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IMITATION: TRADITIONAL AND NONTRADITIONAL TRANSFORMATIONS OF MELODIES

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IMITATION:
TRADITIONAL AND NONTRADITIONAL TRANSFORMATIONS OF MELODIES

Can imitations and canons be different from those that were ever found in the musical repertoire? The question could seem rhetorical. It could seem so, first, because the theory of imitation and canon appears to be quite elaborated, enough to cover perhaps all of its conceivable varieties, and second, because music, during the course of its existence, seems to try out virtually every kind of imitation considered by music theory, and more. Nevertheless, the question is still in no way trivial.

Certainly the limits of traditional theory come up with only a negative answer to this question since all the limits have been explored long ago, and any examples which go beyond them simply cannot be called imitations. But in fact, theory — or, better to say, not theory itself but the combination of subjects covered by it — is not a hopelessly closed system, but a system which contains in itself potentials for self-extension (similar to the way that the natural numbers — historically discovered first — had "the capacity" from the start of being complemented by fractions, then by negative numbers, et cetera). Of course, the means of such extension are not always predictable in advance — otherwise the process of learning would not take up any historical time, and reality would open up before a human being immediately and completely. But if one is to examine the question abstractly, one will see that extension — as far as it is feasible — would bring with itself the realization of at least one of the two following possibilities: (1) the generalization of those cases which have already been discovered in music, but were not covered by traditional theory; (2) the discovery of those cases previously never encountered and, most likely, never thought of. Anticipating the consequent results, I will permit myself to state that both of these potentialities will be realized in what follows.

First About Terms

1. In the present article, *imitation* is looked upon strictly from the point of view of *change of the imitated melody into the imitating one*. This is why, even though imitation is usually defined as a "precise or imprecise repetition of a melody, in whatsoever voice, stated just before that in another voice" (Muzykal'naya Encyclopedia, vol. 2, p. 505. Moscow: Izdatel'stvo Sovetskaya Entsiklopedia, 1974), within the limits of this article, the only indispensable qualification of an imitation to be considered is a *precise or imprecise repetition of a melody*, and attention will not be paid as a rule to whether the melodies were placed in several voices or in one voice, whether they sound directly one after the other or if they are placed in time in some other way (due to this extension of terminology, which is not central to the main idea, it is easier to grasp a broader variety of phenomena, and not establish boundaries which are not essential to the main topic).

2. The terms *antecedent* and *consequent* will be defined as follows: the *antecedent* (A) is a melody regarded as the initial one; the *consequent* (C) is a melody regarded as the derived one.

3. The term *imitation* will be used only for the so-called *strict imitation*, that is one in which both the durations and pitches are imitated and where the chosen means of repetition is carried out without interruption.

Traditional Transformations

4. According to classical theory, transformations possible in imitation are confined to the following:

— for durations: exact repetition or augmentation (diminution is understood as a variety of augmentation);

— for pitches: exact repetition or transposition or inversion;

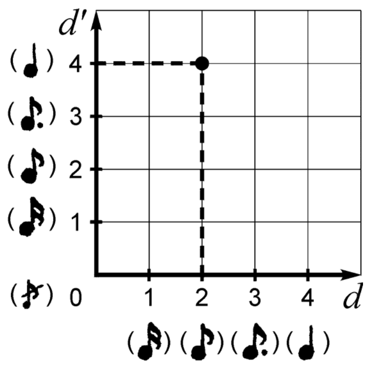
— for succession of sounds: direct or retrograde motion.

Traditional Transformations Are a Segment of a Wider Sphere of Transformations

5. Any melody (as well as any other musical structure) can be regarded as an ordered set of sounds. It is easy to see that in the case of any of the traditional transformations, a univocal correspondence exists between the sounds of the antecedent and the consequent: one sound is mapped with one sound, identical sounds in duration and pitch of the antecedent are mapped with identical sounds in duration and pitch of the consequent. But a correspondence of this kind is possible also in the case of transformations which are different from traditional ones. Thus one can assert that from a certain point traditional transformations occur not as phenomenon confined to itself, but as a part of a wider domain of transformations of the same nature.

a. Transformations of Durations

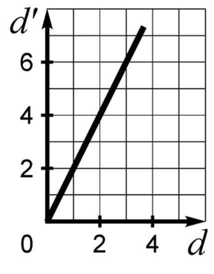
6. Each duration can be matched with an appropriate number. Let as assume that 𝅘𝅥𝅯 = 1, ♪ = 2, ♪. = 3, ♩ = 4, et cetera. Let d be the duration of a sound in the antecedent and d' — the duration of the corresponding sound in the consequent. Such or other relation between them could be expressed graphically:



The dot in the graph means that each ♪ of the antecedent turns into ♩ (♪→♩).

Since in a double augmentation *all* the durations become twice as large, any imitation of this type can be characterized with the help of the following graph or formula:

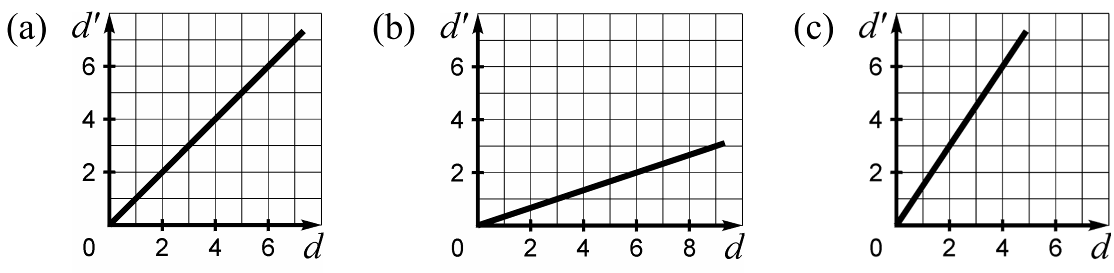
Example of an imitation



$d' = 2d$

(the arrows, letters and numbers serve as an explanation to the example).

For an exact repetition of the durations (a), a diminution of three times (b), and an augmentation of one-and-a-half times (adding a "dot" to each note) (c), the rules of correspondence are as follows:



$d' = d$ $d' = d/3$ $d' = 1{,}5d$

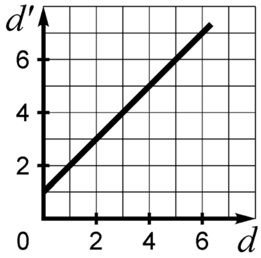
The generalizing formula for traditional transformations is $d' = ad\,(a > 0)$.

7. Since not only $d' = ad$ but, in principle, any concrete manifestation of $d' = f(d)$ could be understood as a rule for transformation of antecedent into consequent, it is not an exaggeration to say that we have an unlimited number of possibilities.[1]

[1] The formula $d' = f(d)$ means that the correlation between sets $\{d\}$ and $\{d'\}$ — between durations of the antecedent and the consequent — is a *function*, that is, every d corresponds to one d'; f is the rule of the correlation. Particular cases of $d' = f(d)$ are: $d' = d$, $d' = 2d$, $d' = d^2 + 2d - 1$, et cetera.

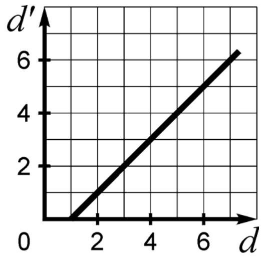
8. Here are just a few of them:

(a)



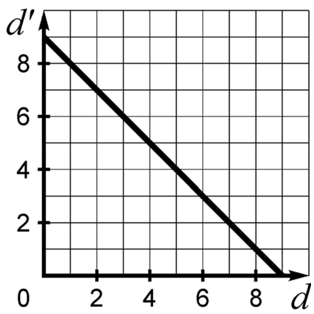
$d' = d + 1$

(b)

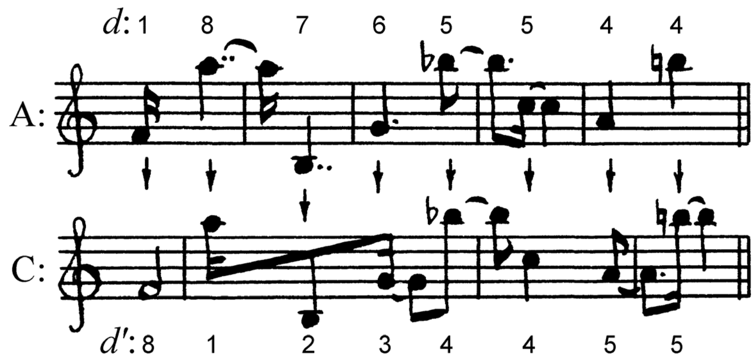


$d' = d - 1$

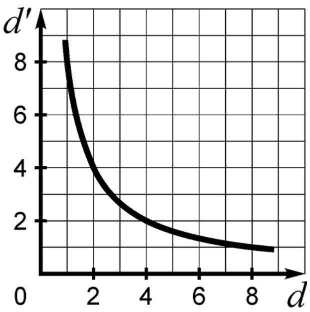
(c)



$d' = 9 - d$

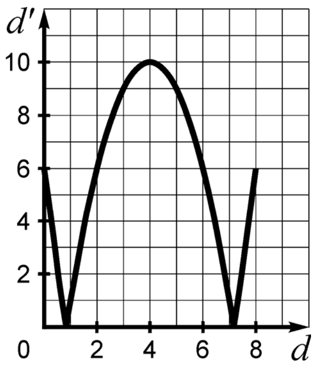


(d)



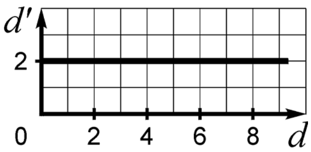
$d' = 8/d$

(e)

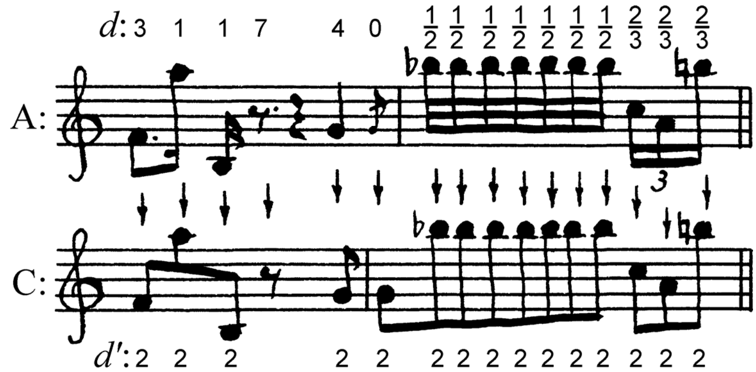


$d' = |-d^2 + 8d - 6|$

(f)



$d' = 2$



Commentaries to the examples:

a. to each duration of the antecedent a 𝅘𝅥𝅯 is added;
b. drom each duration a 𝅘𝅥𝅯 is subtracted;
c. large durations turn into small ones and vice versa in such a way that the sum of the corresponding durations is always the same (𝅗𝅥 + 𝅘𝅥𝅯 = 𝅘𝅥.. + 𝅘𝅥𝅮 = = 𝅘𝅥. + 𝅘𝅥𝅯. = … = 9);
d. large durations turn into small ones and vice versa in such a way that the product of the corresponding durations remains constant (𝅗𝅥 × 𝅘𝅥𝅯 = 𝅘𝅥 × 𝅘𝅥𝅮 = = 𝅘𝅥𝅮 × 𝅘𝅥 = … = 8);
e. one of the qualities of this complex transformation is that certain different durations of the antecedent correspond to identical durations of the consequent, for example: 𝅘𝅥𝅯 → 𝅘𝅥𝅯 and 𝅘𝅥.. → 𝅘𝅥𝅯 ;
f. all the durations of the antecedent, when passing into the consequent, become identical.

b. Transformations of Pitches

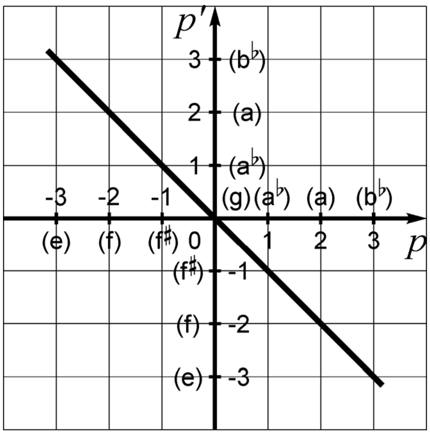
9. If one identifies a pitch collection (Γ — "gamma" — *scale*) and takes any of the pitches as the origin 0, every pitch of the collection will have a corresponding numerical value, for example:

Γ = Chrom, G' = 0

Γ = C major, G' = 0

Let p be the pitch of a sound in the antecedent and p' be the pitch of the corresponding sound in the consequent. For imitation in inversion the correspondence between the pitches of the antecedent and the consequent could appear in the following manner:

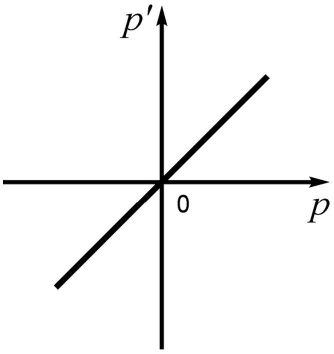
Γ = Chrom, G' = 0



$p' = -p$

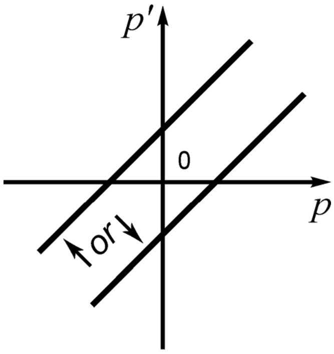
The graphs and formulas for the exact repetition of pitches (a), transposition (b), and inversion (c):

(a)



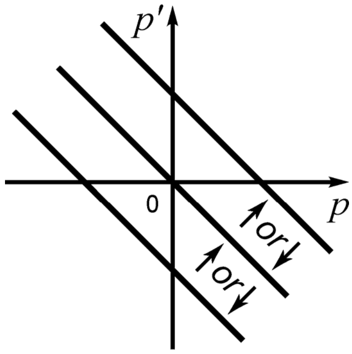
$p' = p$

(b)



$p' = p + a$

(c)



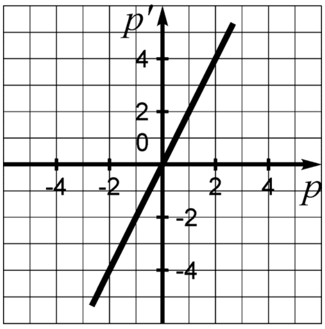
$p' = -p + a$

The generalizing formula for traditional transformations is $p' = \pm p + a$ (a is an integer).

10. Some of the nontraditional transformations, categorized under the expression $p' = f(p)$:

Γ = Chrom, G' = 0

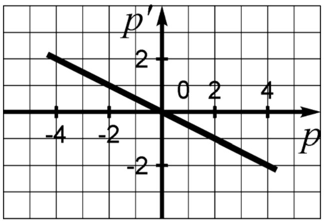
(a)



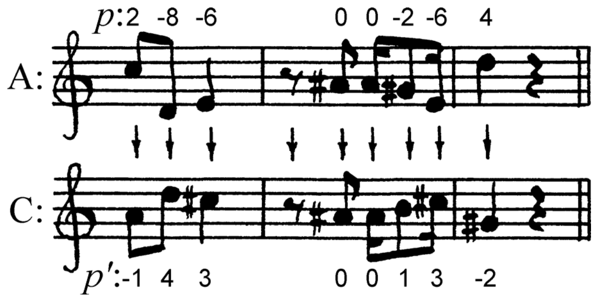
$p' = 2p$

Γ = Chrom, B♭' = 0

(b)

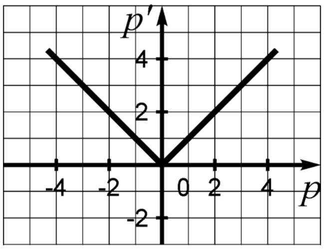


$p' = -p/2$

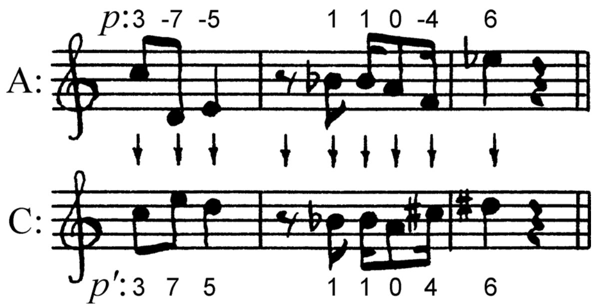


Γ = Chrom, A' = 0

(c)

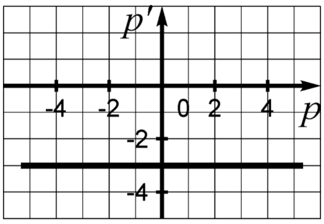


$p' = |p|$



Γ = Chrom, C'' = 0

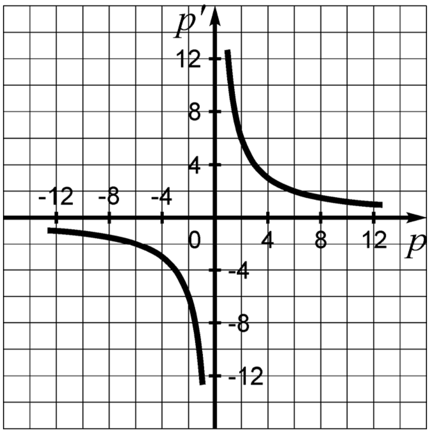
(d)



$p' = -3$

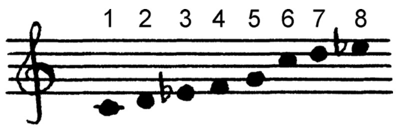
Γ = Chrom, C' = 0

(e)

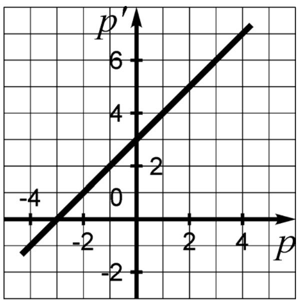


$p' = 12/p$

Γ =



(f)



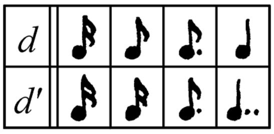
$p' = p + 3$

Commentaries to the examples:

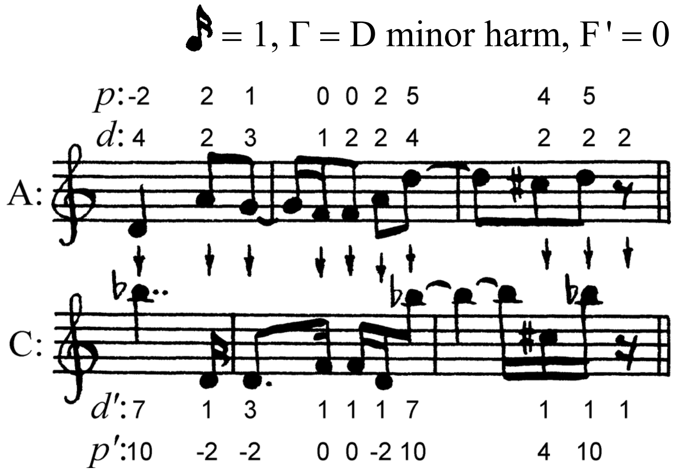
a. all the intervals of the melody are doubled;
b. all the intervals are halved and inverted;
c. the pitches, situated below A' are inverted in relation to it;
d. all the pitches, when passing into the consequent, become identical;
e. the closer any particular pitch of the antecedent is to C', the further away from C' is the corresponding pitch in the consequent and vice versa;
f. the melody changes considerably when transposed, since the pitches G' and C'' are understood to be neighboring scale degrees.

11. It is obvious that both the pitches and the durations could be transformed simultaneously in a complex way, for example:

$$\begin{cases} d' = d^2 - 3d + 3 \\ p' = p^2 - 3p \end{cases}$$



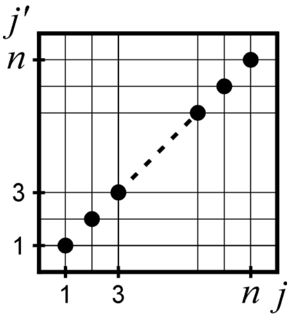
p	-2	-1	0	1	2	3	4	5
p'	10	4	0	-2	-2	0	4	10



c. Permutations of Notes

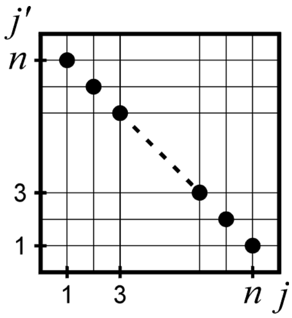
12. Traditionally the order of notes can be transformed in two ways: the order remains the same (direct motion) or becomes reversed (retrograde motion). Let j be the ordinal number of a sound in the antecedent, j' the ordinal number in the corresponding sound in the consequent, n the total amount of sounds in a melody. The graphs and formulas represent direct (a) and retrograde (b) motion:

(a)



$j' = j$

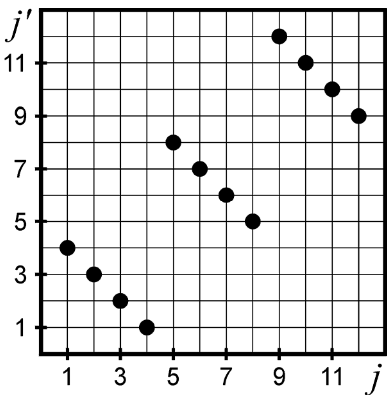
(b)

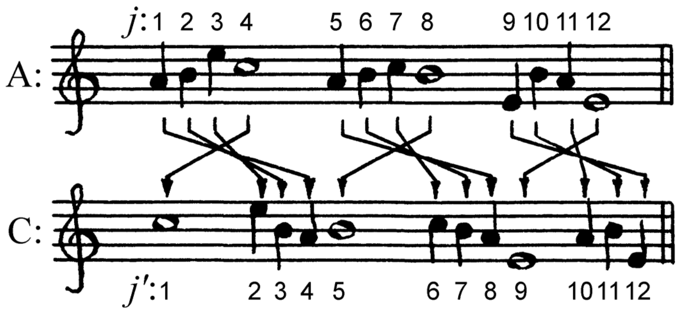


$j' = n + 1 - j$

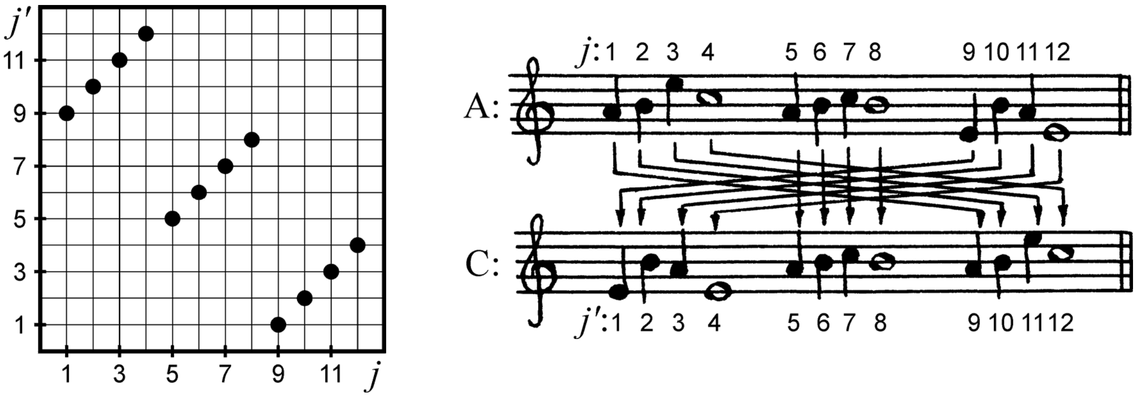
13. Some permutations differ from traditional ones:

(a)

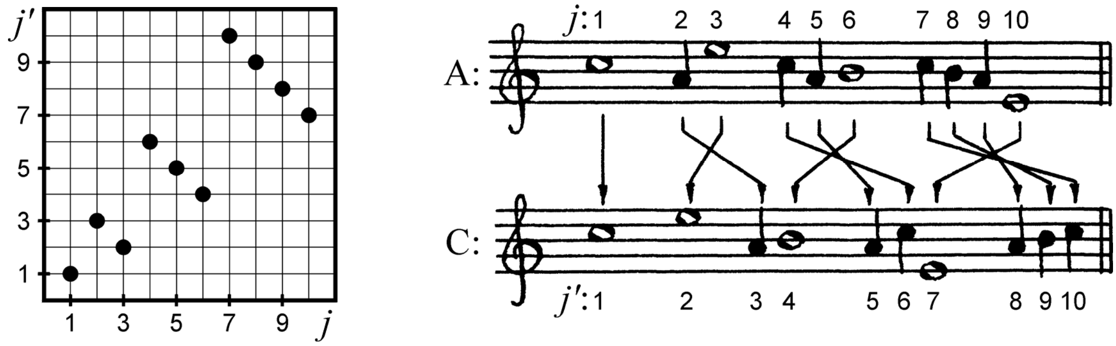




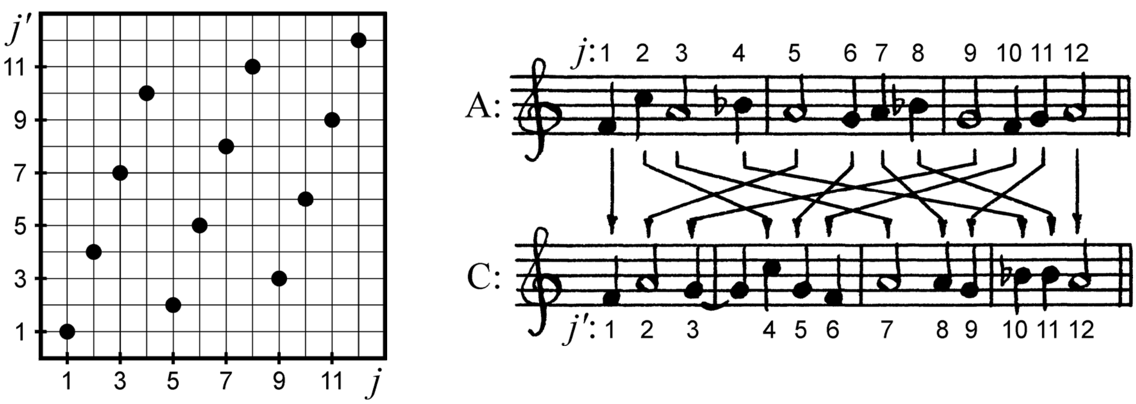
(b)



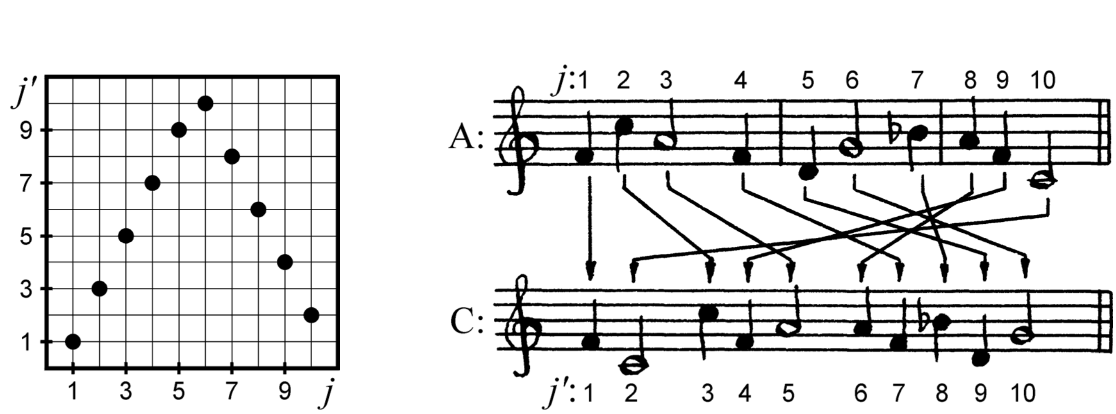
(c)



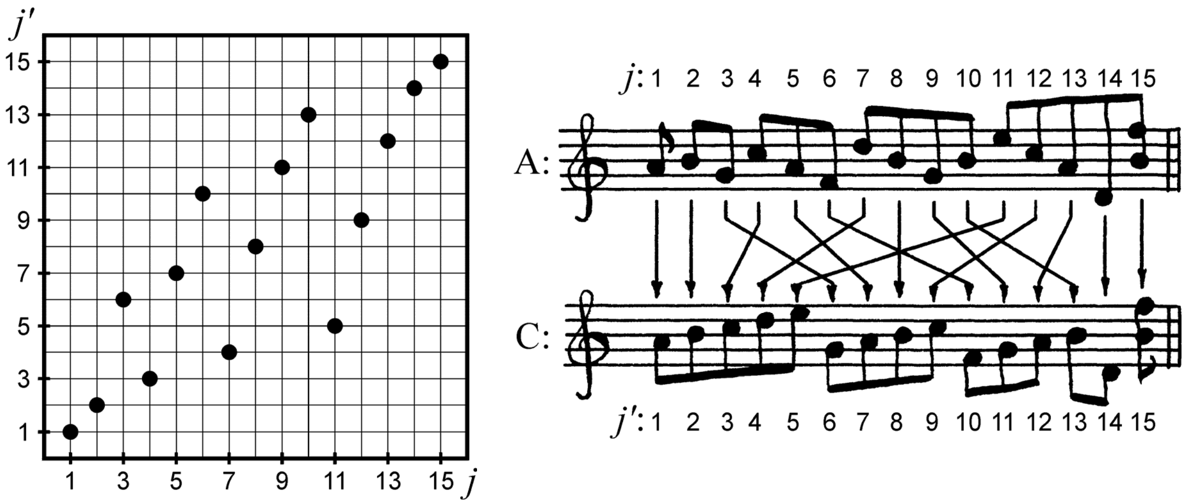
(d)



(e)

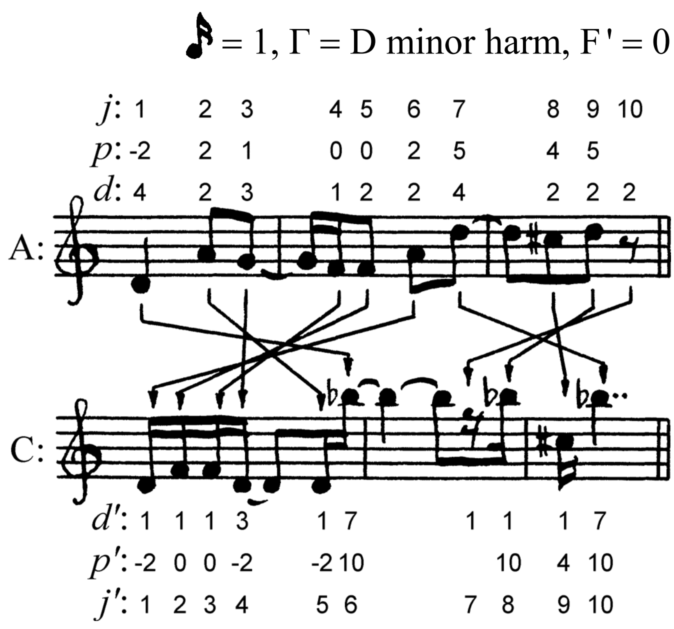


(f)



14. In a complex manner one can simultaneously alter the durations, the pitches, and the order of the notes:

$$\begin{cases} d' = d^2 - 3d + 3 \\ p' = p^2 - 3p \\ j' = \begin{cases} 7 - j\,, \text{ if } j \le 6 \\ 17 - j\,, \text{ if } j \ge 7 \end{cases} \end{cases}$$



d. Generalization

15. Since, generally speaking, durations, pitches, and the ordering always change simultaneously — as far as an exact repetition is likewise a transformation — and if one takes into account *all* the transformations of the examined ones, without exceptions, the transformation of melody could be generalized in the following way:

$$\begin{cases} d' = f_1(d) \\ p' = f_2(p) \\ j' = f_3(j) \end{cases}$$

or in an even more concentrated manner: $s'=f(s)$, where s is the sound of the antecedent, s' the sound of the consequent, f the rule of transformation of s into s', if to consider that the short entry and the more extensive ones are equal in meaning.

Thus it is possible now to grasp a rather large scope of events with one glance, revealing what has previously been concealed and joining together what has already been revealed.

16. In order to avoid the speculation that *any* transformations could be characterized in the like manner, it suffices to say that even the following instances, for example, do not pertain to the domain of the $s'=f(s)$ transformations:

Validation of Nontraditional Transformations

17. Nontraditional transformations are more complex and many of them are much more so than traditional ones; the alterations of the antecedent are more profound, and the connection between the antecedent and the consequent is less apparent. But despite the fact that many complex transformations are sometimes dramatically unlike the traditional ones, the characteristic $s'=f(s)$, common to both the former and the latter, allows one to consider its totality as one unified entity, similar to the way it is done now in relation to a part of these transformations covered by the traditional concept of imitation.

The statement $s'=f(s)$, as it is understood here, in translation into the language of words, signifies the following: (1) each sound of the antecedent corresponds to exactly one sound of the consequent; (2) identical durations correspond to identical durations; (3) identical pitches correspond to identical pitches.

But does this give too scant a background in order to speak about such diverse transformations as pertaining to one category? Maybe it would be so if one could find a boundary line somewhere between simpler transformations and more complex ones, which would sharply divide one group of them from another. But the transition from simple transformations to complex ones is always more or less smooth. Though the boundaries are definable, none of them surpasses the one which distinguishes an exact repetition from even the slightest change. And because for a long time one has not limited oneself to exact repetitions — at a certain point in time, changes have come to be tolerated — it has become necessary for more complex transformations to appear again and again as a natural continuation and product of the simpler ones. Similarly, if 2 appears following 1, then with all necessity sooner or later there should appear (there would be recognized) 3, 4, 5… until infinity would be filled up…

Nontraditional Transformations in Music

18. If, while experimenting in one's mind, one takes melodies — linear segments arbitrarily extracted from musical compositions, containing an equal amount of notes and pauses — and compares them with each other, searching for a possibility to present some of the melodies as resulting from transformations of other ones, an interesting fact will be discovered: by means of transformations of $s'=f(s)$, a wide array of different melodies may be derived from each other. In some cases, in order to transform one into another, the simplest transformations suffice:

A or C (Scarlatti):


C or A (Tchaikovsky):


while others — of which there are a lot more — require more complex ones:

A or C (Scarlatti):


C or A (Ives):


Melodies that could be derived from one another turn out to be such a common phenomenon — unexpectedly so — that the task becomes rather difficult to find two such melodies (equal in quantity of notes and pauses), where neither could be presented as being derived from the other. The probability that two melodies are connected by the transformation $s'=f(s)$ is very great, and the shorter the melodies are the greater it becomes. With melodies consisting of not more than two notes, this probability attains its highest point. In other words if one takes the array of all (notated) musical compositions, then any 2-note melodic fragment from any work of any author is on a certain ideal level an initial and (in an extreme case — or) the derived one in relation to any other dyad of the same work or any other which has ever been created or which has not been written yet; and almost every 3-note, 4-note, … 7-note … fragment is the same in relation to a fragment of an equal number of notes. Can one not but marvel at how intensely saturated with such connections is the musical "field", cultivated during the course of centuries?..

Of course many connections have appeared before and appear now unintentionally, and if one sees a Plan in each of them, then it is hardly worth it to find in almost any one of them traces of an *individual* plan. In addition, these connections are, as a rule, barely perceived directly (in other identical cases, once again, the shorter melodies are and the more complex the transformation that connects them, the less perceivable the connection seems to be).

However, among the obscure and barely discernable connections, one can occasionally find examples that are distinguished from the rest, either on purpose or for some other reason, and that become perceptible and noteworthy — the principle of derivation is given special significance and is perceived as such.

Traditional transformations are well known as having been used in music intentionally and with the purpose of their perception. Any ordinary imitation, sequence, ostinato, repetition at a distance, repetition in inversion or retrograde, correspondence between motives, borrowing or quotation embodies that kind of transformation. By traditional means one can transform scales into one another, arpeggios into one another, trills into one another, et cetera. But, in a similar manner, whether intentionally or unintentionally, nontraditional transformations have also been occasionally used (most frequently rather simple ones) which in the long run are comprehended as $s' = f(s)$ of transformation.

Quite often a transformation happens to be nontraditional when a melody is repeated in a different mode (nontraditional, in this case, only from the point of view of our classification):

A or C:

C or A (Mahler):

The transformation about which we find out from Olivier Messiaen's *Technique de mon langage musical* can also be regarded as a repetition of a melody in a different mode:

A (Moussorgsky):

C (Messiaen):

The following examples could be understood not only as rhythmical, but also as thoroughly strict pitch imitations, if under the aegis of this term one can include nontraditional transformations as well:

(from J. S. Bach's *Fugue in D major* for organ)

A or C: / C or A:

A or C: / C or A:

A case, the intentionality of which is apparent, may be found in the work of Alfred Schnittke (the pitches are transformed according to the rule $p' = a$):

(from *Fourth Violin Concerto*, Second Movement, 1984)

A: / C:

In the following example, by the means of $s' = f(s)$, durations are transformed:

(from A. Schnittke's, *In memoriam*, First Movement, 1978)

A or C: / C or A:

The transformation of $d' = a$ can be found, for instance, in the music of Béla Bartók:

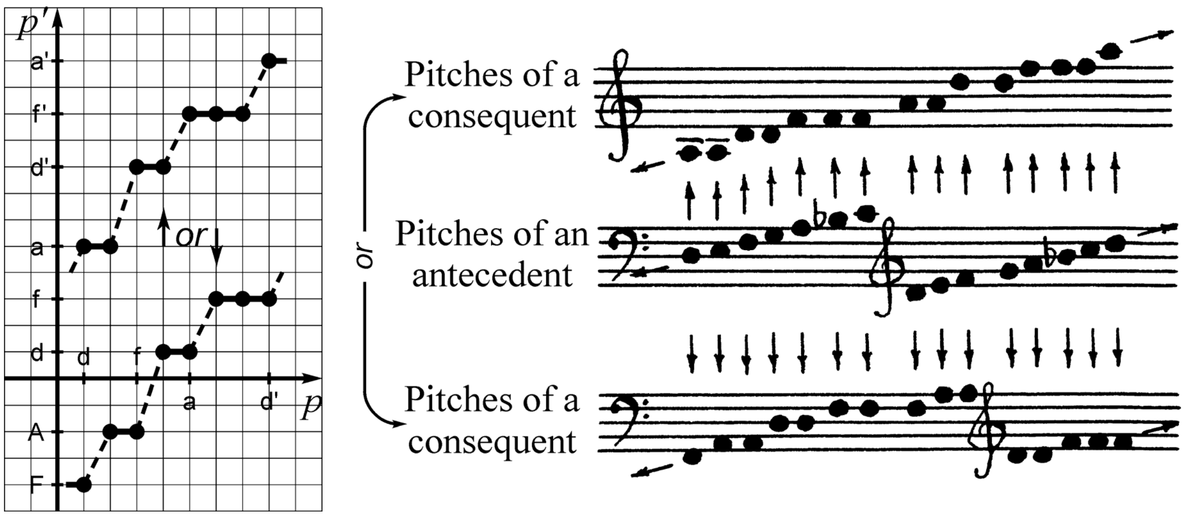
(from *Music for Strings, Percussion, and Celesta*, Fourth Movement, 1936)

A: / C:

Transformations of $s' = f(s)$ cover permutations of notes, among which some very intricate ones have been actualized (for example in the “Île de feu II” from the *Quatre études de rythme* of Messiaen).

By nontraditional means one can transform trills and tremolos into one another, scales and arpeggios into one another, pitch-series and duration-series into one another…

Certain musical compositions, which are relatively few in number, allow us to observe an extreme situation, where the structures transforming and transformed by whichever mean of $s' = f(s)$ continue throughout the course of the entire composition or one of its autonomous sections: here the significance of transformation per se — of the whole *idea* of transformation — is expanded to its utmost limits. In this category of pieces one can place, for example: the *Canon in Three Voices* for piano by Vassily Lobanov,[2] where the consequents are brought out by the formulas $d' = d + 4$ and $d' = 2(d + 4)$; *Trivium* for organ by Arvo Pärt, the character of transformation in this composition could be explained through the following scheme:



and the *Four Canons* for violin and cello by the author of these lines. In the Four Canons the following nontraditional $s' = f(s)$ transformations were used: $d' = 8/d$, $d' = 2$, $d' = d + 3$, $d' = |-d^2 + 8d - 6|$. Moreover, here transformations were carried out, which, being absolutely strict, extended beyond the limits of the $s' = f(s)$ transformation as well. They were: $p'_j = p_j - p_{j-1} + 7(p_j - p_{j-1} / |p_j - p_{j-1}|)$ and $p'_j = p_j - p_{j-1} + 7(p_j - p_{j-1} / |p_j - p_{j-1}|) + |p_j - p_{j-1}| - 4$. The *Four Canons* were composed in 1981, shortly after the time when the idea comprising the subject of this article first occurred to me, opening up for me, among other things, the possibility of essentially more complex transformations of durations and pitches than those which I had the chance to encounter earlier.

[2] The information about this composition was gathered by me from the diploma thesis of Valeriya Tsenova “The Musical-Theoretical Problems of the Creative Work of Moscow Composers of the First Half of the 1980s,” Moscow Conservatory, 1985 (typescript).

About Repetition

19. An imitation is frequently defined as a repetition of a *melody*, although even in a double augmentation, the consequent cannot be called a repetition in the strict sense. At the same time, even among the most complex $s'=f(s)$ transformations, where not a trace remains of the repetition of a melody, a repetition — an exact repetition! — does not disappear at all: what occurs, however, is the repetition not of the melody but of the *relation* between the corresponding sounds of the antecedent and the consequent.

It is the relation between paired sounds (connected by arrows ↓ in the examples), the $s'=f(s)$ relation, which in each case could be characterized by a concrete combination of formulas or graphs, that is repeated in all pairs without any changes. This is what determines the repetition of more complicated but more perceivable relationships between corresponding fragments of melodies: groups of two, three, or *n* number of sounds (only in one case, when the $s'=f(s)$ relation is an identity relation, its repetition implies the repetition of melody).

A repetition of a relation (as in another case a repetition of a melody, whether an exact one or not) is that which brings connection between melodies. Granted that with complex transformations the $s'=f(s)$ relation is deeply hidden, which is why the connection might seem nonexistent. (More simple relations that do not repeat appear on the surface.) But the more hidden a relationship, the more joy it brings to discover it and to comprehend what relates particular melodies to one another.

Apparently, the more complex the relation (the rule of transformation) is, the greater and more thorough must be the efforts — in particular, a greater the number of repetitions must be carried out — so that the rule-determining character of the transformation may be perceptible, and the connection between so related melodies, no matter how deep, may become clear to us, showing itself as real and significant.

Once Again about Terms

20. We may use the term *imitation* to identify the combination of two melodies or the relation between them, one of which is derived from the other by the means of $s'=f(s)$ transformation. Its advantage is that it emphasizes the genesis and the natural connection between what is new and what was previously discovered. Its drawback is that it has strong associations with another meaning, which is in two ways more rigid. Nevertheless, the inconvenience created by the latter circumstance could be avoided by saying *imitation of the* $s'=f(s)$ *type* or *imitation in a wide sense*, et cetera. The term *correspondence* is also possible.

In turn, traditional imitations and transformations could reasonably be called *classical* ones.

Conclusion

21. Even though there is an infinitely large number of $s'=f(s)$ transformations, they all are but a very small part of the domain of possible transformations. In the future, those which are not $s'=f(s)$ transformations could be examined in conjunction with the latter ones, and significantly more heterogeneous phenomena could appear related to each other. Among the possible transformations covered by one overview, there would be those which are by themselves well known and used for a long time, as well as those about which we do not know anything yet. For a given pair of melodies, one would be able to find a significantly greater number of various transformations leading to the same result than have yet been found. The question would arise about interpretation — that is, about exactly which of the transformations could be considered the most adequate in a given case. Other questions will arise, among which, presented in a new light, will be certainly the "eternal" ones as well: about music for the ear and for the eye; about good and bad music; about chaos and order; about the spirit and the substance of music; about the question of why canon appears so rarely…

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