Alexander Stankovski/Mirrors Within Mirrors

Alexander Stankovski, Daniel Mayer and Gerhard Nierhaus

Alexander Stankovski was born in Munich and grew up in Vienna.[1] He had piano lessons from the age of six years and music theory lessons from the age of 12. When he was 16 he attended an analysis course with Karlheinz Füssl, where Beethoven's Piano Sonatas were analysed from the perspective of the Second Viennese School. The concentrated atmosphere and stimulating discussions gave Stankovski his first opportunity to speak precisely about music, where form could be analytically described, and therefore in part, its meaning and reception could be better understood. Shortly after, he began to study composition and music theory at the University of Music and Performing Arts Vienna. His main memories from this period of study are of a conservative, and sometimes authoritarian mode of academia. Memorable rays of hope for him were at the electronic music department, ELAK, where instead he found an environment which fostered chaotic-production, where Stankovski created his first composition for tape. It was also unforgettable for him, when he heard the first concerts of the ensemble known today as Klangforum Wien (when it was still under the name, Société de l'Art Acoustique) at a time when composers such as Sciarrino, Grisey, Lachenmann, Furrer or Nono, were still completely unknown in Vienna.

[1] Biographical introduction and texts from the composer translated from the German by Tamara Friebel.

A. Stankovski
Institute for Composition, Music Theory, Music History and Conducting,
University of Music and Performing Arts Graz, Graz, Austria
e-mail: alexander.stankovski@kug.ac.at

D. Mayer · G. Nierhaus (✉)
Institute of Electronic Music and Acoustics, University of Music
and Performing Arts Graz, Graz, Austria
e-mail: nierhaus@iem.at

D. Mayer
e-mail: mayer@iem.at

G. Nierhaus (ed.), *Patterns of Intuition*,
DOI 10.1007/978-94-017-9561-6_9

After graduating, Stankovski went to Frankfurt to study with Hans Zender in his newly founded composition class, where he also met personalities like Isabel Mundry and Hans-Peter Kyburz. They all inspired his future: on the one hand he learnt a reflective analysis of tradition, which is not just simply taken for granted and continued but instead is based on the experience and broaching the issues within its historical distance, and on the other, he absorbed the development of rational, compositional strategies that could be formulated, forming something like the "syntax" of a possible music language.

However, perhaps the most important influence during this time in Frankfurt came from literature and painting, where from Fernando Pessoa and Gerhard Richter he learnt about the recognisable splits and schisms of the creative personality in diverse artistic media: the oeuvre of an artist is not a succession of separate "creative periods", but a conscious contrasting, so to say, a contrapuntal juxtaposition of sequences of works that abruptly oppose each other; although between these oppositions, subcutaneous connections can exist. As in Pessoa's heteronyms, where multiple imaginary characters can be created by one writer to write in different styles, fictional poets with their own biographies and different aesthetics, for example, seen in Richter's harsh coexistence of the most diverse painting techniques, where there is no continuous style or personal signature, but the person appears as a "common denominator" of the differing, conflicting expressions. The Belgian poet, Henri Michaux, 10 years younger than Fernando Pessoa, had already held this stance for a long time. He wrote in 1937: "Il y a pas un moi. Il n'est pas dix moi. Il n'est pas de moi. MOI n'est qu'une position d'equilibre (Une entre milles autres continuellement possibles et toujours prêtes.)".[2]

These thoughts are also present in the work of Stankovski. The continuity and quality of his work doesn't show itself in an intended, readily recognisable personal style, but in the continuous leading of new and differing working compositional modes. In 1996 Stankovski returned to Austria and worked for a few years as an assistant in the composition class of Michael Jarrell at the University of Music and Dramatic Arts Vienna.

Since 1998, alongside his composing career, he teaches counterpoint, music theory and musical analysis at the University of Music and Performing Arts Graz.

At the moment, besides the string quartet he is composing for this project, he is also working on two multimedia pieces that demand very different aesthetics and compositional techniques. The first is an opera project using an old Chinese ballad and the second is a melodrama for speaker and instrumental ensemble, using a text from the Austrian author Xaver Bayer.

[2] "There is no I. There are not 10 I's. There is no I. I is only a position of equilibrium (which is only one among a thousand others, with unending possible variations, always ready for delivery on demand)." Quote [7, p. 217] translated from the French by Alexander Stankovski.

Artistic Approach

Statement

I believe in the meaning of art, in which each artist in his or her work must find and invent a means of expression, which is independent of its use and worth.

I believe in intuition, which through the artist as a person enables a vision of something not yet in existence to emerge, becoming reality uniquely from him or her.

I believe in a communication between the composer and musician, the musician and composer and between the composer and listeners.

I believe in being a self-critic, where a view of one's own work is as if they had an outsider's perspective.

I believe in chance, where unexpected results can arise, even with the most detailed planning.

Composing means for me, that decisions are made, "lines are drawn" and constraints are envisaged. I am unable to compose without a selected and defined scope of constraints. The definitions themselves, the containment of my possible decisions, can change from piece to piece and even within that, from movement to movement, from layer to layer or from section to section. I'm interested in the juxtaposition of differently defined regions. It is not about the mediation of opposites, rather it is about the representation and experience of incommensurability.

Personal Aesthetics

I have no personal, recognisable style and I also do not aspire towards one. I attempt, on the other hand, to put out as many different artistic goals from piece to piece as possible, as far as it appears achievable within my means. On the other hand, I often come back to already posed queries and thoughts. Various differing work groups and series are formed, intentionally, where it could appear to have been produced by different composers.

Pieces with implicit or explicit reference to works from past epochs, which will in turn become their own structural foundation, where the association to the original text of "komponierter Interpretation" (Hans Zender),[3] reaches its own full re-forming of the musical material. I have directly referred to compositions of Arnold Schönberg, Johannes Brahms, Anton Webern, Girolamo Frescobaldi and Claude Debussy in a row of pieces and in each case have reworked them in very different ways. There is also, alongside, a reference to one's own tradition, i.e. fragments from earlier works can become the basis for new compositions.

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[3] "Komponierter Interpretation" refers to "composed interpretation", see Hans Zender: *Schuberts Winterreise—Eine komponierte Interpretation* für Tenor und kleines Orchester (1993).

Pieces, which are conceived as monodic lines and respectively as contrapuntal networks of multiple lines. One of the applied techniques at this juncture is an imprecise mirroring of material, in order to bring forward a self-referential virtual, unending continuity.

Pieces, where non-musical "objets trouvés" are used (for example, sounds of nature) and an attempt to most accurately transcribe these sounds for instrumental music, which implies to refrain mostly from an immanent musical logic, replacing it with a given "extra-musical" sound shape.

Pieces with a spontaneous approach, without premade conscious defined rules: being thrown back on one's own subjectivity without diversion of one's own decisions made through a self-inflicted resistance.

Pieces especially written for radio, with a focus on text.

Pieces, where the central compositional strategy is based on the reduction of the available means.

Pieces with mixed approaches, which consist of stylistically and technically very different parts. The resulting tension should simultaneously create the impression of incommensurability and the interrelation of individual parts of a composition.

It can be seen, that out of these anytime-expandable-categories, my compositional work should reflect our present time, with its abundance of artistic possibilities, but also at the same time should place itself as something new against the virulent questions about the definition and meaning of the artistic subject which has been a theme since the end of the 19th century.

Formalisation and Intuition

At the beginning of the compositional process a number of things can exist: a formal idea, the involved instruments, a text, etc. The imagination of a piece at the outset is indeed undefined with respect to details, but it can however have a very strong conception, that already over a long time, sometimes over years, has stayed in the thought process before it becomes a reached goal. The way to this point, the compositional technique, must be invented and found during the compositional process.

Starting from a general conception of a piece, I arrive, via the formulation of rules, to the realisation of these. The rules here are not ends in themselves, but are preliminary signposts, which after the musical results that they lead to, are judged and can accordingly, if necessary, be changed. The deviation of the rules can also lead to their abolishment; in extreme cases the rules serve only as a beginning point in order to dismantle them.

Composition can refrain from formalisms only with difficulty, although this was necessary in certain moments in music history during which especially interesting music was created—e.g. during the so-called free atonal phase (around 1908–1923) of the Second Viennese School.

Composition must always be more than a act of formalisation. Formalisation is only the first step, then a second must follow: a critical debate with the rule-generated, and the detailed post-editing from within (transcribing data), or if applicable, also its destruction from outside (overwriting data).

The decision, when, if and to which degree the transcription or overwriting occurs, can in my judgement, not be met on the level of formalisation, but through an instance which attempts to receive the vision of the relation between technical means and their musical effects.

Evaluation and Self-reflection

In judging the quality of one's work and thus its meaning, opens a wide range of self-delusion and even self-deception. I think that a composer cannot decide alone if a piece has turned out well or not: the quality of the piece reveals itself only in the process of how it is dealt with. A piece turns out as what it is, by communicating with musicians and listeners (and the composer is also one of them). This is the only way to release the potential that is inherent in the piece, and to open the possibility for it to act in which way, whatever way it should. The self-judging of the composer has to go beyond aesthetics, compositional techniques and subjective private matters and has to consider the effect on others, foremost on the performers. Otherwise there is the danger that "reflection" degrades to an academic ritual of navel-gazing.

Project Approach: The Mirroring Technique

One of multiple techniques, which I have developed in the course of time, to realise a specific artistic goal, is what I call the "mirroring technique" (Spiegeltechnik).[4] This is in contrast to traditional mirror techniques, for example the canon by inversion ("Spiegelkanon", literally, mirror canon in German), the inversion of a fugue theme or a retrograde inversion construction, which can be found in the work of composers like Guillaume de Machaut, Johann Sebastian Bach or Anton Webern. Musical material is not directly worked with, but the intervals and durations are carried over into numerical values, which are ordered in a retrograde, where the inverted number either remains the same or becomes varied by a certain value. The resulting number series is then translated back into traditional notation.

The goal is a kind of genetic code that is based on a clearly defined initial condition, allowing in every moment a tangible musical connection, but offers nevertheless

[4] Purely on a technical level, this distinguishes between spatial mirroring, the reversal of the direction of the movement of intervals (inversion) and the reversal of the temporal sequence (retrograde). While in the first case the rhythm remains unchanged, in the second part there is "mirroring". What is here called "mirroring technique" is primarily concerned with the temporal mirroring of the musical material, but in a broader sense refers to other applied techniques.

sufficient room for unexpected development. An example of this is my *Courante* for solo violin—a piece that belongs to the above mentioned second category, that means it is constructed as a monodic line: a rhythmic and intervallic initial cell (a shorter plus a longer value) becomes symmetrically mirrored around an axis (denoted by a dotted line), the cell and its inverse mirrored a second time and so on. A melodic flow is created which repeats the initial material over and over but it also transforms it constantly into a different shape or form. The intervals and rhythmical values are inverted independently from one another, where the mirrored values can show minor deviations, in a way that keeps the information of the beginning present but broken in a constantly changing way (Fig. 1).

The starting material consists rhythmically of the proportions 1:4, which is mirrored as 4:1 (bars 1 and 2). The proportions remain identical, but their assignment and therefore durations are changed: a 16th quintuplet (5 notes per quarter note) becomes a 16th quadruplet (4 notes per quarter note). In the following mirror (bar 3) the allocation is changed as well as the value of the first number pair: 1:4/4:1 becomes the proportion 2:5:4:1, measured in the 16th sextuplet (6 notes per quarter note). From these results in the following two mirrors (from bar 4 until bar 8 inclusive) 1:5:4:2:2:4:4:1/1:4*:4:1:2:3:5:1:1:4:4:1:1:4:3:1, with changing allocations (sextuplets, quintuplets and quadruplets). The values marked with a star (*) are split in a pendulum movement made from identical notes.

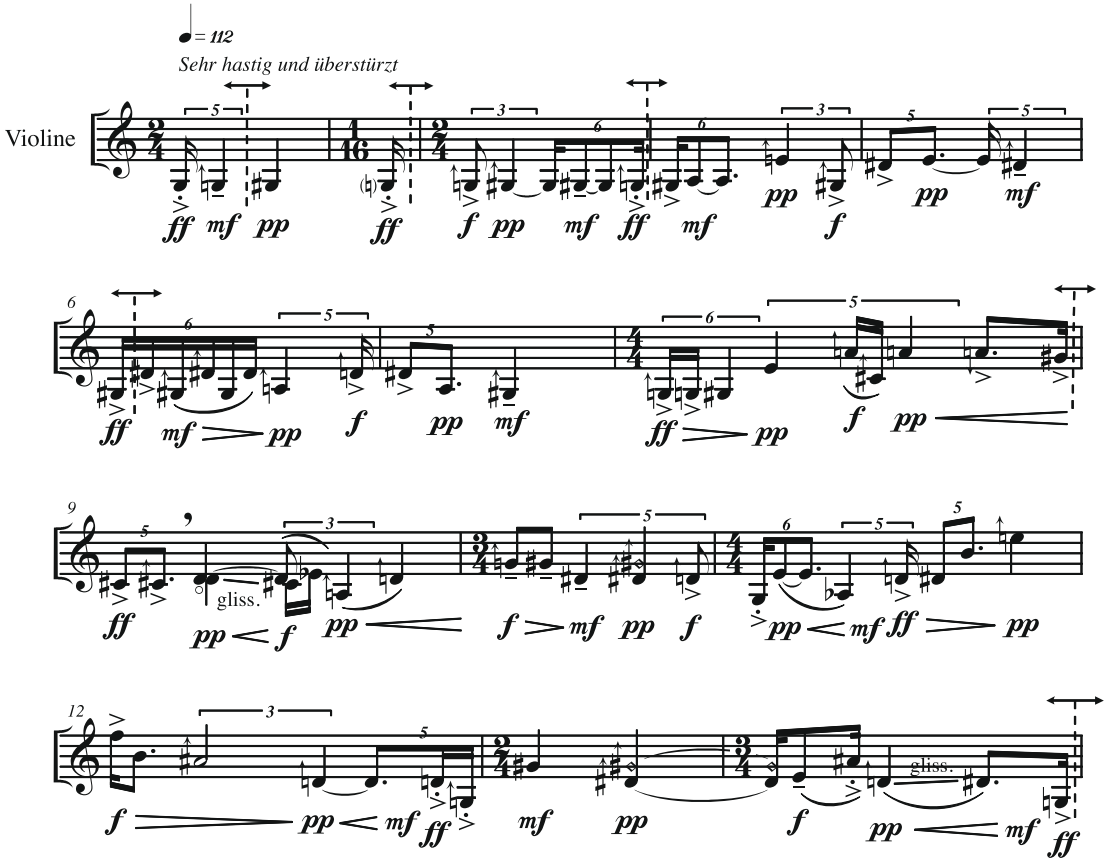

Fig. 1 *Courante* for violin solo, first section

With respect to the value of the intervals 1:1 (bar 1: two ascending quarter-tones between G and G#) to 2:1 (descending semi-tone + ascending quarter-tone) mirrored, the value 1:1/2:1 on their part again to 2:1:1:1/2:1*:2:1*:2*:1*:1:0*, at which those values marked with a star become played on the next highest string, thus become transposed up a fifth. Four different dynamic levels are used: *pp*, *mf*, *f* and *ff*. These four levels are assigned 1:4, to produce the following pattern (bars 1–8): 4:2/1:4/3:1:2:4/4:2:1:3:3:1:2:4/4:2*:1:3:3:1:2:4*(:3:2):1:3:3:1*(:2:4). From the * begins crescendo or decrescendo, which quasi absorbs the values following the brackets.

Rhythm, intervals and dynamic are encoded as a series of numbers that are inverted with minimal deviations (+1 or −1) and in fact without a directed tendency of this deviation. In addition, the following rules are applied:

- The allocation of rhythmical proportions with precise durations is variable within narrow boundaries.
- Longer durations may be broken down into shorter but equal durations.
- The direction of movement of the intervals is not determined.
- Intervals can be transposed through a change of the string (from bar 4) or harmonic fingering (from bar 10). A punctual dynamic with a sharp contrast from note to note becomes here and there smeared and fused in sporadic local developments, also with help of the articulation, which on such positions often moves from *detaché* (one bow length per tone) to *legato* (one bow length for multiple tones) respectively merges to *glissando* (unbroken connection of two tones).

Project Expectations

The thing that interests me about the work in this project, is at first the development and refining of the "mirroring techniques". As shown in the score examples it was necessary to have several additional rules besides the mirror itself, in order to create a musically satisfying result. To what extent can the additional rules create a "feedback" in the mirrors? Formalising aspects of my mirror technique might not necessarily lead to an acceleration of the compositional process, but I'm happy to invest, especially in our era of perverted economical thinking, in the luxury of this time-intensive and "apparently" ineffective mode of working. However, maybe new possibilities for the extension of one's own composition strategies originate right through the automisation of the process.

Exploring a Compositional Process

POINT: We see Stankovski's use of mirrors in his compositional work as continuing a historical debate: one and many, unity and variety, unity within variety (Einheit in der Mannigfaltigkeit), identity and negation, difference and repetition, several forms of an often bespoken pair of terms in philosophy since ancient times, which has also been influential in music history, though in different interpretations.

The thought of "One and Many" is seen as a basic principle by Plato, appearing in several dialogues in several forms, e.g. in *Phaedrus* [9]. As is typical for Greek philosophy, aesthetical and ethical questions are interwoven; for Plato a good life is an ordered life that integrates or subdues its plurality. But the "Many" must be ordered as an all-embracing principle and this also concerns the individuals of the state as well as the elements of a work of art [8]. Plato's critical thoughts on music are often cited, this mainly regards music not compliant with his general demands of order [10].

In his *Monadology* [11] Leibniz describes "Einheit in der Mannigfaltigkeit" as characteristic of the monads, the ensued points of the universe in his metaphysical view. In a note[5] he also identifies harmony as "Einheit in der Mannigfaltigkeit", the idea of this relation had deep impact on the music philosophy of the classical era [6].

From the beginning of the 19th century romanticism and subjectivity became a matter of philosophical debate. Hegel develops a concept of the duality of unity and plurality based on perception: unitary perceptible things do not exist without a plurality of properties [4]. The idea of a pre-stabilised or over-individualised harmony, still alive in Leibniz' thinking of "Einheit in der Mannigfaltigkeit", vanishes with Hegel. For him music is "subjektive Innerlichkeit" (subjective inwardness) [5]. Besides the plurality of perceptible things, Hegel's dialectical process of thesis, antithesis and synthesis creates a varied identity and emphasises the teleological aspect of unity and plurality.

Rejecting Plato and Hegel, Gilles Deleuze describes difference and repetition as "leading and undirected forces" [3]. This is a critique about identity and representation, a plea for the otherness and to relish the use of these concepts. As Deleuze's concept transcends classical ideas of balance as well as romantic ideas of a subject expressing itself, even denying the existence of a stable subject at all, he has become philosophically attractive to contemporary artists. Reciprocally much of his work is referring to art, in his works on cinema Deleuze differentiates between a unified view on the world connected with traditional ways of storytelling [1] and the predominance of discontinuity and missing order [2], a distinction that might well be adapted to music too.

POINT: Your use of iterated and varied mirroring leads to structures that let the dualism of identity and variety appear in several forms. What are the aesthetical reasons determining the choice of using them, do you feel obliged to any of the philosophically enrooted interpretations of identity and plurality above, or others?

Stankovski: First of all I would like to emphasise the differences between the varying discourses. I'm primarily concerned with queries of a musical nature, rather than philosophical. I am suspicious to identify music and philosophy with each other because this identification limits a potentially open scope of experiential understanding, which through precise ideas certain standards were derived, within which this scope was exactly designed for. It may be useful to refer musical and philosophical concepts to each other, especially when composers explicitly gain inspiration for their creative work from philosophy, or find elements of their artistic activity from philosophical texts.

[5] In a draft of a letter from Eckhard from May 1677 Leibniz denotes "Harmonia autem est unitas in multitudine".

Of the above-mentioned positions I acknowledge that my compositional interest, not surprisingly, again lies best in Deleuze's thoughts, which in turn, reflect the fundamental uncertainty of contemporary European culture. The deliberate destruction of the subject, certain in itself, seems to me to be the common theme.

I am explicitly concerned with the question of the identity of the creative personality, since my encounter, as previously mentioned, with the works of Fernando Pessoa and Gerhard Richter. Earlier I was also fascinated with Stravinsky, not only because of his impressive and perfectly crafted musical works but also because of the diversity of his stylistic interface, which raised queries about the criteria one uses to consider an oeuvre as a whole.

The mirroring technique can also be seen as a response to these particular queries. The focus lies in the foundation of an associated context, directly between very different, unpredictable musical events, through variation of a common idea. Having said that, the mirroring technique is only one part of my compositional work. I also use completely other techniques, at times in sharp contrast with each other—as a complementary reaction to the same query, but here with a focus on the diversity.

POINT: To sum up the results of some of your procedures: the beginning and ending in full measures as well as in parts show varied identity, an iterated application which leads to self-similar structures. Is self-similarity a guiding principle for you? Do you see it related or independent and in addition to principles of identity and variety?

Stankovski: The term "self-similarity" is for me too much related to very defined mathematical structures, from which I have limited precision as a mathematical layperson. What interests me in the mirror technique is a personal actualisation of the musical principle of variation. I place my work rather in relation to the musical tradition than to mathematical concepts.

Some of the musical phenomena, which emerge from the mirror technique, could be called "self-similar" in an extended meaning: for instance if the initial cells reappear in the course of a series of mirrors again almost unchanged. What is important for me is however not a greater principle, but the construction of a coherent musical speech.

POINT: In order to approach Stankovski's use of mirror principles we provided an algorithm that can perform iterated mirroring with arbitrary sequences of operations op_i and depth parameters d_i. In this way we generalised the procedure he works with, which is not restricted to musical parameters, but it isn't restricted to numbers either. We needed an operation or a sequence of operations that was defined for all of its possible results. The operations are not functions in a mathematical sense, as they might contain non-deterministic elements. For Stankovski operations were defined for numbers and worked as deviations.

Let's say we start with an axiomatic tuple of items,

$$x_0 = (x_{0,0} \dots x_{0,n_0})$$

an operation op_0 is applied to each element of the mirrored start tuple and we get:

$$x_0^* = (op_0(x_{0,n_0-1}) \dots \ op_0(x_{0,0})).$$

It is not relevant for the explanation of the principle if the last element of the starting tuple is mirrored or not, we omitted it in this case. The depth parameter d_0 determines what amount of the mirrored tuple is actually taken. Let [ ] denote the rounded integer, then the size of the mirrored tuple is

$$j_0 = [d_0 * n_0]$$

i.e. only the first j_0 elements of x_0^* are used and x_1, the overall result of the first mirroring is the concatenation of the starting tuple x_0 and the shortened tuple x_0^*:

$$x_1 = (x_{0,0} \dots x_{0,n_0} \ op_0(x_{0,n_0}) \dots \ op_0(x_{0,n_0-j_0+1})).$$

The procedure is applied to x_1 and so forth. The amount of change done by the last operation determines the similarity of the start and end points. As a simple example with numbers let's start with a tuple

$$x_0 = (3\ 6\ 9\ 12\ 15)$$

with a non-varying operation that randomly adds 1 or -1 and a non-varying depth $d = 1$ a possible result could be:

$$x_1 = (3\ 6\ 9\ 12\ 15\ 13\ 8\ 7\ 2)$$
$$x_2 = (3\ 6\ 9\ 12\ 15\ 13\ 8\ 7\ 2\ 8\ 9\ 14\ 14\ 11\ 8\ 7\ 4)$$
$$\dots$$

with $d = 1/2$ a possible result could be

$$x_1 = (3\ 6\ 9\ 12\ 15\ 13\ 8)$$
$$x_2 = (3\ 6\ 9\ 12\ 15\ 13\ 8\ 7\ 14\ 16\ 11)$$
$$\dots$$

It is interesting to regard overall developments of the iteration process. For example in Fig. 2 with six iterations of a non-varying operation that randomly adds 1, 2 or 3 we started with tuple $x_0 = (0\ 1\ 2\ 3\ 4\ 5\ 6\ 7\ 8\ 9)$ and took full depth $d = 1$ in all iteration steps (Fig. 2).

We see a self-similar structure, a large bow form consisting of smaller bow forms with increasing and finally decreasing deviations. In this case the deviation operation, adding random values within non-varying bounds, is independent from the mirrored values and hence from the starting sequence, i.e. if we only regard the deviations in Fig. 2, or equivalently take a starting sequence of zeros, we get Fig. 3.

So in Fig. 2 the deviation sequence of Fig. 3 is just added to the repeatedly mirrored start sequence.

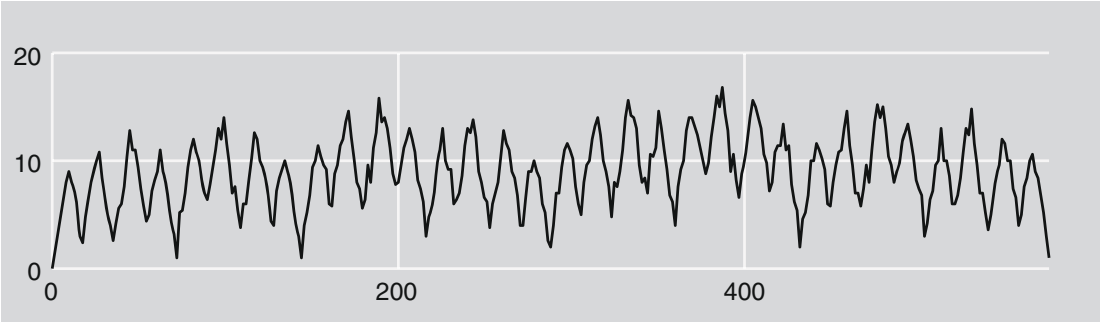

Fig. 2 Iterated mirroring with random addition of numbers 1–3, starting with numbers 0, ..., 9

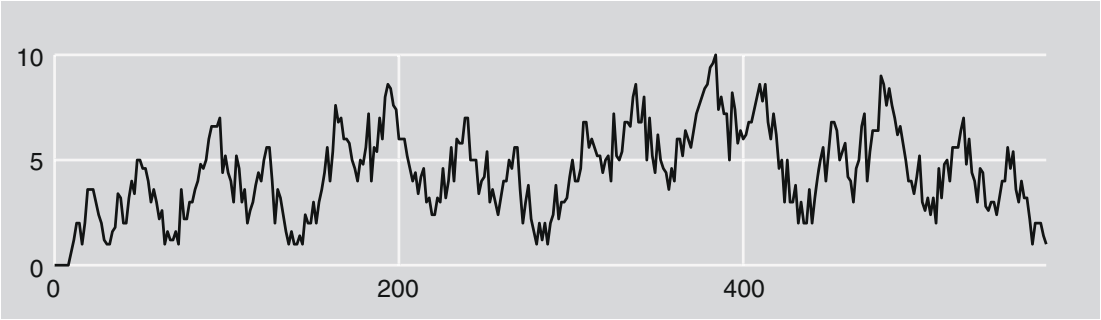

Fig. 3 Regarding only iterated mirroring and additioning of Fig. 2

With shortened mirroring, typical patterns also occur, partial sequences with mirrored shape of increasing length enfold in combination with a global tendency. Now we chose again a zero sequence at the start and a deviation operation, adding random values within non-varying positive bounds between 1 and 3. A mirror depth $d = 0.3$ and 18 iterations result in a graph shown in Fig. 4.

Regarding only bare shortened mirroring with identity operations we observe typical behaviour depending on constant depth d, independent from the start sequence. For $d < 0.5$ we end up with an oscillation between two states of increasing respective lengths, see an example of this in Fig. 5.

This, again independent from the start sequence, doesn't seem to happen for $d > 0.5$ (Fig. 6).

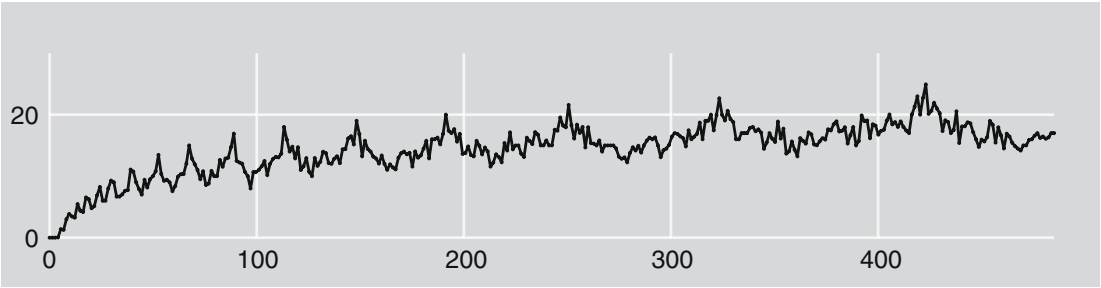

Fig. 4 Iterated shortened mirroring (d = 0.3) with random addition of numbers 1–3, starting with a zero sequence

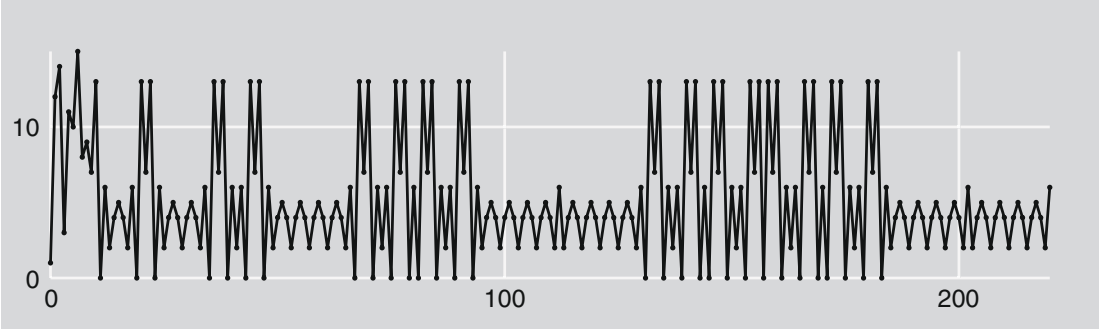

Fig. 5 Shortened mirroring with identity operations, d = 0.4

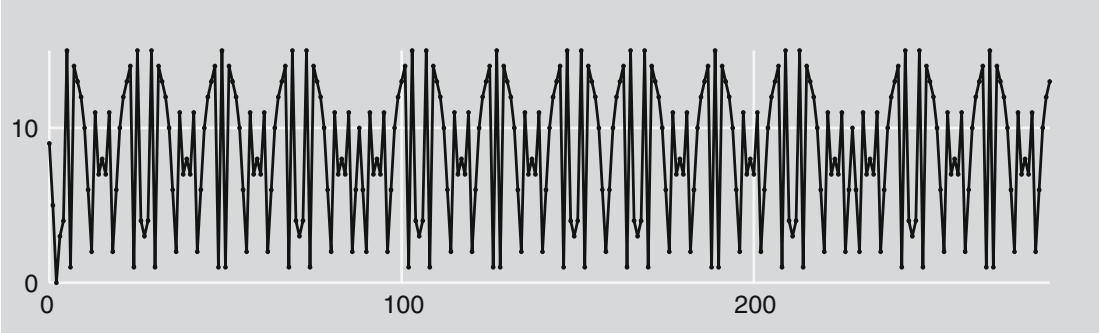

Fig. 6 Shortened mirroring with identity operations, d = 0.8

In his string quartet *A House of Mirrors III* Stankovski explores the generalised mirroring algorithm with specific characteristics. Stankovski uses several such processes to generate interval and rhythmic data, which he also subsequently adapts. Let's regard the first one which determines intervallic data for all instruments.

For a starting sequence of one element

$$x_0 = (7)$$

mirroring depths are varied, he defines them in absolute lengths (hence notated as $\underline{d}$), here just with increasing integers:

$$\underline{d}_0 = 1,\ \underline{d}_1 = 2, \ldots,\ \underline{d}_i = i + 1.$$

For the deviation operation he takes an offset vector from which partial vectors are taken by defining a vector of start indices. In taking increasing integers as starting indices we slide along a defined sequence which here is the interleaved sequence of positive and negative integers. The resulting sequence of partial vectors can be written:

$$O_0 = (0)$$
$$O_1 = (1\ -1)$$

$$O_2 = (-1\ 2\ -2)$$
$$O_3 = (2\ -2\ 3\ -3)$$
$$\ldots$$

20 iterations give the following sequence, see Fig. 7.

As the order of increasing depths is linear, the order of increasing mirrored sequences is quadratic, hence relative depths decrease, below 0.5 quite rapidly. Again, oscillation between two states can be clearly observed.

As Stankovski uses the values as step values, deciding the directional changes from step to step, the development of absolute values is relevant (Fig. 8):

7 7 8 6 5 10 5 7 8 8 3 1 11 5 11 1 4 8 9 7 6 2 5 10 3 14 3 10 5 1 6 8 9 9 4 2 9 13 7 1 15 3 15 1 7 13 8 2 5 9 10 8 7 1 4 18…

For each instrument of the string quartet Stankovski occasionally added seconds and quarter-tone sharps and flats, the first violin starts with the interval sequence (see also score, Fig. 9):

7 7 8 6 5 10 4.5 6.5 8 8 2.5

In the first part all instruments play only intervals, adjacent intervals usually have one pitch in common, so that the interval sequence is somewhat folded. Rhythmic data is determined by a similar mirroring procedure which is not included here in this report. Finally the above interval sequence translates to the violin part (Fig. 10).

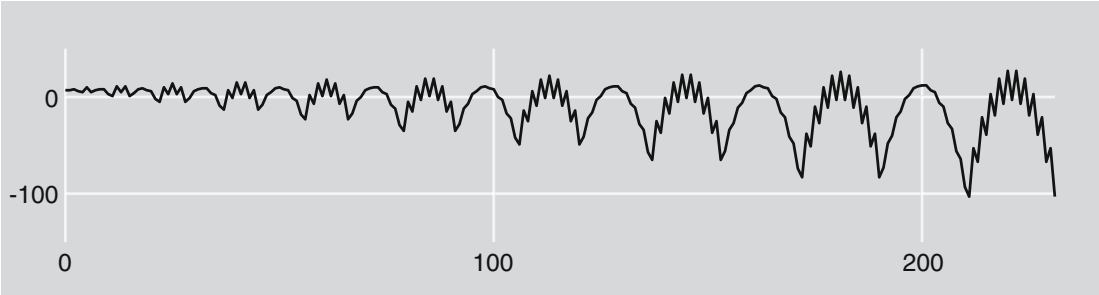

Fig. 7 First raw mirroring sequence for intervallic data of *A House of Mirrors III*

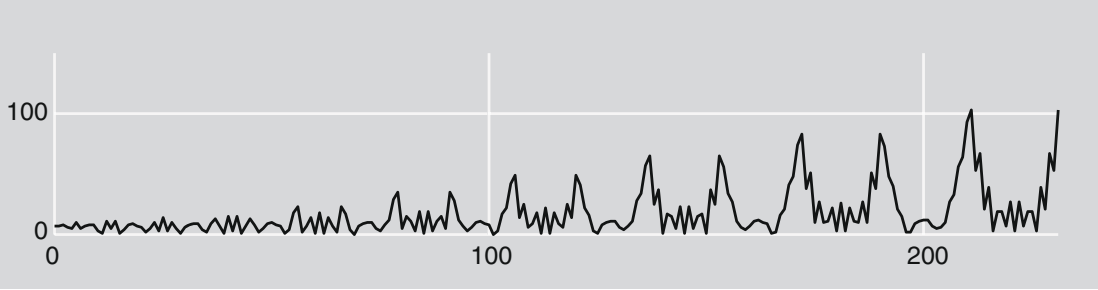

Fig. 8 Absolute values of sequence in Fig. 7

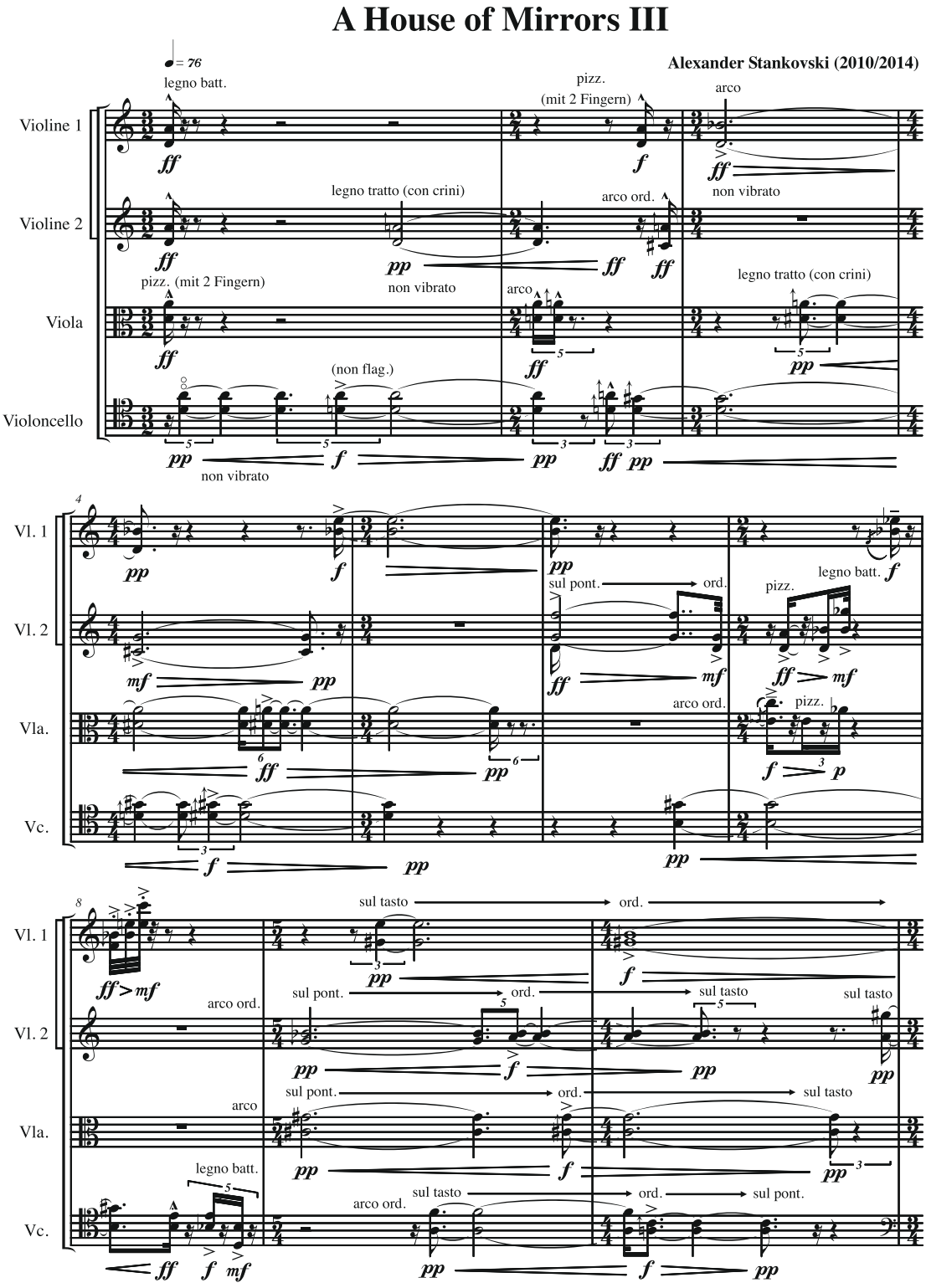

Fig. 9 *A House of Mirrors III*, bars 1–10

The pitches of the harmonics for tones D and F# (both sounding) are in compliance with the partial sequence (−4.5 10 3 13.5 1.5 10 −5 −1 6 7 8) taken from the original (5 10 3 14 3 10 5 1 6 8 9 9).

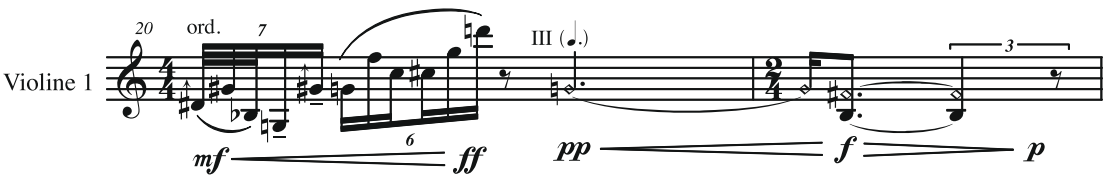

Fig. 10 *A House of Mirrors III*, 1. violin, bars 20, 21

POINT: Sometimes you make quarter-tone deviations from the original interval sequence and sometimes diatonic deviations (mostly up to a maximum of a second), what are the reasons for these deviations?

Stankovski: On the one hand I wanted to use quarter-tones; on the other hand I had to probe each quarter-tone for its musical meaningfulness in order to avoid the risk of an "indifferent" microtonality. I had certain instrument-dependent and musical context-dependent criteria for the use of quarter-tones, which I believed should not be left up to the algorithm. For example it was therefore important for me to relate a quarter-tone to a simultaneously or immediately previously or afterwards sounding tone, either as a melodic deviation or as harmonic roughening.

Moreover it was part of the compositional idea to increase in the first part of the piece more and more the room for manual deviations in order to allow for further significant subjective disturbances of the perspective of the originally planned mirroring.

POINT: Experiments generalising the mirror principles you used, resulted with typical patterns. One is the oscillation of two states with increasing respective lengths, in this example from the beginning of the piece likewise with increasing values. Were there points you considered when choosing this type of procedure? How does it comply with your aesthetical preferences, i.e. concerning identity, variance and escalation?

Stankovski: I didn't give much thought in advance to repeating numerical patterns, but made at first very simple general musical considerations. It was clear to me that the original material might return several times but that its recognisability would in addition be strongly affected by the separated treatment of pitch and rhythm on the one hand and on the other hand by the continuous inversion. The continuous mirroring of the rhythmical "basic cell" (short-long) yielded very rapidly a polarity between long held tones and fast passages of single instruments (Fig. 9). The relation between both poles is slowly inverted: at the beginning long continuous tones dominate, interrupted by scattered chords, whereas at the end of the first part there are only gestures left, which are interrupted by rests.

POINT: Stankovski added additional rules: he filtered out rhythmical or interval values above a certain threshold. Applying a threshold value of 30 to the sequence of Fig. 2 lead to a development towards an almost periodic fluctuation (Fig. 11).

The values actually taken in the piece come from three generations of iterated mirroring with different depth and deviation inputs and, after every generation, filtering out zeros and values above a threshold (dependant on the instrument) plus adding

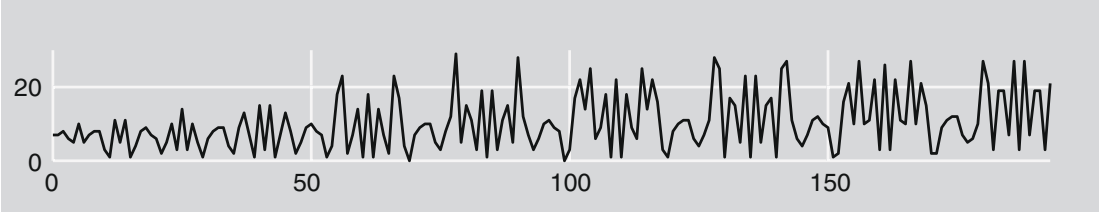

Fig. 11 Sequence of Fig. 7, filtering out values greater than 30

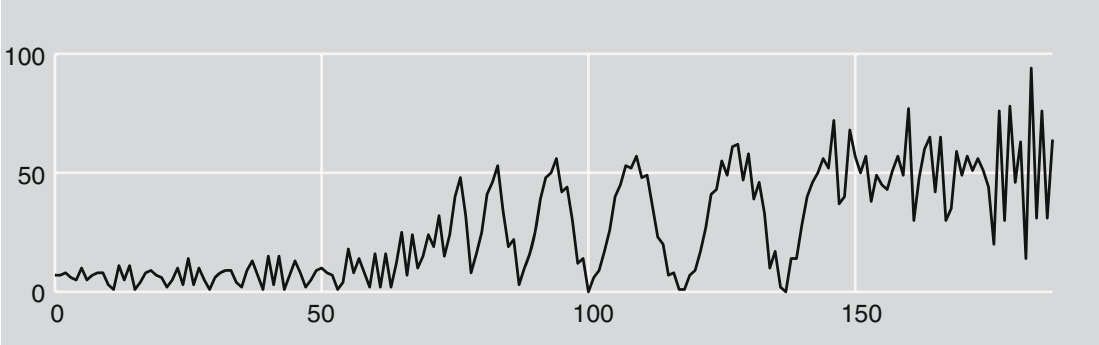

Fig. 12 *A House of Mirrors III*: concatenation of three mirroring sequences for intervallic data, absolute values, no filtering of values, no inflections

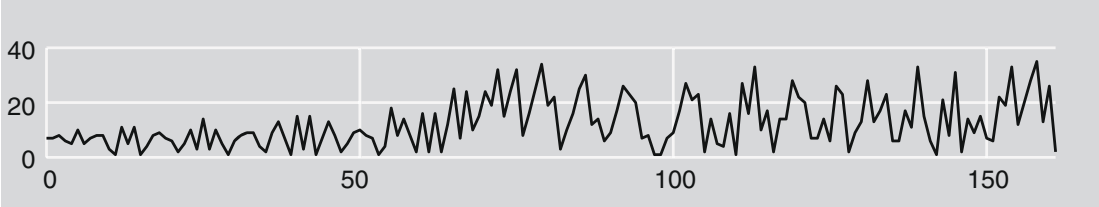

Fig. 13 Sequence of Fig. 12 with filtering, no inflections

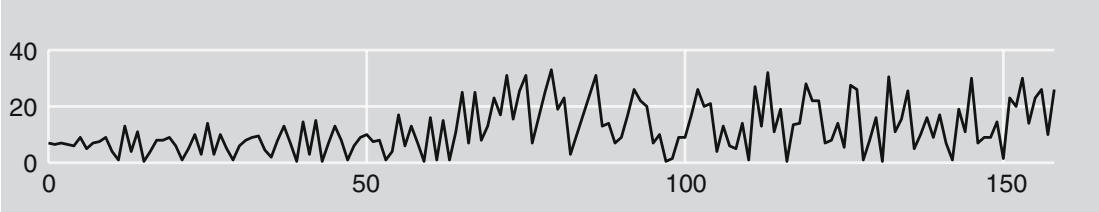

Fig. 14 Sequence of Fig. 12 with filtering and inflections (sequence of interval values used for the viola part)

microtonal inflections. That way the microtonal inflections also have an influence on the mirroring performed after them. Here one can see a comparison between iterated mirroring without filtering and inflections (Fig. 12), iterated mirroring with filtering and without inflections (Fig. 13) and finally mirroring with filtering and inflections

(Fig. 14), always reduced to absolute values. Figure 14 shows the sequence of interval values used in the piece for the viola part.

POINT: In the first part of *A House of Mirrors III* you performed three generations of iterated mirroring. In each generation you used different mirroring depths and deviation operations. What were the reasons for altering the starting conditions?

Stankovski: Parallel to the above-mentioned shift from surface to gesture runs the separation of the four instruments via the individualisation of the mirrors. The first mirror indeed separates already between intervals and rhythmical values, yet a set of mirrors holds for all four instruments. In the second mirror I separate the quartet in two pairs of voices each with different initial data, also for intervals and rhythms, to be used by the algorithm. In the third mirror each instrument finally has its individual initial data. My idea was—independently of the applied mirror technique—the transition of a homogeneous texture to a clearly audible separation of the voices. In the second part there is a development of isolated sound islands towards more integrated episodes.

POINT: What is the role of the mirroring in the second part of *A House of Mirrors III*?

Stankovski: The second part of the piece is also based on mirroring techniques. Rhythmically, the second part is based on the retrograde result from the events in the first part. The entries of all instruments are combined in a sum of rhythms and can be read in reverse order, in which, as in the first part, increasing deviations are possible (and necessary!) both at the micro level of specific rhythmic values and at the macro level of tempo. Therefore, the speed of the second part, in contrast to the constant tempo of the first part, is unstable and fluctuating.

The pitch of the second part goes back exclusively to the cello part, which in the end of the first part remains solely alone (Fig. 15). However, the pitches are multiplied through vertical mirroring so that chords of symmetry, or respectively, balanced intervals arise. These symmetries are broken in places through individualised mirroring within the single parts, so that apparent motivic imitation can arise (Fig. 16, bar 89). The mirroring axis between the first and second part is in the middle of the pause in bars 85, 86. The durations are arranged in retrograde, where pauses can be replaced by sounds, and vice versa, the pitch of the cello in bars 85–78 is the basis for the symmetrical chords in bars 87–89. In bars 91, 92 the first noise material replaces the pitches.

As the number of entry points from the additive rhythms is much larger than the number of pitches of the cello, empty periods arise, which become occupied by noise material, so that the way back to the intervallic "original position" becomes displaced through an increasing isolation—although structurally it goes back the same way, musically there is no way back.

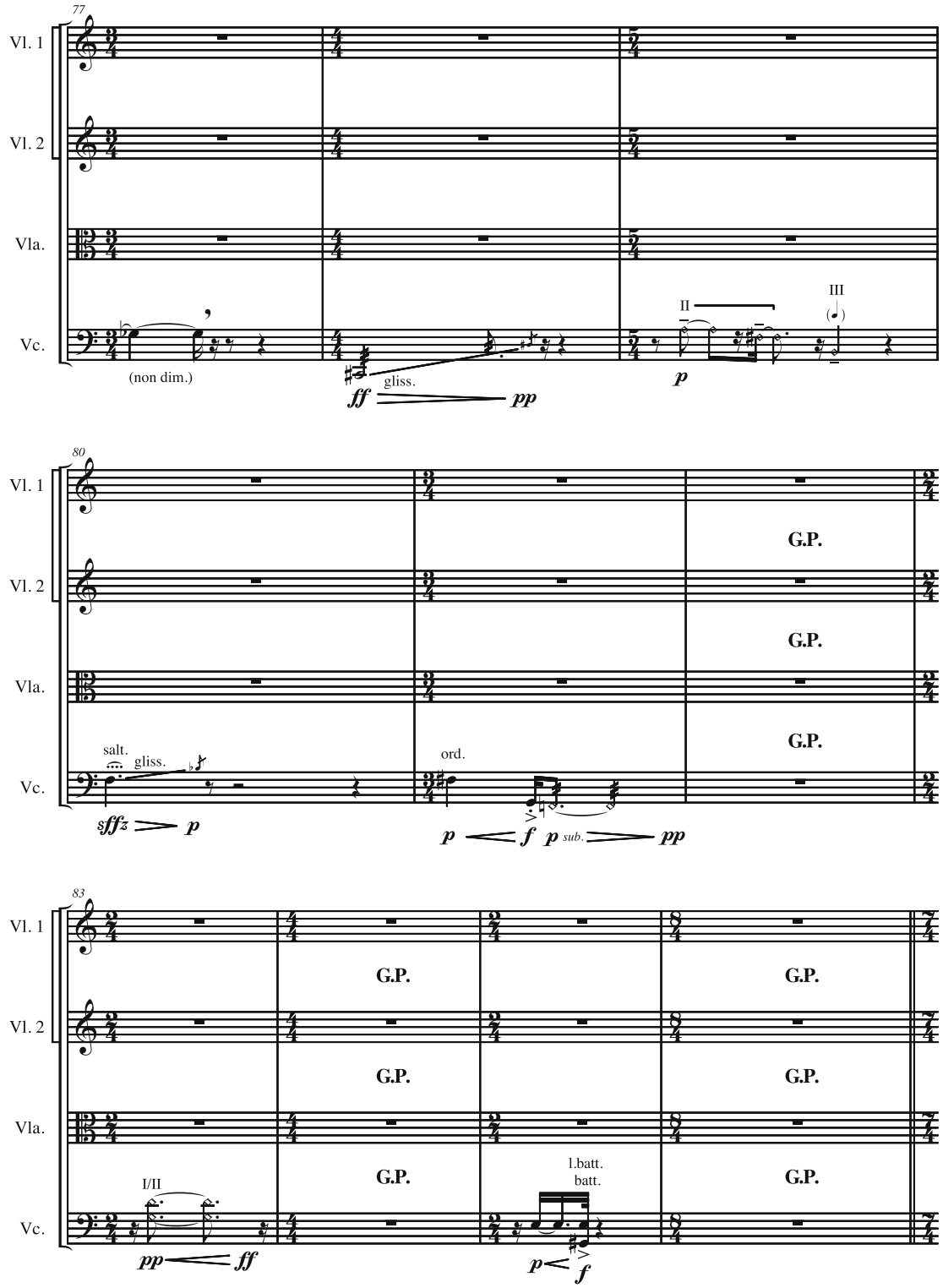

Fig. 15 *A House of Mirrors III*, bars 77–86

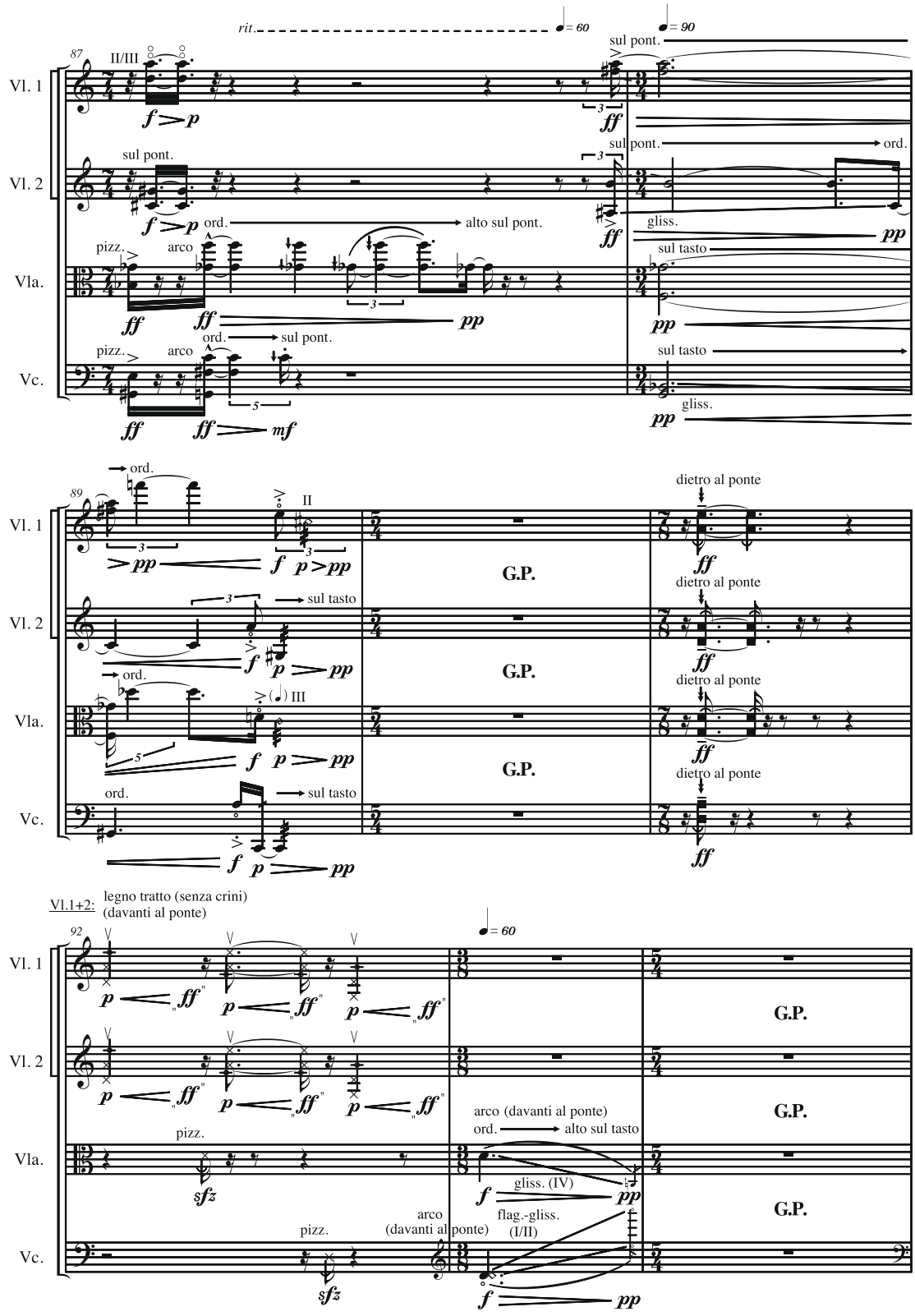

Fig. 16 *A House of Mirrors III*, bars 87–94

Project Review by Alexander Stankovski

The "balance" of the outcome of the project has been ambivalent—on one hand it has brought me a refinement of my originally fairly rigid use of the mirroring technique, in particular by addressing the additional parameters of the mirroring depth, which I will certainly take into account when I apply this technique elsewhere. On the other hand, the compositional process in *A House of Mirrors III* was much more tedious than expected. Not only was the manual process for each value in the first part of the piece very time consuming and the actual process of notating not inspiring, I came in this part to a dead end, which I only overcame by changing my compositional strategy. So the principle of mirroring has unexpectedly changed from a technical tool into a psychological reaction, as a break with the prior technique that was used.

But that does not mean that I am not satisfied with the music that was created through the engagement with the automatically generated data. On the contrary, I would not have been able to write the first part of the quartet so coherently with such creative exploration without the rigid structural framework. When the function of the framework had been met in the first part, I had to respond in a completely different way in the second part, so as not to remain a servant to an abstract principle.

Whereby my summary is as follows: the development of personalised compositional techniques, however they might be defined, is essential, but this continues to remain a means to an end. Consequently, when it becomes necessary that they need to be modified, ruptured or replaced by completely different ones: only in this manner do they become the expression of a personality.

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