

Analytic Interpretation. Steps towards the Exploration of a Research Field exemplified on Metric Structures.

Dissertation Abstract

The dissertation introduces a new research approach on the relationship between a musical composition and its performance. Adorno argued that an analysis of the composition is an essential prerequisite of its performance. Hence the question arises as to how far an analysis may serve as a basis for decisions about interpretation. Various studies (such as in [Riemann 1884], [Adorno 1976], [Berry 1989], [Epstein 1987], [Sundberg 1993], [Mazzola 2002]) have contributed to a promising approach within performance theory, which defines the performer's role in the following way. The task of the performer is to elucidate the structure of a piece of music to the audience, in other words, to communicate his understanding of the piece to the listener. The dissertation investigates the relation between analysis and performance by discussing the proposals and results of these researches within an experimental approach. Computer-aided performances were produced on the basis of musical analyses and evaluated within listening experiments.

The experimental approach was carried out with the RUBATO Workstation for Musical Analysis and Performance (see <http://www.rubato.org>). It models the *transformative process* from the symbolic reality of the signs of the score into the physical reality of sounds. In the concept of the workstation and the theory behind it the performance transformation is modeled on the basis of analytical data and the method of applying analytical weights in order to shape the performance. The analytic tools of RUBATO include modules for melodic, metric and harmonic analyses. The analytic structuring of the score with the help of these tools (called *Rubettes*) results in numeric *weight values* for each note, whereas each weight depends on the chosen analytic perspective and represents *one* analytic view on the piece. The user produces a mapping between score events and physical events by choosing the analytic weights as well as the operators which affect the performance parameters: should the analytic information shape the timing or articulation or dynamics or...? This mapping results in a MIDI-file-output. Thereby RUBATO produces by no means automatic performances on the basis of the analytic weights, since the user can influence many parameters of the transformative process and can thus experiment with different ways of "expressing" an analysis with the help of a performance.

The dissertation focuses on the relation between analysis and performance concerning *metric structures*. It introduces a notion of *metric coherence* based upon the model of inner metric analysis implemented in the *MetroRubette*. Inner metric analysis studies the metric structure of the notes of a given piece without considering the time signature and bar lines and is opposed to outer metric structure given by the accent hierarchy of the bars. The analysis results in a metric weight for each note of the score. The notion of *metric coherence* describes the correspondences of varying degrees between the outer and inner metric structure. As a result of the explorative work with the model, a higher degree of coherence was detected within those works, which are typical representations of the accent scheme given by the time signature. Furthermore metric

ambiguities, as those in the works by Johannes Brahms, can be described as a divergence between inner and outer metric structure. The results of the metric analyses on various compositions discussed in chapters 1-5 give hence surprising insights into the understanding of metric architectures of compositions. The comparison of the results of inner metric analysis with the method proposed in [Povel/Essens 1985], which aims at the description of perception of temporal patterns furthermore brings to light an interesting correlation between the results of the pulse- or "clock"-finding algorithm based on accents of rhythmic grouping and the results of the metric weights. Hence the first part of the dissertation investigates the proposed notion of metric coherence by applying it to various pieces of different styles as well as to pieces belonging to a corpus (Symphonies by Brahms, Bach's Mass in B Minor) the suitability of the analytic methods concerning the description of metric characteristics of compositions.

The following chapters (6-9) of the dissertation are concerned with the exploration of the question, of how far metric analysis might serve as a basis for decisions about interpretations. They include the discussion of theoretic approaches (see [Riemann 1884]) as well as experimental approaches (see [Clarke 1993], [Drake/Palmer 1993], [Todd 1985]) in order to study findings, methods and questions of performance theory which can be related to and tested within experiments with RUBATO. In a first approach complex performances have been shaped on the basis of various analytic weights (including melodic and harmonic weights as well) for two piano pieces (Beethoven's Pathétique and Schubert's Moment Musical op. 94 No. 6). They have been performed on a Yamaha Diskpiano and have been evaluated within listening experiments regarding their musical adequacy. Concerning the evaluation of the underlying analysis and hence the relation between the analysis and the performance it is argued that positive responses of the participants can be interpreted as indicating that the analysis as well as the specific way it influences the performances might transfer some proper information about the piece to the listeners. A convincing relationship between strong/weak inner metric accents and a proper corresponding increasing/decreasing of timing was detected by evaluating the performances aesthetically. This result is related to the findings in [Drake/Palmer 1993].

In order to gain a precise description in how far metric weights might help to shape a performance that elucidates the metric structure to the listeners an experiment is described in chapter 8 in which questions were formulated as if they were ear-training tasks. Drum rhythms were played with various structures of *accentuation*, arising from metric weights of different degrees of coherence. As the outcome of the experiment conducted with 46 persons, a relationship was detected between metric coherence and the understanding of the corresponding interpretation by the listeners. Metric weights of higher degree of coherence led to a more convincing interpretation regarding the question in how far the metric structure was expressed properly. These results may be taken as an indication for a relationship between analytical structures of the score and the understanding of the performed music by listeners through suitable expression of these structures within a performance.

The underlying model concerning metric structure does not claim to model the cognitive aspects of understanding metrics in the first place, instead it aims at the description of structural features of the score. Hence the notion of metric coherence is a music-theoretical term. It has been tested empirically by applying it to various compositions of different styles. The evaluation within the listening experiments furthermore enlightens the suitability of the metric weights to transfer structural aspects to listeners. Therefore the *analytic interpretation* contributes to actual efforts within musicology to close the gap between empirical studies without a sufficient theoretical

background, and theoretically complex models which, by their very complexity, are unable to be empirically tested.

Overview

Chapter 1 introduces the model of inner metric analysis of the MetroRubette and suggests the notion of metric coherence.

Chapter 2 demonstrates the application of the model on various compositions, which relates to controversially discussed questions in music theory concerning diverse metric phenomena. Regarding *Mozart's Sonata A Major K 331* there exist at least two different approaches concerning the grouping of the very beginning (see [Meyer 1973], [Gabrielsson 1987], [Lerdahl/Jackendoff 1983]). Furthermore in [Maurer Zenck 2001] it is argued, that the time signature of 6/8 in this case should be interpreted as being a composed version of 3/8, e.g. two measures of 3/8 form one measure of 6/8. Inner metric analysis confirms this latter observation as well as the downbeat grouping of the very beginning which have been favored within most theoretic approaches.

Schumann's Third Symphony is analyzed regarding a divergence between notated and perceived meter as stated in [Epstein 1987]. This divergence is described as a divergence between inner and outer metric structure; inner metric structure suggests an interpretation as 3/2 and hence confirms Epstein's observation. The B-part of *Schubert's Moment Musical* op. 94, No. 4 gives rise for a discussion of the 'proper' placement of the bar with the help of inner metric analysis. By comparing metric analyses of works by *Ockeghem*, *Dufay* and *Binchois* different musical styles are characterized which corresponds to a description in [de la Motte 1981] of these styles. *Handel's Sarabande* gives rise to a discussion of the influence of the original dance Sarabande on metric characteristics of his piano piece.

Chapter 3 discusses metric analyses of the four symphonies by Brahms. Characterizations of metric peculiarities in different research approaches ([Schönberg 1976], [Frisch 1990], [Epstein 1987], [Epstein 1994]) are compared to the results of inner metric analysis. Central findings of their theoretic approaches confirmed with the outcome of the metric weights, such as placing a progressively greater stress on the weak beats of the bars. Epstein's descriptions of peculiarities of the Second Symphony such as hidden 6/8 structure within time signature 3/4 or robbing the attack on the last beat of the measure as well as the detection of passages without any clear structural accents have been specified and confirmed within inner metric analysis. Furthermore the detection of motivic relationships between larger parts of movements (such as between exposition and reprise) was gained with the help of common characteristics of inner metric structure. The description of various types of interaction between instrumental parts such as forms of mutual metric backing or annihilation enlightens new insights into the metric architecture of Brahms' works.

Chapter 4 explores diverse forms of metricity within the vocal parts of Bach's Mass B Minor. In comparison to compositions of the classic or romantic epoch the pieces by Bach are lacking more often a regular accent hierarchy within inner metric structure, although metric coherence in some cases (for instance within the *Pleni sunt coeli*) can be stated as well. The diverse forms of metricity are discussed concerning *stile antico* and *moderno*.

Chapter 5 compares the model by Povel and Essens and inner metric analysis. Despite different analytic approaches both methods are in accordance when applied to the examples discussed by Povel and Essens; this points to a special relationship between grouping and meter within these examples.

Chapter 6 discusses the theoretic approaches ([Riemann 1884], ([Riemann 1905]) of performance theory as well as experimental approaches (Clarke, Drake/Palmer) in order to study findings and questions which can be related to experiments with RUBATO. Riemann's proposal concerning shaping of timing in accordance with metric structures is compared to the finding in Drake/Palmer as well as to the model of Todd. A revision of Todd's model of expressive timing and a comparison with tempo hierarchies implemented in RUBATO furthermore concludes in a proposal for an experimental testing of Todd's model.

Chapter 7 documents performance experiments with RUBATO. It includes the description of shaping complex performances regarding Beethoven's *Pathétique* and Schubert's *Moment Musical* op. 94 No. 6 on the basis of analytic weights and their evaluation within listening experiments. *Timing* was in these cases shaped with coherent metric weights. A convincing relationship between strong/weak inner metric accents and a proper corresponding increasing/decreasing of timing was detected by evaluating the performances aesthetically. Findings of Riemann, Drake/Palmer and Todd's model could be related to the results. Furthermore harmonic weights have been tested as well regarding their suitability concerning the shaping of timing and melodic weights concerning dynamics.

Chapter 8 reports the listening experiment concerning metric coherence. Monophonic and polyphonic drum rhythms were played with various structures of *accentuation*, arising from metric weights of different degrees of coherence, e.g. different performances have been shaped on the basis of different metric weights of the piece. Furthermore the question was explored in how far it is important for the listeners, that the structures of accentuation “fit” with the inner metric structure. Therefore another performance was gained by using a metric weight resulting from an analysis of a *different* piece, which is characterized by coherence of a high degree but stems from a different structure. Listeners rated the various performances by comparing pairs and assigning the better one. The results of the experiments suggest that metric weights may indeed help to transfer structural information to the listener within a performance. Metric weights of higher degree of coherence led to a more convincing interpretation regarding the question in how far the metric structure was expressed properly.

Chapter 9 concludes the results of the dissertation.

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