from the 1950's onwards, the old, 'peasant' instruments have been replaced almost everywhere by more 'sophisticated' ones, such as the clarinet or the violin. At the same time, the discography and the radio diffused a homogenized, song-oriented, pan-Hellenic[vii] (or even pan-Thracian or pan-Aegean) repertoire, which was mainly administrated by ensembles of professional musicians. Much more should be said about this transformation that changed the way dramatically of how younger generations of musicians (as well as the audience) perceive music. The new context did not favour the technique of *parataxis*. Hence, this repertoire is almost marginalized.

The goal of this article has been to propose an analytical tool suitable for such a repertoire. The main contribution of our methodology is that it offers a 'common ground' between scholars and folk musicians, as well as the possibility of collaboration between them. The *Parataxis* project can be useful for a variety of users. Musicians and music students can use it in order to analyze and document a performance; they may annotate one recording themselves, or even do this in collaboration with other musicians. This may help them to understand instrumental improvisations and study them more in depth. On the other hand, we believe that *Parataxis* would be helpful for the ethnomusicologist in order to access and study instrumental folk music. Far from the proposed parameter set, one may annotate any information necessary for his/her research purposes. He/she has the opportunity to use it as a tool for a 'second-by-second' encoding of data and information coming from folk musicians or other informants, hence 'charting' a music performance. If it is used together with other kinds of research, i.e. in the context of ethnographic research, this method will help scholars understand how improvising musicians are thinking when they are performing.

Our web database may hopefully act as a meeting point for everyone who is interested in analyzing instrumental folk music of the abovementioned areas. A user, regardless of his/her background, can upload a music piece as well as its annotation, while other users can listen to this piece and see its analysis. Thereafter, they may upload their own annotation; thus, many users may annotate a single recording[viii]. Hence, a corpus of analyzed instrumental music can be established by the contribution of different users. It is obvious that everyone will benefit from such a 'thesaurus', which can lead to a high amount of new data by the cross-examination of music material coming from different areas, musicians, musical instruments, etc. Data treasured in the web database can be used to preserve the improvisational techniques used by folk musicians and to teach improvisation to future musicians. Finally, it could be a contribution to our understanding of how improvisational music is constructed and reconstructed every time a piece of music is performed.

We believe that our methodology can act as a tool to enhance the dialogue between people of various backgrounds. In its present form, it is suitable for a multilateral analysis of structure at the level of structural units. In the future, a more developed version will help to shed light on more complicated topics, such as microstructure and macrostructure, as well as be useful for cross-examinations of music phenomena in an extended corpus of recordings from various areas. An interesting application of the *Parataxis* project could be in combination with automatic methods for recognizing isolated musical patterns, like the ones proposed by Pikrakis, Theodoridis & Kamarotos (2003), in which automatic recognition of musical patterns in Greek traditional music is proposed as a tool for the search and comparison of music extracts within a large multimedia database. Hence, convincing answers can be given to various questions such as: how, to what extent, and why does a musician perform a given tune differently at two different occasions? How can one define the 'improvisational identity' or the 'playing technique's identity' of a musician? How can one define the differences in ornamentation between two genres of an instrument's repertoire?

In order to provide convincing answers to the abovementioned questions, the study of instrumental repertoire has to be reconsidered. First of all, we have to establish a 'common language' in terms of terminology, which will be valid for any form of paratactic repertoire. The next step is to proceed to the establishment of a methodology for the 'charting' of the paratactic repertoire in terms of structural units. Furthermore, we have to bear in mind that music is an ultimate subjective experience, even when some of the music elements become part of a computer database. *Parataxis* project can become a useful tool for the analysis of instrumental folk music, as well as a means to help to understand the informants' points of view. It has to be used in a meaningful way in order to be useful. It is from this point that we can make clues about various music phenomena, focusing consecutively on microstructure and macrostructure, by which we can achieve a 'holographic' understanding of the music under analysis. We hope that this article will provide a fruitful field for discussions on our website (www.parataxis.eu). We firmly believe that everyone who wants to 'penetrate' into the charming world of folk instrumental music of the Balkans and the Aegean has, first of all, to understand the technique of *parataxis*.

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[i] Parataxis: from Greek verb *paratásso*, which means 'the act of placing side by side' (*pará*, beside + *tássein*, to arrange). It is a literary technique used in writing or speaking that favors short, simple sentences, often without the use of conjunctions.

[ii] Singing verse: a complete structural unit, where an entire circle of a song's melody is unfolded.

[iii] Motif: The smallest self-efficient, but not autonomous melodic unit, through which a melodic idea is emerging. Motivic logic: When motifs are standing out through the unfolding of a music segment; these motifs are placed side by side, they are modified, developed, or interchanged.

[iv] Melodic unfolding: When one cannot make out motifs in a music segment, but rather a unique unfolding melodic line. In melodic unfolding a 'melodic liquidation' of the original motivic material is taking place; that is a melodic development, through which one cannot make out any characteristic motifs.

[v] *Research Programme "Thrace"* (1995-2004) was an inter-disciplinary project of the Lilian Voudouri Music Library of Greece, dedicated to the research of the music tradition of Thrace and Eastern Macedonia provinces of Northern Greece. A large multimedia database was developed, where music recordings, interviews, photos and videos were stored. Access to the database is free after subscription, follow URL: http://epth.sfm.gr

[vi] Scholars do not get any instructions regarding the expected length of music segments. A segment may be a short instrumental motif, lasting a couple of seconds, or even a melody of a song. In general, instrumental segments of motivic character are short, while segments of melodic unfolding and song melodies are longer. Statistical analysis of a corpus of recordings (coming i.e. from a specific instrument from a specific area) through *Parataxis* would definitely reveal valuable data for the segments' length in relation to other musicological parameters.

[vii] The 'Pan-Hellenic' repertoire is a simplified and homogenized version of the folk music repertoire of Greece, which was introduced in the big cities of Greece (mainly in Athens) through the radio, the discography, as well as through folkloric dance groups. The music pieces were orchestrated and played by mixed orchestras of Greek folk instruments. The musicians were professional soloists from various areas of Greece, hence they 'grafted' the music they played with exogenous music elements. The power of the radio broadcasting brought about the vast diffusion of this new music aesthetics.
[viii] Anyone willing to annotate a music piece from our database may request the recording, so as to proceed using PRAAT as described above.

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