

Analysis of György Ligeti's second string quartet: Second Movement

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1 Introduction

Once asked which of his pieces, György Ligeti, considers the most important for his stylistic developments, he mentioned the second string quartet which reflects his ideas most clearly and where one would find all the different techniques he has used up to the late 70s (Varnai et al. 1983).

In this paper, we have chosen to analyze the second movement among five of Ligeti's second string quartet. The main reason for this choice is the great structural link and plurality of structures from a compositional standpoint and strong emotional forces achieved in this movement from a perceptual standpoint, both in a global and local manner.

In his writings and interviews, Ligeti encourages a multiplicity of views in regard to analysis of his works due to his own approach towards composition. This view has caused different and in some cases contradictory views of his works in the literature. In this analysis, we use several techniques described by Ligeti and others to examine the piece and demonstrate certain moments, locally and globally, when a link of compositional structures reach certain emotional factors

as described by Ligeti.

In the following section we briefly introduce three different analytical views on Ligeti's works. We then provide our methodology and objective towards this analysis, followed by the analysis itself and some reflections.

2 Different Analytical Views

Richard Toop, the author of a book on Ligeti, provides an analytical overview on three of Ligeti's works in the 1960s in (Toop 1990). In his analysis, he constantly refers to the techniques Ligeti describes in his conversations (1983). In the mentioned article, he analyzes three pieces for keyboard instruments: *harmonies* for organ (1967), *Continuum* for harpsichord (1968), and *Coulée* for organ (1969). In his analysis, he describes the ways Ligeti uses different techniques specific to that period. We describe some of the terminologies which pertain to our analysis:

- wave patterns
- Expansion and contraction of the patterns' amplitude, speed and etc.
- blurring technique
- super-cold expressionism
- clocks
- clouds

All of the terminologies above, have been borrowed from the composer himself. *Wave patterns* refer to trajectories over time that Ligeti introduces on certain musical material in a particular section or throughout the piece. *Blurring technique* is a wide terminology used by the composer that refers to masking of sound and strategies. *Super-cold expressionism*, again, is a term used by Ligeti and most often refers to passages with mechanical nuances which are most often disturbed from their original register formation. The terms *Clocks* and *Clouds*, besides referring to one of Ligeti's pieces for orchestra and voice, are metaphorical descriptions of contrasting sonic environments often observed in his music

of that period. In his analysis, Toop evades an overall analysis and remains on a microscopic level, observing how these different techniques manifest in the pieces mentioned.

Sabbe (1987) has provided a different view mostly based on psychological and perceptual measures of audition. In his analysis, he uses principles from communication theory, information theory as well as auditive illusions to analyze the effect of Ligeti's compositions on music perception.

A different analytical view belongs to (Kyburz 1990) where he tries to demonstrate the numerical foundations of the second string quartet. In his paper, while criticizing the efforts of Sabbe (1987), he shows that the structure of many of Ligeti's pieces of that period relates to the number 11 in one way or other. For example, by counting the number of metrical units in each movement of the second quartet, he shows that the number of events in the second movement is equal to 221 or $(20 \times 11) + 1$ and the number of events in the whole quartet is 1332 or $(11 \times 11 \times 11) + 1$. He further shows that the total number of notes in each movement follow the same consistency. As an example, the number of notes in the second movement is 462 or 42×11 and the total number of notes is 13221 or $(1202 \times 11) - 1$.

3 Methodology

In our analysis, we will demonstrate some of the techniques used in a local manner but will focus mostly how these different views gather together to form an overall structure. We have come to the conclusion that due to the plurality of the musical material and extreme *blurring* at some points in the piece, it is hard to demonstrate a dominating technique in a long span of time in the piece despite the fact that at some particular points, some techniques are quite evident.

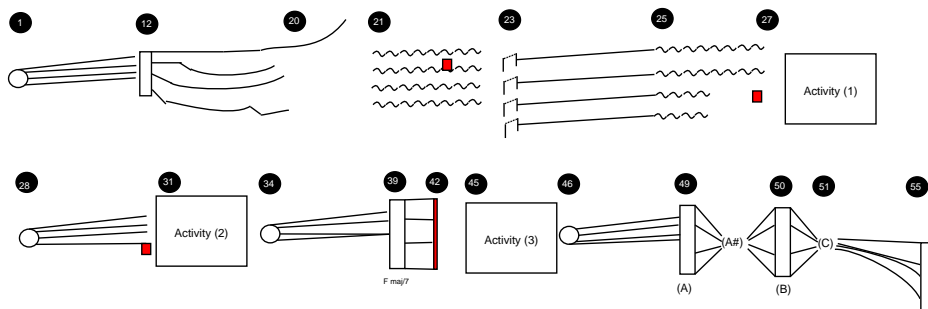


Figure 1: Formal diagram of the second movement of Ligeti's second string quartet

4 Analysis

4.1 Global picture

Figure 1 shows a formal diagram of the second movement according to local activities, their movement along with their measure numbers and pitch directions. In this diagram, circles show a centered pitch and lines show the direction of propagation from that center. Hollow boxes show sustained chords observed in several locations, filled small squares demonstrate local abrupt activities and activity boxes demonstrate different activities.

We consider various aspects of this picture using the terminology provided in Section 2.

4.1.1 Clocks and Clouds

Using Ligeti's terminology and fascination with the sonic idea of "clocks" and "clouds", one can consider the second movement as a "cloud" in relation to other movements, specially the first movement. One can argue on the relevance of the classical *slow* second movement in a string quartet to this extent. However, a closer look at the piece shows that one of the main structural elements in the piece is the contrast between the so called clouds of *wave patterns* and dynamic clock sections which are characterized by their high range of activity in pitch register, abrupt nuance changes and dense energy.

The “clouds” in this movement are slow changing trajectories in Figure 1 which demonstrate low activity in a short time-span. As an example, the movement starts with all strings playing pitches centered on $G\#$ and gradually moving upward. The overall tendency of most pitch *wave patterns* in this movement are upwards except for the ending and a short period of time in measures 14 through 17. This upward movement gradually constructs the main characteristic of the “clouds” in this movement and in this respect, the descending movement in the end can be considered as a cadence.

On the other hand, “clocks” are characterized by their high range of activity. The first of these activities occurs briefly in measure 21 with *sforzando* with different timing between the strings, marked in Figure 1 as a small filled box. The second, activity number 2 in figure, occurs at the end of measure 27 with downward jump in the violins and upward in viola and cello. These two seem to be preparing *Activity(2)* in measures 31 through 33. A close look at the pitches of measures 31 and 32 shows that all the 12 tone series have been introduced in each measure with various nuances and registers. This dense structure almost at the midpoint of the movement, demonstrate a climax of contrast. Moreover, this particular passage lies in the category described by Ligeti as *super-cold expressionism* where a certain passage is introduced with high register and nuance jumps. The last “cloud” or activity in the diagram, however, seems to clarify itself in a different situation. It is the first time in the piece that a descending pitch pattern is explicitly shown while most of the movement is dominated by ascending ones. This particular activity can be viewed as a premonition of the cadence as well as contraction of the descending pattern.

5 Local Analysis

In this section we provide local analysis of measures 1 through 12 with regards to observed activities and criteria described by Ligeti himself. We focus our attention on *wave patterns* and how the structure forms itself.

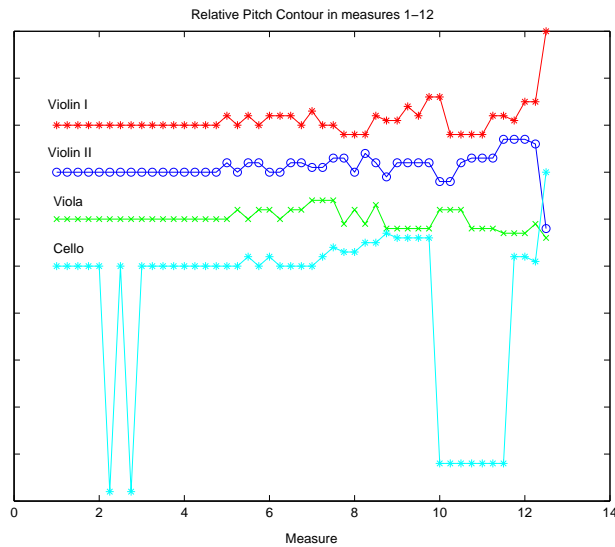


Figure 2: Pitch Wave Patterns, measures 1-12

An immediate observation in measures 1 to 12 is the pitch trajectory in different instruments. The movement starts with different introductions of $G\#$ in the four instruments. They will be all followed by a general ascending pitch pattern leading to the chord introduced in measure 12. This part of the piece is of particular importance because the same pattern occurs in other clouds but with different departure and arrival points. Figure 2 shows the pitch pattern observed from measure 1 to 12 until the mentioned chord in the four instruments and without any regards to their exact point of entry. In this figure, the ground zero pitch for all four instruments are assumed to be $G\#$ and everything else is measured numerically according to number of semi-tones. The jumps in the cello are two-octave leaps.

This figure, suggests a strategic expansion of the pitch intervals towards the harmonic cloud in measure 12. $G\#$ is also the last note from the first movement, suggesting a continuation geste between the movements.

Another important factor in the notation of these measures, which again occurs throughout the movement, is the different rhythmic subdivisions for each instrument and throughout the measures. These divisions are partly responsible

for non-period entry points of different instruments when moving the clouds are progressing. But more importantly, it is interesting to examine Ligeti's obsession with wave patterns of such rhythmic structure. This kind of wave pattern is particularly important in the third movement and the very beginning of the last movement. Note that the divisions used throughout the movement are 3, 4, 5, and 6. Figure 3 shows the pattern taken out of different rhythmic division of each measure between measures 1 and 12.

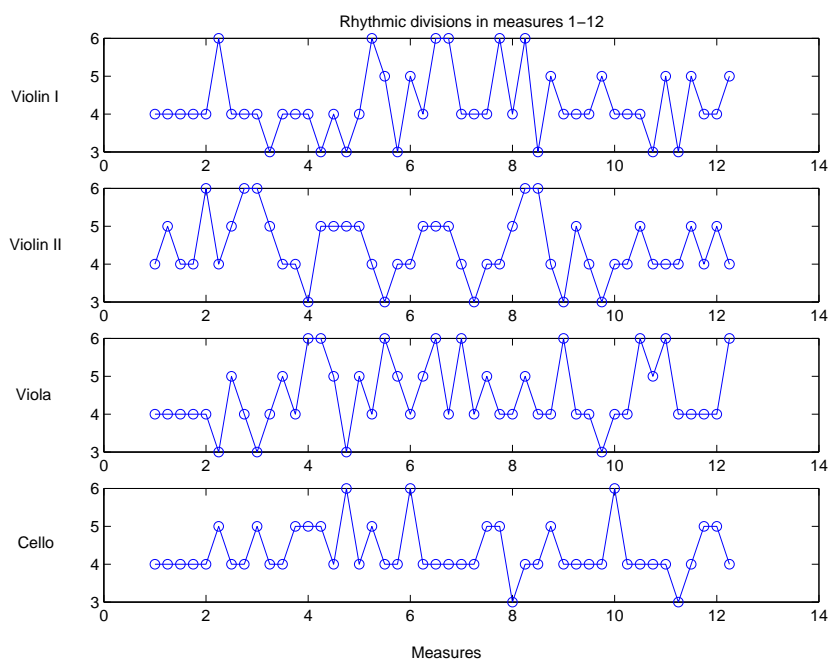


Figure 3: Rhythmic Division Wave Patterns, measures 1-12

An initial look at Figure 3 does not reveal much structural pattern but a closer look might give some hints: It seems like the local activity in measures between 6 and 8 reach a climax.

In order to examine this hypothesis, we introduce a measure of *entropy* over the sequence of data gathered. The basic concept of entropy in information theory has to do with how much randomness is in a signal or in a random event. An alternative way to look at this is to consider how much information is carried by the signal. In short, entropy is a measure of this randomness,

suggested by Claude E. Shannon (Shannon 1948). If we consider the sequence of data gathered as x with N temporal elements, in this case different rhythmic divisions through time, the entropy of the sequence at each time n is equal to:

$$H(x) = - \sum_{i=1}^n p(i) \log_2 p(i) \quad (1)$$

where $p(i)$ is the probability of occurrence of $x(i)$ in the sequence. For this example, we compute $p(\cdot)$ from the histogram of the observed sequence and we compute $H(x)$ starting from the middle of measure 3 and increasing n (or the memory) until we reach the end of the sequence in measure 12. Figure 4 shows the entropy for each instrument sequence as well as average entropy measure on the rhythmic subdivisions in measures 1 through 12.

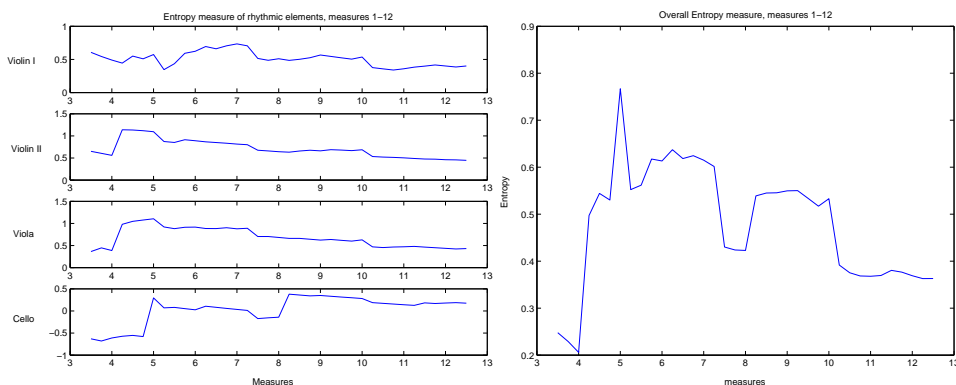


Figure 4: Entropy on rhythmic divisions of measures 1-12, for each instrument (left) and average overall (right).

This figuration suggests an overall strategy in this section of the piece which is an increase in “randomness” and back to order towards measure 12. It is interesting to see how both perceptually and numerically this assumption agrees with the score.

A closer look at the score in these measures shows that, besides the two factors seen, instrument figurations (*sul tasto*, *sul pont.*, etc.) and few nuance changes in this section follow similar patterns along the same structure observed above. This observation, can not be easily deduced from the score and is a

result of Ligeti's multiplicity of structure layers which result emotional forces and high-level structural patterns in the piece.

6 Conclusion

In a conversation with himself, Ligeti emphasizes the role played by speculative elements on the one hand and the emotional factors on the other as (Varnai et al. 1983):

(...) The initial impulses that set the act of composition going tend to be naive in character. I imagine the music in the form in which it will later be heard, and hear the piece from beginning to end in my inner ear. (...) Structural features, worked out during the process of composition, transform the music from its raw state into a musically consistent and linked network. Composition consists principally of injecting a system of links into naive musical ideas. (P. 124).

In this analysis, we attempted to look at the second movement of his second string quartet in this regard by looking at various structural elements at work both globally and locally for the introductory measures of the movement. While this analysis does not demonstrate all the aspects of Ligeti's structural composition and "inner ear", it provided a simple framework for analyzing low-level structural elements in Ligeti's music in order to reach higher order, perceptual elements of the music of Ligeti.

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