

Modalization, Serialization and Intervalization

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The aim of this study is to introduce mainly some new concepts usable for composers and musical theoreticians. All the debate concerning the general conception of modality, serialism and interval composition are re-formulated (as well as conceived in another way) theoretical views of Prof. Alois Piños. To this topic his paper “Obecné rysy modality a seriality / Vztahy mezi modalitou a serialitou” (“General Features Of Modality And Serialism / Relations Between Modality And Serialism”; [Piños 1996]) is related.¹ It is interesting that many of Piños’ ideas can be found anticipated in his works “Vyvážené intervalové řady” (“Balanced Interval Series”; [Piños 1970]) and “Tónové skupiny” (“Tone Groups”; [Piños 1971]). On the basis of Piños’ inquiries other investigation are made.

In the beginning of our reflection let us remind ourselves the fact of *tone system*. For example, in the western music the well-tempered half-tone scale is still the main scale in use. It is a well known series of tones C2, C sharp 2 (D flat 2), D2, D sharp 2 (E flat 2), E2, F2, F sharp 2 (G flat 2), G2, G sharp 2 (A flat 2), A 2, A sharp 2 (B flat 2), B2, C1, ..., c, ..., c1, ..., c2, ..., c3, ..., c4, ..., c5.² There is a common thought that the octave is only the frequency doubled, so the tone c1 differs from the tone c2 minimally. Thus the European tone system can be understood as the sum of the twelve elements, tones, in a number of octave positions.

This system can be supposed to be an ordered set.³ The members of this set are tones; structuredness is then given by different distances between the tones, there are intervals between them. Every tone of the tone system is in the interval of half-tone from the next tone. Considering the fact that there are twelve tones, there are eleven kinds of intervals (minor second – 1, major second – 2, minor third – 3, major third – 4, fourth – 5, triton – 6, fifth – 7, minor sixth – 8, major sixth – 9, minor seventh – 10, major seventh – 11; of course, we omit

¹ The second part of this paper was adapted for International Conference Musica Nova I., edited in the collection (JAMU, 1996) under the title “Ke vztahům mezi modalitou a serialitou” (“To Relations Between Modality And Serialism”).

² Let us write ‘#’ instead of ‘sharp’ and (unfortunately less naturally) ‘b’ instead of ‘flat’.

³ The mathematical aspect of this topic could be disputed very intimately (this holds for the logical notions of whole study). It is not considered to be convenient here.

the null interval and the interval of twelve here). The *complementary intervals* are those the sum of which is the interval of an octave (1 and 11, 2 and 10, 3 and 9, 4 and 8, 5 and 7, 6 is complementary to itself); the complementary intervals can be considered to be closely mutually akin. We do not consider the intervals overreaching the interval of an octave, *transferred* intervals as of different quality than *basic* intervals.⁴

The **tone group (TG)** is a selection of tones from the tone system. Alois Piños uses the definition “The group is every union of given elements, i.e., of all elements or of every their selection”, and “the given elements of tone groups are individual tones” (both quotations are translated from [Piños 1971], p. 11). Let us add that the selection of tones can be also the selection of all the tones, or (on the other hand) the empty set of tones as well. It is a matter of law that the tone group selected in this way retains the properties given by the tone system. Thus also the tone group can be considered to be an ordered set.

Many tone groups embody a high level of affinity. Hence it is possible to distinguish certain basic figures (so-called *representatives*) and closely related figures (so-called *derivatives*) derived (by some operations) from the basic figures. The representative stands for all the figures with different octave transpositions of some tones and repeated tones, etc.⁵ The representative could be compressed in one octave. The representative and derivatives make a so-called *collection*. Compare with Tone Groups [Piños 1971]. A typical operation that can be applied to the tone group is thus change of order of tones, or octave transpositions of some tones, or repetition of tones. With respect to properties of the tone system, intervals change. Briefly speaking: *tones remain, intervals change*.

⁴ For any other tone systems, the same general laws hold (this principle is applied in the whole study).

⁵ In contrast to Piños ([Piños 1971], pp. 12-15), the inversions and fourth or fifth transformations are not taken into account because in the case of all representatives of tone groups the derivatives does not always generate figures with the same tones. Inversion figures from some representatives are not usually from the same tones, but in contrast to figures of fourth or fifth transformations they have always the same intervals as the respective representative - figures of inversion should then be assigned to the notion of interval group (see further). Transposed figures can be, but it is not necessary, assigned to one representative; transposed figures are surely intervallically congruent, but from the entrance collection they can be obtained also by adequate isomorphic substitution of tones. This different definition is made with respect to the analogous way of defining an interval group (Piños’ definition of tone group enables to subsume in one collection higher number of related figures; this is more expedient for compositional use). For details see [Raclavský 2005].

The notion of an interval group is constituted by Piños in a similar way (however, the first explicit definition is in the present text). With respect to the fact of ordering of the tone system, we can evaluate every selection from it from the viewpoint of the priority of another aspect. Instead of the preference of tones (tone aspect), the selected group can be evaluated primarily as an interval group (the tones are then secondary). The **interval group (IG)** is a selection of intervals contained in the tone system. Similarly as in the case of tone groups, the representatives of related figures (among them also inverted figures) can be differentiated. Again we can realize the changes of order of intervals, but, of course, to generate objects of higher number of members than what the number of kinds of intervals is.⁶ With regard to the properties of the tone system, these operations change tones. Hence: *intervals remain, tones change*.

For the purpose of our following inquiries it will be convenient if the tone group or the interval group would be construed as a *matrix*, a pattern, for building of other objects – modes and series. By the term *mode* one should not understand different historical phenomena as *modus gymel* etc., or *trochaic modus*, ... etc., et al., but only as a general term for church modes, church scales, modes, modal scales, modal terrains, tone terrains, natural or artificial modes et al., all scales can be understood by this term. Another historical term *series* will be understood generally as every *n*-elements (for *n* higher than 1) progression, sequence (the twelve-tone series of dodecaphony are the special cases).

Let the **modal principle** be (together with A. Piños) formulated now:

“The modality is connected with selections of elements (tones, secondarily also intervals, rhythms).” ([Piños 1996], p. 2). Generally, this selection of elements can be taken from any set: for example, the set of tones, the set of intervals, the set of tone lengths, etc. The selection of elements is consequently *obligatory* because it is just the selection that agglutinates, connects, the mass of composition; that is the binding property given by the selection of

⁶ Let one fact be deeply realized: the classical harmony built up chords (in their main constellation) from one interval group (3 4) only, the exceptions are augmented and diminished chords and conceivable nearly all altered chords. With exception of chords of fifths (major and minor ones) all the other chords (seventh-chords, ninth-chords, etc.) are built up from figures of higher number of members than the number of interval kinds in respective interval group is. (The inversions of chords, i.e., the permutations, arise from primarily tone evaluation - the tones are permuted, the intervals are changed: for example, c1 e1 g1 b1 is permuted to the figure e1 g1 b1 c2 where the interval structure, 4 3 4, is changed into the structure 3 4 1.).

elements. Assembling elements to other different compound objects is then a secondary matter.

If only tones are taken into account then it can be claimed that any tone group can be used as a mode (in the case of intervals the matter is analogous). The modes can have very small number of tones (for example, a two-tone mode), or they can be built up from a number of tone groups or from one group in several transpositions (an arisen mode is then the other tone group: either representative or derivative; the way the mode is built up is interesting only for our practical insights).

It is clear enough that a tone mode is a subset of the tone system (let the chromatic scale, which is “non-selectional”, be not taken into account). It follows that some things are not accessible: these are unselected tones and also the intervals between unselected tones (for example, the whole-tone scale-mode does not contain minor second, minor third, fourth, fifth, major sixth, major seventh), or the intervals between a chosen tone and an unselected one (for example, in pentatonic mode e, g, a, b flat, d the major second occurs, but not between the tones e and f sharp).

The horizontals and the verticals, i.e., the melodies and the chords, are frequently freely chosen from mode. The horizontals and verticals are objects which are in effect differently organized subsets of respective chosen set (in such objects there are not usually all members of mode). The mentioned freedom may be decreased in favor of compositional rigorousness. Any other hierarchies can be established as well, i.e., the meaning priority of some elements (in the composition with “the tones of white keys” we do need to hierarchize in a certain way, otherwise it will not be clear whether the Ionic mode, or the Dorian mode, the minor or the major scale (and so on) is realized; they all have only the one representative). The doctrines of the major-minor system (mainly the “calculi” of classical harmony) are well-known examples of codification of certain rules of hierarchization.

What has been told about the tone modes holds for all the other modes, “selections of elements”. (Let the really problematical construing of interval mode be seen here.) Generally speaking the modal principle is the selection of elements. It relies on *binding property given by selection of elements*. This binding property may be mutated by hierarchizations, or by more rigorous constructions of composed objects.

Let the **serial principle** be (with A. Piños) formulated now:

“The serialism is bound with the choice (destination) of sequences (series) of members, for example, of tones, intervals, tone lengths, timbres etc.” ([Piños 1996], p. 8). Again, work with

different sets is possible: work with a set of tones or with a set of intervals and so on. The selection of elements, members, is not obligatory here; it is the *selection of series*, sequences, successions that is *obligatory*. The agglutination of the matter of composition is based on the selectivity which is in this case the selectivity of series of elements (*binding by the selections of series of elements*).

A small number of elements or a high number of elements may be associated into a series. The numerical frequency of one element in certain series may be different too. For example, the famous theme of Beethoven's Fifth symphony is from the viewpoint of tones a four-member series where one member is repeated three times. In contrast to this, classical dodecaphony works with twelve-member tone series where every tone occurs only one-times.

The individual tone series (if only tones are in our field of interest) is one of many possible series that are constructible in a given tone system. Many possible series are then very akin (they differ by the small number of inherent sub-series), some of them are akin more, some of them rather less (they differ by the higher number of partial series). It is a question of compositional work if those much related series or those not so related series are chosen. The affinity is also determined by the number of members of series (for example, dodecaphony prefers to work with twelve-member twelve-tone series). Affinities and preferences enable hierarchization. In the case of rigorous work with series, many elements should not be immediately reachable (it is in connection with the impossibility to realize meaningfully all the series which are possible in only one composition - the composition should be the selection). Let the following be added now: verticals can be appropriately understood as overturned (rotated, translated) horizontals (where the look-in of succession is easy).

What has been said about tones series holds for the "selections of series" of elements from the other sets. The serial principle thus is the selection of series of elements. It relies on *binding property given by selection of series*.

The notions of modalization, serialization and intervalization, deintervalization respectively be - in the meantime generally - will be defined here as follows:

- **modalization** is a conversion of musical structure into a structure evidently based on selectivity of elements
- **serialization** is a conversion of musical structure into a structure evidently based on series (selections of series of elements)

- **intervalization** is a conversion of musical structure into a structure based on priority (of evidence) of intervals (of selection of intervals); the intervalizations are, for example, the octave transpositions of some tones for reaching the structure with balanced number of kinds of intervals (more specifically: of balanced number of directions of intervals), symmetries, or periodicities (if tone balance was present then it is not retained)⁷

- **deintervalization** (from the viewpoint of connotations the term tonalization is not evidently convenient) is a conversion opposite to intervalization - the obtained structure does not have usually regular interval order, the priority is thus put on tones (again the tone balance, symmetry and periodicity are related affairs).

In all cases the scale of evidence, large diffusion, a plenty of degrees, is possible.

Towards the notions of tone and interval order: for example, not all twelve-member twelve-tone, i.e., balanced, series are eleven-member eleven-interval series, i.e., balanced, commonly called all-interval series, and vice versa. In spite of this such structures exist: for example, series g♯1 g1 f1 a♯1 e1 a1 e♯1 e1 b♯1 d♯1 b1 c1 (by the way, after octave transpositions of tones the mode, strictly speaking the series, Grandmother Chord is obtainable).

The notions of modalization, serialization, intervalization and deintervalization should be regarded as conversions, or as processes. *Conversion* (transformation, transmutation, transfiguration, arrangement) is a conversion of a structure into a structure of different characteristics. (The conversed structure can be exposed in a composition, for example, by certain cut). *Process* is a gradual conversion, progressive passage, successive transformation of an entrance structure via partial structures to the final structure. (Process can be implemented in a compositional whole, for example, as an evolution).

The number of all cases is much higher. But the following selection should bare effective insight into the problem as well as it should show contemporary well usable cases.

⁷ *Balance* is given by the fact that in a certain structure every kind of element is represented by the same number as the other kinds of elements (for example, in the interval structure 5 2 2 2 5 2 5 5 every kind of interval is exposed four-times; analogously in the case of tones). *Periodicity* means periodical repetition of partial structure (for example, 5 2 2 5 2 2; similarly in the case of tones). *Symmetry* means that the structure is ordered in such a way that in both ways of reading it is the same (for example, 5 2 2 5 2 2 5; similarly in the case of tones). Some structures have more than one of these properties (for example, periodical and symmetrical structure 2 5 2 2 5 2). The classification is due to Piños.

The inquisitive reader will derive the other cases according to her/his needs. It should be noted here that, for example, introducing tone order to modal structures is omitted.

The small letters signify *act*, the capital letters signify *stage* (for example, mTG means the metamorphosis of tone group by modalization; imTG means modalization which runs parallel with intervalization; MTG then means modalized tone group, i.e., the mode; IMTG signs intervalically modalized tone group, i.e., the mode with orderly interval order). The round brackets are meant to signify tone or interval group, the slashed brackets are meant to signify mode, the square brackets are meant to signify series. The notation of tones in tone groups is, of course, abstract, it does not mark out octave position. In the case of modes the sign + is usually omitted, the mode is read in ascending order.

- modalization of TG (mTG)

Modalization of tone group means the advance by which the tone group is construed as mode (some figure of whatever tone group is considered to be a mode, i.e., the selection of tones). For example, the tone group (c d f g§) is conceived as the mode /c d f g§/.

- intervalization of modalization of TG (imTG)

The modalization of tone group runs with respect to the interval order which is (possibly) realizable by fixation of octave transpositions of some tones and by some other operations (historically known periodical, pertinently balanced, or symmetrical modes built up from so called modal successions such as 1:3:1:3:1:3...). For example, the tone group (c d e f g a b§) is transformed into the mode /b§1 c2 f2 g2 a2 d3 e3/ of which the interval structure 2 5 2 2 5 2 is periodical and symmetrical.

- modalization of IG (mIG)

Modalization of interval group means the advance by which the some figure of whatever interval group is conceived as a mode, i.e., a selection of intervals. For example, derived figure of the interval group with representative (1 2 3), that is, for example, (1 2 9) can be conceived being the mode /1 2 9/.

- deintervalization of modalization of IG (dmIG)

Modalization runs with respect to the tone order in this case. For example, from (1 2 3) it is derived /1 2 3 9 10 11/, then, for example, /2 3 1 11 9 10/, which is a tone symmetrical mode, cf. /c1 d1 f1 g§1 f2 d3 c4/.

- serialization of TG (sTG)

Tone group is conceived as series, sequence. It means that to a selected figure of tone group the order (the succession) of tones is assigned. For example, from the tone group (c d f g§) it is constructible the series [d1 c1 g§1 f1], or [g§1 c2 f1 d], or [c1 d1 f1 g§1] as well.

- intervalization of serialization of TG (isTG)

Serialization of tone group runs with respect to interval order with using octave transpositions and other operations. For example, from the tone group (c d e f g a b§) the one-direction ascendant series [b§1 c2 f2 g2 a2 d3 e3] is constructible which has the interval structure +2+5+2+2+5+2, or the both-direction series [b§1 c2 f2 g2 a2 e2 d2] with structure +2+5+2+2-5-2, in the both cases the structure is periodical and symmetrical.

- serialization of IG (sIG)

Interval group is conceived as the series, succession. That means that to members, i.e., intervals of selected figure of interval group, the order (succession) is assigned, pertinently also to the directions of intervals. For example, from (1 2 3) it is built the series [+2+3+1], or [-2+3-1], and so on similarly.

- deintervalization of serialization of IG (dsIG)

Interval group is serialized with respect to the tone order, intervals are ordered in such a way to reach the tone order as it is possible; in such cases it is not possible for them to be substituted by related intervals. For example, from the interval group (1 2 3) the series [+2+3+1+11+9-2] is built which is irregular as regards intervals but tonally symmetrical - compare, for example, [c1 d1 f1 g§1 f2 d3 c3].

Let it be understood that acts of modalization and serialization are not complementary with respect to tone (or interval) group, they are not qualitatively the same operations. In the case of modalization the one tone (or interval) group (its representative or derivative) is conceived as a mode, while in the case of serialization else the conceiving is the operation, but more the assigning of order, succession, of members (of given group) is added.

The contrary courses of operations, i.e., the courses to tone or interval group (the terms demodalization and deserialization could be used here) are also useful. A given mode is identified with a figure of tone (or interval) group and then respective representative is found, and consequently all the related figures, i.e., derivatives, can be derived.

The same is possible with the series: a series is conversed first onto an one-direction figure, than the succession is omitted; thus the path from a series to a tone (or interval) group, mode, is easy. Compare it with the following.

Let the following cases be compared by reader with claims and examples in Piños' paragraph "Vzájemné přehodnocování módů a řad" ("Mutual Revaluation of Modes and Series"; [Piños 1996]).

- serialization of MTG (sMTG)

Tone mode is serialized, series are derived from it (the extreme case is overturning of mode to one-direction series (after adaptations to multi-directional series); in the wide sense, it is a precise work with series on the basis of the selection of tones, it is the re-evaluation of priority of a selection – a primary accent on selectivity of elements differs in favour of primarily ancillary work with selections of series (the extreme case here is saving rigorous modality and installing of rigorous serialism, compare with our epilogue).

- intervalization of serialization of MTG (isMTG)

The preference and building of an interval order (on the level of series, not of modes) is added to serialization of MTG.

- serialization of MIG (sMIG)

Analogously to sMTG, a series from an interval mode may arise.

- deintervalization of serialization of MIG (dsMIG)

The structure of a tone order of a series during the making-up a series from a modalized interval group is preferred here.

- modalization of STG (mSTG)

Tone series is modalized (the extreme case is overturning of - pertinently prepared - series onto horizontal and from here is conceived as tone mode); in the wide sense, it is a disengagement of (mainly partial) successions in a series in favor of a selection of tones in continuance of some composition (the extreme case is saving rigorous serialism with installing rigorous modality).

- intervalization of modalization of STG (imSTG)

Together with a modalization of serialized tone group an interval order of mode is increased (or created).

- modalization of SIG (mSIG)

Analogously to modalization of STG, the selectivity of elements, i.e., modality is emphasized.

- deintervalization of modalization of SIG (dmSIG)

It is a modalization of SIG but with the improvement of a tone order of a mode.

As it was apparent during the study, to construe and to use the notion of mode in any independent position with regard to the notion of tone or interval group is inadequate. The notions of tone group or interval group are ex definition consonant (identical) with the most general definition of mode. (Let it be seen how peculiar it is to imagine a mode, i.e., a selection, as a selection from a tone or an interval group which both are already themselves selections.) The notion of mode is frequently not used in its most general sense, it is alleged in connections with different historical theories and conceptions, and consequently is then - in spite of the notion of tone or interval group - often confusing. Of course, there is a certain contemporary compositional practice which uses some recent compositional techniques of so called modal way of composing. Also with respect to this fact our study operated with the term mode.

The *epilogue* could then be formulated in the following way. So called modality and so called serialism are two sides of the same coin. It could be expressed (independently of history)⁸ as: *the series are built from tone group or interval group*. Tone group or interval group is a selection of elements (this selection is naturally presented in a composition by the respective series). These elements are then ordered in certain way to series, thus the selections of different partial and whole series is realized (this selection is naturally presented in a composition as well as the selection of elements). From the compositional point of view, we can operate near the former pole - rigorously working with selection of elements and freely work with selections of series, or we can operate near the latter pole - rigorously working with selection of series and freely work with selections of elements, or, to work in an intermediate position where the first one is unpretentious in the freedom in selections of elements and series, the second one, on the other hand, sophisticated in rigorous work with selections of elements and selections of series as well.⁹ (Compare also with paragraph “Sbližování modality a seriality”, “Convergence Of Modality And Serialism” in [Piños 1996].) On the one hand, there is a selectivity of elements (the modal principle) and on the other hand there is a selectivity of series (the serial principle). In connection with this claim, consider the fact that

⁸ The notion of tone group and the analogous notion of interval group are exactly homological to set-theoretical concepts. Similarly the notion of series has its mathematical pendant. In composition the mathematically objective operations with (objective) material and (objective) properties of tone system come into account.

⁹ Let one fact be at least quite clearly understood: so called thematically-motivical work is in principle nothing other than serial way of composing (although on the background of some mode).

musical composition (its order) is constituted by connections, linkages, bindings, series of elements, and not the mere reality of elements.¹⁰

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¹⁰ The author is obliged for various tutor interventions to Prof. Alois Piños in 1998 and 1999 when the present study was written. Let the study be dedicated to Piños.