A METHODOLOGY FOR THE DISCUSSION OF CONTOUR: ITS APPLICATION TO SCHOENBERG'S MUSIC

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Accounts of continuity in tonal music have generally been accounts of pitch relations. This can be justified because of the gravitational power of the tonal center in defining cadences and because of the decisiveness of consonance-dissonance relations for hearing meter. For twentieth-century music, theories of pitch-class relations have attempted to play a similar role, reassuring all doubters that pitch class not only accounts for relations at the surface level, but is the only true source of deeper structural relations. Pitch-class relations, however, by their very nature, are incapable of exerting the same degree of control over the musical surface as could be attributed to pitch relations in tonal music. Whereas pitch relations are the bearers of linear continuity in tonal music via scale steps, pitch-class relations in post-tonal music, no matter how rigorously controlled, cannot make a comparable claim.

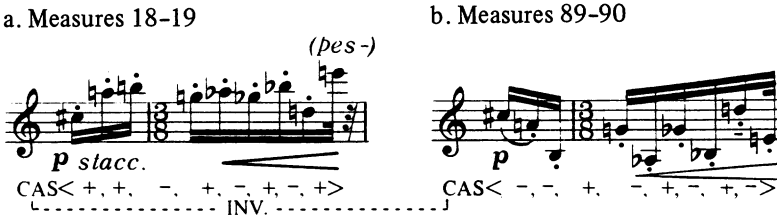
We are confronted, then, with a serious gap between the vivid realities of the surface of twentieth-century music and our accounts of the rather remote abstractions that are supposed to be its prime determinants. Recent work on timbre, meter, and attack point relations has begun to remedy the one-sided pitch-class favoritism, but these parameters too often are relegated to the margins as surface phenomena.

The radical music of the classical twelve-tone period most often has been analyzed with a heavy emphasis on pitch class. After all, it *is* the music whose harmonic content is dictated by a specific ordering of the twelve pitch-classes. The control of pitch class exercised in twelve-tone music, however, is as much a delimitation of its sovereignty, as it is a tribute to its importance, and this autonomy of pitch class and interval class has a logical corollary, the autonomy of contour. Thus, the independent associative power of each musical parameter is the major consequence of the classical twelve-tone premises of composition. It remains for the analyst to ascertain how far the music goes in carrying out the potential for independent parametric development that is inherent in the theory of twelve pitch-classes.

In one hypothetical and extreme compositional treatment of the relation of interval class and contour, there could be a close link between the use of particular row segments and contours with which they are consistently associated. On the other extreme, contour and pitch class could be treated autonomously, each yielding its own features of association and even its own hierarchical structures. In this latter view, a musical gesture must be understood as a matrix of rhythmic, pitch-class, contour and timbral characteristics, each of which can be developed independently. Although separate scrutiny of each of these musical parameters necessarily lends an artificial quality to our hearing, contour analysis adds a much needed dimension to our view of important segments of twentieth-century repertoire.

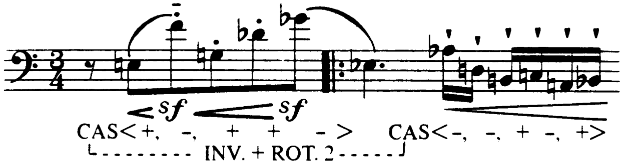
One obvious application could be to the intervallic expansions of the opening tune of Bartok's *Music for Strings, Percussion and Celesta,* in which contour is the invariant factor, and the pitch space is subject to transformation. The classics of the 12-tone literature offer another focus, where the series of interval classes in time is invariant, and contour therefore becomes an important source of transformation and motion. One vivid example of the independence of contour operations from pitch and interval class in Schoenberg's music can be seen in measures 18-19 and 89-90 from the Waltz of opus 23, shown in Examples 1a, b. Pitch class, as well as duration and metrical placement are held invariant between the two passages, but contour is inverted. Even more characteristic for Schoenberg's music are those passages in which a process such as transposition or inversion is applied to a pitch-class set; while an order transformation such as rotation or retrograde is applied to the contour, resulting in two conflicting mapping processes.

The implications of contour study in twentieth-century music are even more significant for the listener than for the composer. Perception of contour is more general than perception of pitch, and for those listeners who have difficulty grasping the complex world of pitch, interval, and set-class relationships as outlined in atonal theory, the contour of a musical unit may be the melodic parameter that is most easily



Example 1. Schoenberg, Five Piano Pieces, op. 23, Waltz

Example 2. Schoenberg, Phantasy, op. 47, measures 1-3



Example 3. Schoenberg, Suite, op. 25, Menuett: Trio, measures 1-2

grasped and related to other musical features. I have found that students in ear training classes can often hear contours accurately, and that this ability not only leads to hearing pitch relations, but can also yield a linear dimension otherwise lacking in their perception of non-diatonic pitch structures. The notion of retaining a tone and hearing stepwise motion, so to speak, between non-consecutive pitches—so central to tonal hearing—has important consequences for the accessibility of twentieth-century music.

The Contour Adjacency Series. I want to propose two tools for describing contour: the *Contour Adjacency Series* (CAS) and *Contour Class* (CC). (For the definition of technical terms and abbreviations refer to the Glossary.) The CAS takes John Rahn's ordered pitch-interval—which measures the direction (+ and -) and "distance in real semi-tone space" between two pitches—and removes the distance factor, leaving only the +'s and the -'s.[1] The CAS describes a series of directional moves up and down in the melody. Thus, the CAS of the opening of Schoenberg's *Phantasy for Violin and Piano,* opus 47, (Ex. 2) is CAS⟨+,+,+,-,-⟩. Adjacent repeated pitches are not taken into account nor is there an indication of long-range pitch repetitions. In fact, the CAS gives us no way of judging the contour relation between non-consecutive pitches that exhibit a change of direction. That is, given a CAS of ⟨+,-⟩, it is impossible to know whether the third pitch is lower or higher than the first. Thus, the CAS is a rather blunt, general description of a series of moves between temporally adjacent pitches.

Despite its lack of refinement, the CAS is nevertheless an effective tool, both for establishing a general kind of contour equivalence and for describing retrograde and order rotation. An example of rotation appears in the relation of the first two hexachords of the violin part of the Phantasy, shown in Example 2. The CAS of the first hexachord is ⟨+,+,+,-,-⟩ and that of the second hexachord is ⟨+,+,-,-,+⟩. We can obtain the CAS of the second hexachord by beginning on the second move of the first hexachord's CAS and shifting the first move to the end, an operation we shall call "Rotation 1." To establish an equivalence class for rotations, retrograde and other ordering permutations, we can generalize the CAS further into a two digit *vector,* in this case CASV⟨3,2⟩—which indicates a six-note melodic unit containing three upward motions and two downward ones in any order. In other words, CAS units that share the same two-digit vector (CASV) may be related by rotation, retrograde and other, more irregular ordering permutations.

We can obtain the inversion of a CAS, as demonstrated in Examples 1a, b, by inverting all of its original signs. An example of inversion plus rotation of a CAS is found in the Trio section of the Minuet from the Suite, opus 25 (Ex. 3). The first hexachord displays CAS⟨+,-,+,+,-⟩;

the 16th note hexachordal complement displays CAS⟨-,-,+,-,+⟩. Rotation 2 of the first hexachord's CAS, obtainable by beginning on the third move, is the inversion of the second hexachord.

Two levels of CAS relation appear in Example 4a, b, which shows the heads, respectively, of the A and A_1 sections of one of the Violin Phantasy's internal ABAs. Viewed as an order transformation, measures 60-61 (Ex. 4b) invert Rotation 2 of measures 52-53 (Ex. 4a). The parallelism of durational pattern and gesture, however, also helps us to hear subset relations between the two passages: the CAS equivalence between moves 2 and 3, and the equally clear inversion between moves 4 and 5. In addition, the CASVs of the two passages provide an index of inversion—CASV⟨2,3⟩ inverted is CASV⟨3,2⟩. It should be noted that contour inversion as described here refers to a general characteristic which is a basis of comparison between two passages, but is unlike pitch or pitch class inversion in that a specific axis is not employed. Figure 1 illustrates the CAS and CASV relations discussed thus far.

The CAS is an equivalence class for an infinite number of representatives in pitch space. It is pointless to quantify levels of transposition for different members of the CAS equivalence class. It is meaningful, however, to observe degrees of difference between CASVs with the same number of moves simply by measuring the difference between corresponding digits of two vectors. For example, the difference between CASV⟨4,1⟩ and CASV⟨0,5⟩ is 4. Awareness of maximum and minimum degrees of difference and similarity of CASVs can convey the relative degree of "upness" or "downness" of a musical unit, as well as signifying a possible structural matrix of relations between musical units.

Contour Class. Contour class (CC) is a more specific and inclusive account of the contour relations among the pitches in a musical unit. It describes contour relations among all the pitches—not merely the adjacent ones as the CAS does—and can reflect the occurrence of pitch repetitions. In the CC, 0 is the lowest pitch, and n-1 (n=number of different pitches in the musical unit) is the highest pitch. Therefore the CC of Example 2 is ⟨1-2-3-5-4-0⟩.[2] The CC describes the position of pitches relative to one another while the CAS describes a series of moves between pitches. The use of the contour class requires a complete picture of the musical unit, whereas the CAS describes the contour motions as they happen.[3] Through the CC we can observe the composer's attitude toward melodic lines as reflected in such traditional concerns as the filling in of leaps and the attainment of high points.

Elsewhere the CC has been described as a series of registral order-position numbers.[4] Space and time are treated as alternative ordering domains for a series of pitch classes. In the present treatment of contour, however, rather than assuming the preeminence of pitch class,

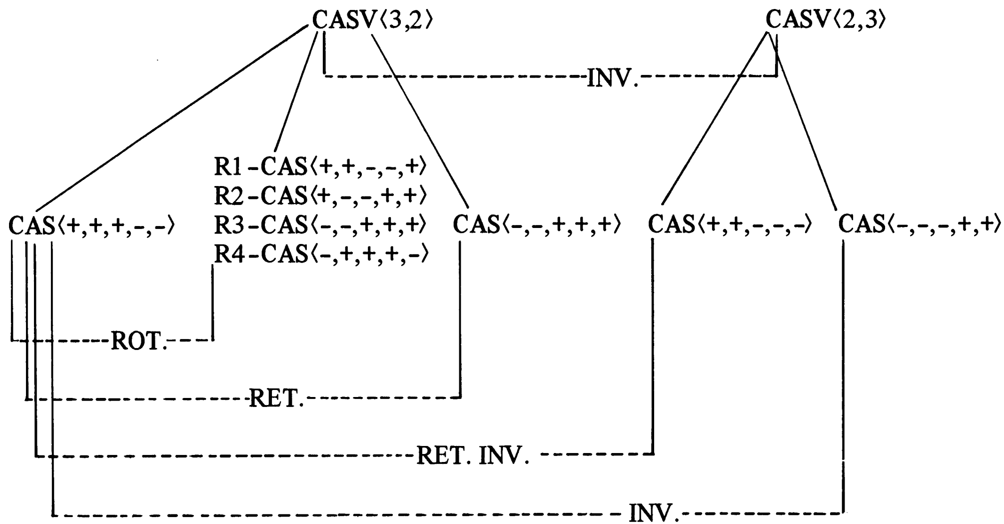
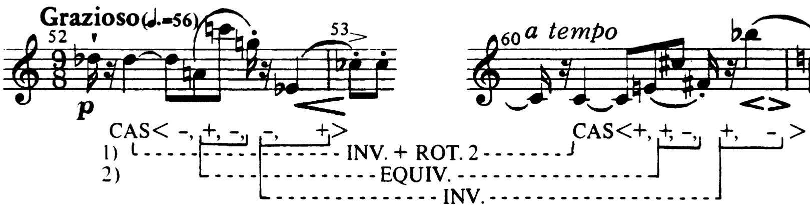
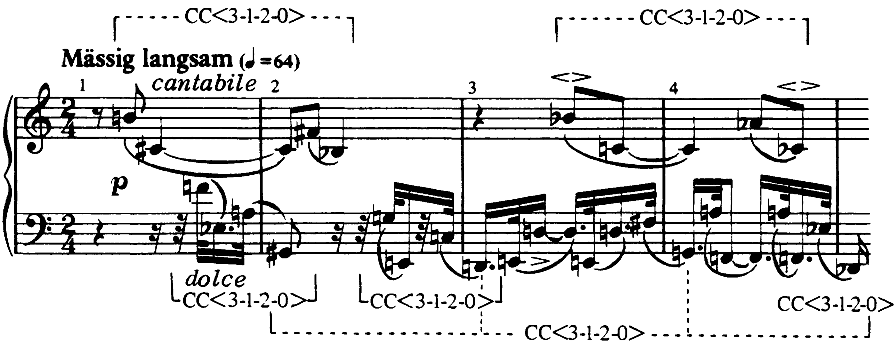


Figure 1. CAS Relations

a. Measures 52-53 b. Measures 60-61



Example 4. Schoenberg, Phantasy, op. 47



Example 5. Schoenberg, Klavierstueck, op. 33b, measures 1-4

Contour intervals (CI) for CC⟨1-2-3-5-4-0⟩

CI+1	CI+2	CI+3	CI+4	CI+5		CI-1	CI-2	CI-3	CI-4	CI-5
1-2	1-3	1-4	1-5			1-0	2-0	3-0	4-0	5-0
2-3	2-4	2-5				5-4				
3-4	3-5									
3	3	2	1	0	/	2	1	1	1	1

CIA⟨3,3,2,1,0 / 2,1,1,1,1⟩

Figure 2. CIA Derivation

the goal is to divorce the pitch-class series from the contour relations, and to describe characteristics of motion that are independent of pitch class. The contour class measures internal relations within the musical unit, not the absolute frequencies and distances. In the CC, registral position numbers and temporal order numbers are implicitly paired, and pitch class is disregarded.

Schoenberg's *Klavierstueck,* opus 33b, provides a striking example of the unifying power of CC equivalence. The opening bars of that piece (Ex. 5) show the prevalence of a contour class idea, CC⟨3-1-2-0⟩, in each of the first two melodic phrases (B-C♯-F♯-B♭ and B♭-C-A♭-B), in the succession of written downbeats (G♯-D-G-D♭), and in the first two accompaniment figures (F-E♭-A-G♯ and G-E-C-D). These five four-note figures—only some of which represent segments of the row—are all characterized by the CC⟨3-1-2-0⟩. This CC and its inversion occur throughout the cantabile sections of the piece and represent, I think, the *Grundgestalt* of the piece at least as strongly as does the row.

The CC evokes the world of contour space, as distinguished from both pitch space and its more abstract relative, pitch-class space. The most distinctive aspect of contour space is the *Contour Interval* (CI), whose smallest unit, 1, describes the relation of registrally adjacent pitches in a CC. In the CC⟨1-2-3-5-4-0⟩ of Example 2, the relation of 1-2 is +1, and the relation of 5-4 is -1. The CI is infinitely expandable or contractable in pitch space. Contrary to the CAS, the relations measured within a CC encompass *all* the contour dyads moving forward in time, not merely those between temporally adjacent pitches. Thus, in the CC⟨1-2-3-5-4-0⟩, 1-5 is a contour interval of +4, and 5-0 is a contour interval of -5.

Contour Interval Succession (CIS), which measures the contour intervals between the successive notes of a given CC, provides a link between the CAS and the CC. For the CC⟨1-2-3-5-4-0⟩, the CIS is ⟨+1, +1,+2,-1,-4⟩. The CIS can be understood as a refinement of the CAS (for this example ⟨+,+,+,-,-⟩) which incorporates the more specific contour information conveyed in the CC. To reiterate, in order to tell the difference between a contour interval of +1 and +2, or between -1 and -4, one must have a complete picture of the musical unit. A larger CI contains a greater number of intervening pitches in the registral order of the musical unit. It is by no means necessarily a larger interval in pitch space.

The *Contour Interval Array* (CIA) describes the frequency, or according to John Rahn, the multiplicity of each contour interval type in the CC as a whole.[5] As shown in Figure 2, the digits on the left side of the slash enumerate the frequency of the positive contour intervals in ascending order. The digits on the right side of the slash enumerate the frequency of negative intervals in ascending order. Figure 2 demonstrates why the CIA for CC⟨1-2-3-5-4-0⟩ is ⟨3,3,2,1,0 / 2,1,1,1,1⟩. A six-element CC has a ten-digit CIA, a five-element CC has an eight-digit CIA, a four-element CC has a six-digit CIA, and so forth.

In six-element CC's, the total of the frequency of contour intervals +1 and -1 is always 5, the total of intervals +2 and -2 is always 4, the total of intervals +3 and -3 is always 3, the total of intervals +4 and -4 is always 2 and the total of intervals +5 and -5 is always 1. Therefore, the universal array of contour intervals unordered with respect to direction for six-element CC's is ⟨5,4,3,2,1⟩. Unordered interval content—in any event, a debatable notion when applied to contour space—is therefore neutralized as a special characteristic of any given CC. Typically, two or more CC's share a given CIA. Therefore, the CIA does not serve to completely identify a CC, but acts as an equivalence criterion for two or more CC's.

The inversion of a CC is generated by obtaining a n-1 index number between all mapped pairs. So, as shown by Figure 3, the only possible inversion for the CC⟨1-2-3-5-4-0⟩ is CC⟨4-3-2-0-1-5⟩, with index number 5 being the sum of all mapped pairs. The inversion of the CC results in the inversion of signs in the CIS. Therefore, CC⟨4-3-2-0-1-5⟩ has a CIS of ⟨-1,-1,-2,+1,+4⟩. The inversion of a CC also results in the inversion of its CIA, which is expressed by an exchange between the digits to the left and right of the slash.

The retrograde of a CC results in the retrograde plus sign inversion of the CIS and also produces the inversion of the CIA. Therefore, the retrograde of a CC and its inversion share the same CIA, and the retrograde inversion of the original CC likewise shares *its* CIA. Thus, CC⟨1-2-3-5-4-0⟩ and its retrograde inversion, CC⟨5-1-0-2-3-4⟩, although their CIS are retrogrades, have the identical CIA. A CC is *identical* to its retrograde inversion only when its CIS forms a palindrome, as in m. 34 of the Phantasy (Ex. 6). It is, however, always *equivalent* to its retrograde inversion in terms of the CIA invariance. Figure 3 summarizes the effects on the CIS and CIA on the CC under inversion, retrograde and retrograde inversion.

As shown in Figure 4a, b, registral rotation (that is, contour class transposition), as well as temporal rotation, are possible operations on a CC, but neither preserves contour interval content and both are perceptually questionable. As applied selectively by composers and analysts, however, they could provide means of transformation and connection.

Two kinds of *Contour Class Vector,* which reflect different levels of generalization in expressing the ups and downs of the line, can be extracted from the Contour Interval Array. The first, CCV I, summarizes the degree of up and down in a CC by collapsing the number and quality of all the positive and negative contour intervals into two digits. As

X =	CC⟨1-2-3-5-4-0⟩ =	CIS⟨+1,+1,+2,-1,-4⟩ =	CIA⟨3,2,2,1,0 / 2,1,1,1,1⟩
INV. X =	CC⟨4-3-2-0-1-5⟩ =	CIS⟨-1,-1,-2,+1,+4⟩ = [INV. OF CIS(X)]	CIA⟨2,1,1,1,1 / 3,2,2,1,0⟩ [INV. OF CIA(X)]
RET. X =	CC⟨0-4-5-3-2-1⟩ =	CIS⟨+4,+1,-2,-1,-1⟩ = [RET. INV. OF CIS(X)] [RET. OF CIS OF INV. OF X]	CIA⟨2,1,1,1,1 / 3,2,2,1,0⟩ [INV. OF CIA(X)] [EQUIV. TO CIA OF INV. OF X]
RET.INV. X =	CC⟨5-1-0-2-3-4⟩ =	CIS⟨-4,-1,+2,+1,+1⟩ = [RET. OF CIS(X)]	CIA⟨3,2,2,1,0 / 2,1,1,1,1⟩ [EQUIV. TO CIA(X)]

Figure. 3. Inversion, Retrograde and Retrograde Inversion of Contour Class (CC), Contour Interval Succession (CIS) and Contour Interval Array (CIA)

CC<1 - 0 - 3 - 2>
CIS <-1, +3, -1>

Example 6. Schoenberg, Phantasy, op. 47, measure 34

Rot. 1 = CC⟨2-3-4-0-5-1⟩
Rot. 2 = CC⟨3-4-5-1-0-2⟩
CC⟨1-2-3-5-4-0⟩---Rot. 3 = CC⟨4-5-0-2-1-3⟩
Rot. 4 = CC⟨5-0-1-3-2-4⟩
Rot. 5 = CC⟨0-1-2-4-3-5⟩

Figure 4a. Registral Order Rotation (Contour Class Transposition)

Rot. 1 = CC⟨2-3-5-4-0-1⟩
Rot. 2 = CC⟨3-5-4-0-1-2⟩
CC⟨1-2-3-5-4-0⟩---Rot. 3 = CC⟨5-4-0-1-2-3⟩
Rot. 4 = CC⟨4-0-1-2-3-5⟩
Rot. 5 = CC⟨0-1-2-3-5-4⟩

Figure 4b. Temporal Order Rotation (Order Number Transposition) shown in Figure 5, the first digit is obtained by multiplying each positive contour interval type by the frequency of its occurrence and then adding the products. The second digit is obtained by multiplying each negative contour interval type by the frequency of its occurrence and then adding those products. CCV I for the now-familiar CIA⟨3,3,2,1,0 / 2,1,1,1,1⟩ is therefore ⟨19,16⟩. There are thirty-six possible six-note CCV I's.

CCV II is a more general measurement of the topography of the CIA. Only the number and direction of the contour intervals are taken into account, not their size. Since there are a total of nine upward "motions" in this passage and six downward ones, its CCV II is ⟨9,6⟩. As with the CASV, both types of CCV are subject to inversion: the inversion of CCV I⟨19,16⟩ is ⟨16,19⟩, and the inversion of CCV II⟨9,6⟩ is ⟨6,9⟩. There are sixteen possible six-note CCV II's. The two CCV's, like the CAS and CASV, describe moves between pitches, rather than the position at which pitch frequencies or contour class elements are located. Measurement of difference is possible with the CCVs in the same way that it is possible with the CASV. The CASV and both kinds of CCV have a dual significance: they function as indicators of an equivalence class, thus possessing associative structural potential; and they indicate "impressionistically" the relative energy of musical units that are generated by their contour.

The Contour of a Succession of Simultaneities. Although the CAS and CC are designed primarily for single melodic lines, they can also describe the contour of two or more simultaneities. There are several possible ways of dealing with strings of simultaneities that comprise two or more pitches. One generates the CASV as the sum of the distinct motions of the soprano, the alto, the bass, and so forth. Another, instead of using registrally given lines as the basis of the CAS, might use timbre. "Die Blasse Waescherin," from Schoenberg's *Pierrot Lunaire,* presents an interesting tension between the registral lines of the three parts of the piano reduction and the timbral lines presented by the three instruments. The sums of either set of lines could provide the basis for an aggregate CASV.

Another approach, however, treats each of the three pitches of a chord moving to all three pitches of the following chord. Nine motions, then, take place between each chord pair. This approach shows that Schoenberg purposefully confounds the registral and timbral lines in "Die Blasse Waescherin" (Ex. 7) as a means of creating a melody that represents a progression of sonorities, rather than a three-part contrapuntal texture.

The five-chord succession from m. 7, using traditional polyphonic criteria applied to the registral lines, would have a CAS as shown below

CIA⟨3, 3, 2, 1, 0 /2, 1, 1, 1, 1⟩

3(+1) + 3(+2) + 2(+3) + 1(+4) + 0(+5), 2(-1) + 1(-2) + 1(-3) + 1(-4) + 1(-5)

=

CCV I(19,16)

Figure 5. Derivation of CCV I from CIA

a. Piano reduction

Registral CAS.

CAS⟨+,-,+,-⟩
CAS⟨-,-,+,-⟩
CAS⟨ -,-,+⟩

Sum CASV⟨4,7⟩

Registral CC.
CC⟨3-4-1-2-0⟩
CC⟨4-3-0-2-1⟩
CC⟨2-(2)-1-0-1⟩

Sum CIA⟨4,1,0,0/7,6,4,2⟩
Sum CCV I⟨6,39⟩
Sum CCV II⟨5,19⟩

b. Score

Timbral CAS.

CAS⟨-,-,+,-⟩
CAS⟨+,-,-,-⟩
CAS⟨+,-,-,+⟩

Sum CASV⟨4,8⟩

Timbral CC.
CC⟨4-2-0-3-1⟩
CC⟨3-4-2-1-0⟩
CC⟨3-4-1-0-2⟩

Sum CIA⟨5,1,1,0/7,8,5,3⟩
Sum CCV I⟨10,50⟩
Sum CCV II⟨7,23⟩

c. *Total Sonority Motion*

Ex. 7c—*Total Sonority Motion.*

CAS⟨-,-,+,-
-,-,+,-
+,-,-,-

-,+,-
+,-,-,-
+,-,-,-

-,-,+,+
-,-,+,+
+,-,-,+⟩

"Sonority" CASV⟨12,23⟩

"Sonority" CC.
CC⟨10- 7- 2- 9- 3
7- 8- 6- 5- 1
9- 11- 1- 0- 4⟩

CIA⟨5,5,4,3,0,0,1,1,0,0,0/
8,9,6,6,8,10,7,6,4,3,1⟩

CCVI⟨54,342⟩
CCV II⟨19,68⟩

Example 7. Schoenberg, Pierrot Lunaire: Die Blasse Waescherin, measure 7 the piano reduction in Example 7a. This approach would be reflected in a CASV of ⟨4,7⟩. A similarly polyphonic perspective, this time reflecting the timbral lines, is shown in Example 7b. Its CASV is ⟨4,8⟩. The interpretation of the contour which views each pitch's motion as directed toward all the tones of the succeeding chord results in a CASV of ⟨12,23⟩, as shown by Example 7c.

The CC can describe the same three-pronged view, for it reveals the relations among all chords, rather than merely between those adjacent. The relative registral positions of the pitches yield three contour class lines, shown in Example 7a. This example also shows an aggregate CIA, derived by adding the three registrally generated polyphonic lines, along with the corresponding CCV I and CCV II. Example 7b shows a comparable response to the timbral lines generated by the three instruments, along with the corresponding CIA, CCV I and CCV II. Example 7c contains the CIA, CCV I and CCV II resulting from the alternative approach to the contour of this passage—one which views it as a progression of three sonorities rather than three distinct lines. This is an unwieldy, but nonetheless suggestive representation of the sense of motion in the passage.

These three views of contour—the first based on registral polyphony, the second on timbral polyphony, and the third on a view of unified sonorities—reveal a unique kind of tension in Schoenberg's music. The two polyphonic interpretations respond directly to his devotion to traditional counterpoint as seen in his extensive use of *Hauptstimme* and *Nebenstimme* in, for example, the four string quartets. The third approach, which perhaps reflects the composer's more avant-garde attitude toward continuity, is represented, for example, in parts of the *Five Pieces for Orchestra.* This strand of compositional thought is most strongly realized in our own time by some composers of electronic music and in some of the instrumental music of Ligeti. The tension between these two approaches to a contour of simultaneities is analogous, in a sense, to the tension between the primary and secondary harmonic dimensions in Schoenberg's twelve-tone music as discussed by Martha Hyde.[6] This concept of tension allows us to address an elusive, but central feature of Schoenberg's music, embodied in what David Lewin calls the "tropic" piano writing of the Violin Phantasy, as well as in many of the successions of violin double and triple stops.[7]

CAS relates to CC as does general to particular. A two-move CAS form can accommodate two different CC possibilities. A three-move CAS form can be expressed by as many as five CC possibilities. A four-move CAS can contain fifteen CC's. Figure 6 shows examples of the multiple CC possibilities within a CAS type. If two musical units share the same CC, there is a much greater degree of similarity between their contours than if they merely shared the same CAS. Figure 7 indicates

CAS⟨+,-⟩
CC⟨1-2-0⟩
CC⟨0-2-1⟩

(2 possible)

CAS⟨+,-,+⟩
CC⟨0-2-1-3⟩
CC⟨0-3-1-2⟩
CC⟨1-2-0-3⟩
CC⟨1-3-0-2⟩
CC⟨2-3-0-1⟩

(5 possible)

CAS⟨+,-,+,-⟩
CC⟨0-2-1-4-3⟩
CC⟨0-3-1-4-2⟩
CC⟨0-3-2-4-1⟩
CC⟨0-4-1-3-2⟩
CC⟨0-4-2-3-1⟩
CC⟨1-2-0-4-3⟩
CC⟨1-3-0-4-2⟩
CC⟨1-3-2-4-0⟩
CC⟨1-4-0-3-2⟩
CC⟨1-4-2-3-0⟩
CC⟨2-3-0-4-1⟩
CC⟨2-3-1-4-0⟩
CC⟨2-4-1-3-0⟩
CC⟨3-4-0-2-1⟩
CC⟨3-4-1-2-0⟩

(15 possible)

Figure 6. CAS to CC: General to Specific

Number of Pitches	2	3	4	5	6
CASV types	2	3	4	5	6
CAS types	2	4	6	16	32
CC types	2	6	24	120	720
CIA types	2	4	12	48	240
CCV I types	2	4	11	21	36
CCV II types	2	4	7	11	16

Figure 7. Contour Types

the six types of contour description I have used and the number of different sets of each type for a given number of different pitches.

Contour Subsets. We must realize that the CAS, the CC, and their vectors are flat or uninterpreted means of description, which do not necessarily reveal the prominence of one feature over another. Just as the pitch-class set itself does not reveal which interval or subset is most significant in a specific context, neither does the CAS or CC reveal the features of contour that the composer highlights by rhythmic, metric or dynamic means. The advantage of this sort of flat, uninterpreted analytic tool is that it reveals the potential of the musical idea independent of its particular use at any given moment. One obvious disadvantage is that it does not address musical features as they are being heard, since the analysis steers towards a nonsynchronous view of pitch class, rhythm and contour.

We can discuss this dichotomy between latent and manifest qualities of a particular contour idea in terms of subset content, especially with regard to the CC. Figure 8 shows that the twenty trichordal subsets of the first hexachord of Schoenberg's Phantasy are distributed among four CC types, as are the fifteen four-note subsets, and that six five-note subsets are distributed among three CC types.[8] Although listing these subset types gives valuable information about the topography of the musical idea—the balance of upward and downward motion and aspects of the overall shape—the lack of a hierarchy of interpretation that shows which subsets are featured and which only remotely heard, indicates the limitations of the approach. The beginnings of an interpreted hierarchy give priority to subsets formed by adjacent elements and especially to subsets formed by pitches at registral extremes. Figure 8 shows that the three-note subsets of adjacent elements form CC types ⟨0-1-2⟩ (two instances), CC⟨1-2-0⟩ and CC⟨2-1-0⟩. The four-note CC subsets formed out of adjacent elements are CC⟨0-1-2-3⟩, CC⟨0-1-3-2⟩, and CC⟨1-3-2-0⟩, and the five-note CC adjacencies are CC⟨0-1-2-4-3⟩ and CC⟨1-2-4-3-0⟩.

The CC subset-type formed out of registral extremes (in this case a three-element subset, since there is only one change of direction in the musical unit) is of the type ⟨1-2-0⟩. In the absence of other considerations, this is the principal contour subset of the idea. The two means of selecting highlighted subsets—adjacent groupings and subsets found at the registral extremes—are dictated purely by contour. Other means of extracting contour subsets would involve those subsets highlighted by metrical stress, durational emphasis or dynamic gesture. In other words, the analyst's judgment, rather than any objective measurement, is critical to interpret the effect of a contour idea and in judging the

CC⟨1-2-3-5-4-0⟩

Three-note subset types

CC⟨0-1-2⟩	CC⟨0-2-1⟩	CC⟨1-2-0⟩	CC⟨2-1-0⟩
{1-2-3}	{1-5-4}	{1-2-0}	{5-4-0}
{1-2-5}	{2-5-4}	{1-3-0}	
{1-2-4}	{3-5-4}	{1-5-0}	
{2-3-5}		{1-4-0}	
		{2-3-0}	
		{2-5-0}	
		{2-4-0}	
		{3-5-0}	
		{3-4-0}	
4	3	9	1

Four-note subset types

CC⟨0-1-2-3⟩	CC⟨0-1-3-2⟩	CC⟨1-2-3-0⟩	CC⟨1-3-2-0⟩
{1-2-3-5}	{1-2-5-4}	{1-2-3-0}	{1-5-4-0}
{1-2-3-4}	{2-3-5-4}	{1-2-5-0}	{2-5-4-0}
	{1-3-5-4}	{1-2-4-0}	{3-5-4-0}
		{1-3-5-0}	
		{1-3-4-0}	
		{2-3-5-0}	
		{2-3-4-0}	
2	3	7	3

Five-note subset types

CC⟨0-1-2-4-3⟩	CC⟨1-2-3-4-0⟩	CC⟨1-2-4-3-0⟩
{1-2-3-5-4}	{1-2-3-5-0}	{1-2-5-4-0}
	{1-2-3-4-0}	{2-3-5-4-0}
		{1-3-5-4-0}
1	2	3

Figure 8. CC Subset Content

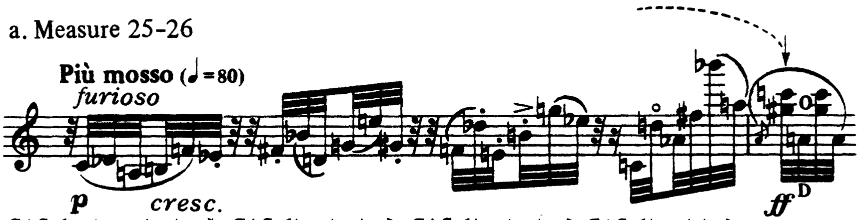
strength of associations that spring from this or any other methodology of description.

Past views discuss contour as a general topographical feature of musical lines that does not lend itself to precise description or analysis. This sort of general treatment is well suited to music in which the difference between structural and ornamental motion is both central and obvious. In the absence of controlling tonal considerations, however, a precise descriptive apparatus for contour is required to complement the comparable theoretical structures that have been devised for pitch class. Neither methodology, however, can determine what constitutes a musical unit, the definition of which is, after all, a primary goal of analysis.

Analytical Applications. The most transparent setting for a study of contour relations in Schoenberg is in a passage that simulates a sequential transition in tonal music by the repeated use of contour and duration units. Example 8a shows the violin line in m. 25 of the Phantasy. Three six-note passages share the same CAS⟨+,-,+,+,-⟩. The first six-note unit has a CC of ⟨2-3-0-1-5-4⟩, indicating a CCV II of ⟨10,5⟩. The second six-note unit has a different CC, ⟨1-4-0-2-5-3⟩, but has the same CCV II, ⟨10,5⟩. The third unit has a CC of ⟨1-3-0-2-5-4⟩ and a CCV II of ⟨11,4⟩, a difference of 1 from the first CCV II. The fourth unit has a CC⟨0-2-1-3-5-4⟩ and a CCV II of ⟨14,1⟩, a difference of four from the first CCV II and a difference of three from the second. The equivalence of CAS forms reveals the element of repetition in the contour of the passage, and the succession of CCV II's–⟨10,5⟩, ⟨10,5⟩, ⟨11,4⟩, ⟨14,1⟩–reveals its transformation, which we can summarize as ⟨0, +1, +3⟩. These descriptive methods reveal aspects of the passage that are intuitively persuasive: similarity combined with transformation and intensification, as indicated by the increasing predominance of upward-directed elements in the CCV II.

The comparable passage in m. 161 (Ex. 8b) contains a similar series of six-note passages. The first of these is the exact inversion–both in interval and contour–of the first six-note unit in m. 25. It therefore has a CAS of ⟨-,+,-,-,+⟩. The next returns us to the CAS of m. 25, ⟨+,-,+,+,-⟩–the inversion of the first unit, which we again hear in the third unit. The CC of the first unit is ⟨3-2-5-4-0-1⟩, with a CCV II of ⟨5,10⟩. It is followed by ⟨0-2-1-4-5-3⟩ with a CCV II of ⟨12,3⟩, a difference of +7. Both of these vectors are different from any of the units of Example 8a, but the second one is located "between" the last two units of the earlier passage; in other words, CCV II⟨12,3⟩ is between CCV II⟨11,4⟩ and CCV II⟨13,2⟩. The third six-note unit of the later passage has a CC of ⟨1-3-0-2-5-4⟩, with a CCV II of ⟨11,4⟩. Although this third unit continues the upward pitch trajectory of the passage in

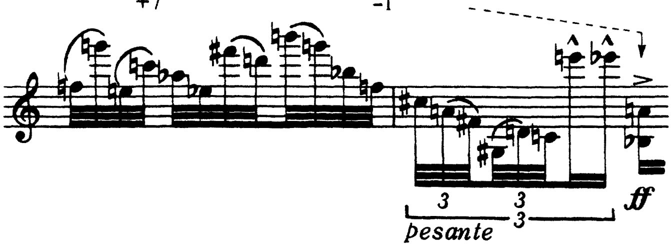
a. Measure 25-26



CAS< +, -, +, +, -> CAS<+,-,+, + -> CAS<+,-,+, +, -> CAS<+,-, +,+,->
CC< 2 - 3 - 0 - 1 - 5 - 4> CC<1-4-0- 2 - 5 -3> CC<1-3-0- 2 - 5 - 4> CC<0-2-1-3-5-4>
CCV II<10, 5> CCV II<10, 5> CCV II<11, 4> CCV II<14, 1>
+1 +3

b. Measure 161-162

CAS<-, +, -, -, +> CAS<+,-,+, +, -> CAS<+, -, +, +, ->
CC<3 - 2 - 5 - 4 - 0 - 1>CC<0-2-1-4 - 5 - 3> CC<1-3 - 0 - 2 - 5 - 4>
CCV II<5, 10> CCV II<12, 3> CCV II<11, 4>
+7 -1



Example 8. Schoenberg, Phantasy, op. 47

CAS <+, -, + + - > CAS< +, -, +, +, - >
CC< 0 - 2 - 0 - 2 - 3 - 1> CC<0 - 1 - 0 - 1 - 3 - 2>
CC< 0 - 1 - 0 - 1 - 2> CC<0 - 1 - 0 - 1 - 2>

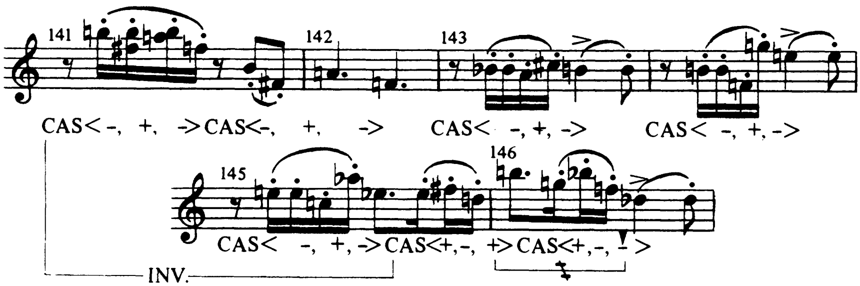
Example 9. Schoenberg, Phantasy, op. 47, measures 111-112 the same manner as in m. 25, the vector reveals a "step back" from its predecessor, ⟨12,3⟩.

The CC of this unit and its vector are equivalent to the third of the units in m. 25, but in the local context the passage functions to deny the unequivocal intensifying effect conveyed in m. 25. When we see that a longer time span precedes the goal of the phrase in m. 161, the intent of the "step back" becomes apparent: to allow more space for the phrase to reach its goal. The goal of the phrase in m. 25 is the following downbeat, whereas the goal of the phrase in m. 161 occurs a full measure later, on the downbeat of m. 163.

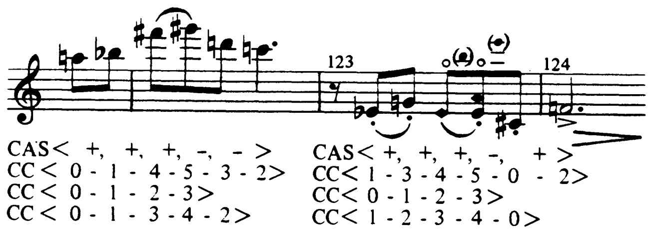
In this paper, I originally intended to explore Schoenberg's use of contour, focusing on it as a compositional parameter independent of pitch relationships. Instead, I have found it necessary to define a set of descriptive tools that allow us to discuss contour relations in any twentieth-century work. Although I have gained access to a broader range of literature with these tools, I have still only touched upon the idiosyncrasies of Schoenberg's treatment of contour.

In closing, I would like to offer a sampling of the range of observations that we can make about contour in the violin part of the Phantasy using the tools outlined above. CASV equivalence, and even CAS equivalence or rotation between adjacent or parallel melodic units, are Schoenberg's most common ways of relating such units, even if the pitch or interval class content does not correspond. CC equivalence is inevitably a less common occurrence, and thus deserves special attention. Measure 34 (Ex. 6), is characterized by one of the most common contour classes for the initial tetrachord of the row, CC⟨1-0-3-2⟩, that is used to initiate discrete sections of the piece. However, when we hear it in m. 52 (Ex. 4a) with a retrograde form of the row—and therefore with a different pitch-class set—it gains greater importance as an independent unifying force in the music.

The more common relation between melodic units is demonstrated in mm. 111-112 (Ex. 9). CAS⟨+,-,+,+,-⟩ is a basis for equivalence in the two bars, but CC⟨0-2-0-2-3-1⟩ is followed by CC⟨0-1-0-1-3-2⟩. This should not suggest, for instance, that Schoenberg's melodic writing demonstrates a cavalier treatment of CC relations. On the contrary, the first five notes of both passages demonstrate CC equivalence, for both exhibit CC⟨0-1-0-1-2⟩. The C of m. 112 gains in eloquence by denying its CC parallelism with the A of m. 111. The passage that introduces and includes the initial bars of the original transposition level of the row (mm. 141-147) presents a similarly related series of parallel gestures. As shown in Example 10, a common CAS bridges the transition and is repeated three times after the initiation of the P_0 row form. A statement of the CAS inversion takes us into the downbeat of m. 146. The next three notes suggest a restatement of the inversion, but the



Example 10. Schoenberg, Phantasy, op. 47, measures 141-146



Example 11. Schoenberg, Phantasy, op. 47, measures 122-124

descent of the fourth pitch prevents a repetition of the pattern, thus producing the cadential contour quality discussed by Schoenberg in *Fundamentals of Musical Composition.* [9]

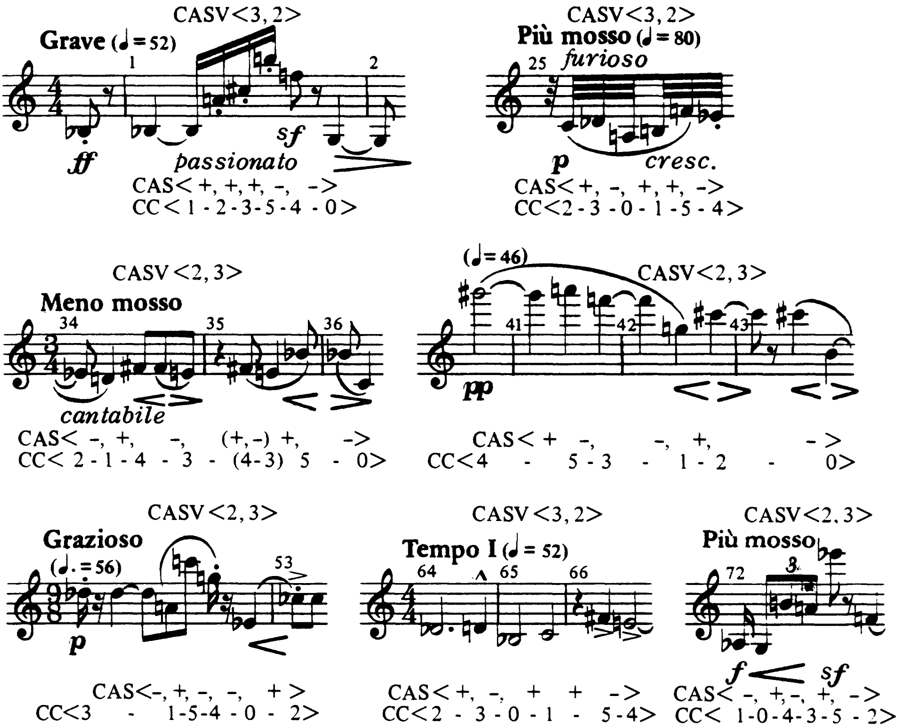
In mm. 122-124 (Ex. 11) Schoenberg could have insured CAS equivalence by writing the C♯ of m. 123 an octave higher. In choosing the low C♯, he prevented a simple cadential echo effect and increased the tension of the second unit. In this case, the F of m. 124 is heard as the pitch that violates CAS equivalence between the two gestures, and it thus becomes the pitch of greatest effect. The more astute listener will hear the CC parallelism between the first four pitches of the unit, CC⟨0-1-2-3⟩, and will thus hear the low C♯ disrupt the CC equivalance between the units by failing to play the same CC role as did D in the previous unit.

Example 12a shows the CASVs, CASs and CCs at many of the important sectional boundaries where the hexachord occurs in single notes as a musical unit. All of these passages demonstrate either CASV equivalence or inversion; some demonstrate CAS retrograde, retrograde inversion, rotation and rotation plus inversion. There are two pairs of gestures demonstraing CAS equivalence, and one of those pairs even demonstrates CC equivalence. Example 12b shows this network of relationships. Since the CASV is only a general basis of comparison, we should deduce nothing more than a general preference for a type of contour from observing the characteristics shared by all members of this network. But, in light of Schoenberg's predilection for concealed relationships among superficially contrasting ideas, one might consider the different levels of similarity exhibited in these contour relations as a possible basis for measuring degrees of remoteness—not to replace, but to supplement the areas of pitch class transposition and inversion.

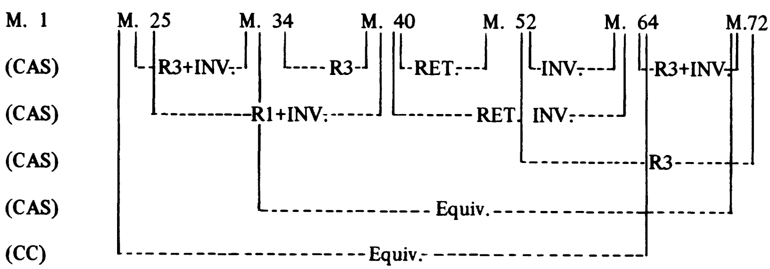
Although I have not explored the subject here, I believe that Schoenberg's treatment of contour relationships often results in a mapping of elements that functions as a quirky and independent commentary on the mapping of pitch-class relationships, both ordered and unordered. The resulting tension provides a key to his musical personality.

The units that I have used to exemplify contour relationships thus far have been small ones. One step towards larger dimensions can be taken if we relate the high points of successive units. For example, the B-G♭-F in the first five bars form CC⟨1-2-0⟩, the same CC type as that created by the registral extremes in the first unit, B♭-B-G. We could achieve a comparable expansion of scope either by enlarging the musical units considered or by integrating a greater number of units into the contour class.

In summary, Schoenberg uses contour both in conjunction with pitch class and as an independent structuring tool. His music shows that contour can convey a network of associations different from the one created



Example 12a. Schoenberg, Phantasy, op. 47



Example 12b

by pitch, interval, and set class—a network sometimes powerful enough even to integrate gestures into an organic whole. Like all other aspects of Schoenberg's music, contour serves to create a maximum concentration of expression, as well as to weave an infinitely rich web of structural associations.

GLOSSARY OF TECHNICAL TERMS

CAS (Contour Adjacency Series): An ordered series of +s and –s corresponding to moves upward and downward in a musical unit. For example, the theme of the finale of Mozart's "Jupiter" Symphony has a CAS of ⟨+,+,–⟩.

CASV (Contour Adjacency Series Vector): A two digit summation of the +s and –s in the CAS of a musical unit. The first digit signifies the number of upward moves in a musical unit; the second digit signifies the number of downward moves in a musical unit. For example, CAS⟨+, +,–⟩ has a CASV of ⟨2, 1⟩.

CC (Contour Class): An ordered series that indicates what registral position a pitch occupies in a musical unit. If n = the number of pitches in a musical unit, then the highest pitch in that unit is signified in the CC by n–1. The lowest pitch is signified by O. For example, the theme of the finale of Mozart's "Jupiter" Symphony has CC⟨0–1–3–2⟩.

CI (Contour Interval): The distance between one element in a CC and a later element as signified by the signs + or – and a number. For example, in CC⟨0–1–3–2⟩, the CI of 0 to 3 is +3, and the CI of 3 to 2 is –1.

CIS (Contour Interval Succession): A series which indicates the order of Contour Intervals in a given CC. For example, the CIS for CC⟨0–1–3–2⟩ is ⟨+1,+2,–1⟩.

CIA (Contour Interval Array): An ordered series of numbers that indicates the multiplicity of each Contour Interval type in a given CC. If there are n elements in the CC, then there are n–1 possible ascending (+) Contour Interval types and n–1 possible descending (–) interval types. Two ascending series separated by a slash (/) correspond to the positive and negative Contour Interval types. For CC⟨0–1–3–2⟩ there are two instances of CI type +1, two instances of CI type +2, and one instance of CI type +3; there is 1 instance of CI type –1, and 0 instances of CI types –2 and –3. In summary, the CIA for CC⟨0–1–3–2⟩ is ⟨2,2,1/1,0,0⟩.

CCV I (Contour Class Vector I): A two-digit summation of the degrees of ascent and descent expressed in a CIA. The first digit is the total of the products of the frequency and contour interval types found on the left side of the slash in the middle of a CIA. The second digit is the total of the products of the frequency and contour interval types found on the right side of the slash in the middle of a CIA. For example, the first digit of CCV I for CIA ⟨2,2,1/1,0,0⟩ is 2(1) + 2(2) + 1(3); the second digit is 1(1). CCV I in this case is ⟨9,1⟩.

CCV II (Contour Class Vector II): A two-digit summation of the degrees of ascent and descent expressed in a CIA. The first digit is the total of the frequency of contour interval types on the left side of the slash in the middle of a CIA. The second digit is the total of the frequency of contour interval types on the right side of the slash in the middle of a CIA. For example, the first digit of CCV II for CIA⟨2,2,1/1,0,0⟩ is 2 + 2 + 1; the second digit is 1. CCV II in this case is ⟨5,1⟩.

NOTES

An earlier version of this paper was presented in the National Conference of the Society for Music Theory, Oct. 26, 1984.

1. John Rahn, *Basic Atonal Theory* (New York: Longman Inc., 1980), pp. 20–21.
2. This description of the contour class is modeled on a normalization of the pitch relations. In this normalization the pitch fundamentals are packed as closely as possible "to the left" with the lowest pitch as 0. The resulting normal form (following Rahn's conventions) is enclosed in curly brackets. Two musical units, x and y, are members of the same contour class only if this normalization results in an ordered series where $x_1 = y_1$, $x_2 = y_2$, and so forth. Under this process, the melodic pitch ideas {-10,+2,+3,0} and {+1,+57,+79,+2} both have the normal form {0-2-3-1} and therefore the CC name ⟨0-2-3-1⟩. The opening of the Phantasy, whose successive pitches could be described as {-2,+9,+13,+23,+17,-5}, would be normalized by perceiving the last element, -5, as 0 and the six-note group as {1-2-3-5-4-0}, with the CC⟨1-2-3-5-4-0⟩.
3. Conversations with David Lewin persuade me that it is possible to apply the CC to relative durations in a musical unit as well as to pitch contours, with 0 representing the shortest duration. The durational contour class account of the first hexachord of Ex. 2 would be ⟨1-[1]-2-0-0-0-1-[1]-3⟩. In this account, the bracketed numbers indicate the relative status of the rests. Other applications of the CC could deal with timbre or dynamics. To the extent that much twentieth-century music uses gestures—for example, sprechstimme-like pitch language and rubato-like rhythms—as its key ingredients, rather than absolutes such as pitch and regular durations, the CC could prove to be a more appropriate descriptive mode or compositional generator than absolute systems such as twelve-tone rows or time-point series.
4. Andrew W. Mead, "Pedagogically Speaking: Manifestations of Pitch-Class Order," *In Theory Only* 8/1 (1984): 26–28.
5. Rahn, *Basic Atonal Theory,* pp. 98–100.
6. Martha MacLean Hyde, *Schoenberg's Twelve-Tone Harmony: The Suite Op. 29 and the Compositional Sketches* (Ann Arbor: UMI Research Press, 1982), pp. 33-75.
7. David Lewin, "A Study of Hexachord Levels in Schoenberg's Violin Fantasy," in *Perspectives on Schoenberg and Stravinsky,* ed. Benjamin Boretz and Edward Cone (New York: Norton Press, 1972), p. 79.
8. The logical steps that are necessary to justify subset extraction from a contour class are: (1) the demotion of the contour class to status as a normalized pitch entity in curly brackets as described in fn. 2 rather than an abstracted contour entity in angled brackets, and (2) the "reconversion" of the subset back into contour space with angled brackets.
9. Arnold Schoenberg, *Fundamentals of Musical Composition,* ed. Gerald Strang and Leonard Stein (London: Faber and Faber, 1967), pp. 103–15.