Rhythmic Composition: Counting Systems

in Robert Maggio's *Two Quartets for Two Flutes and Two Cellos*

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In the semester-long course *Theories of Rhythm and Metre*[1], the topic of meter was explored in great detail. However, rhythm was only discussed for its role in establishing or dissolving a sense of meter for the listener. I had hoped the course would examine rhythmic musical ideas on a more generative level, independent from any metrical context. Analysis of a music that continually subjects the myriad of compositional processes to a given rhythmic idea would be beneficial for composers who may seek to expand their use and development of rhythm in their own work. The chosen piece, if it is to be useful in this endeavor, would be unique in that its development of rhythmic ideas would largely control the musical parameters of melody, texture, color, form, phrasing and musical motion. One such piece is Robert Maggio's *Two Quartets for Two Flutes and Two Cellos*.

This 21-minute work consists of a first and second movement, each entitled *desire, movement* and *love, stillness* respectively. The first movement presents many of the piece's musical problems and the composer's solutions in the first 16 measures. To get right into the substance of what processes and devices can be abstracted from this work, we should start with a look at the opening (Ex.1]. The given meter is 4/4, however the experienced meter is complicated and deliberately deceiving for the listener. The opening arco-pizzicato gesture in the cellos on beats one, two and three (1-2-3) set-off the flute entrances on beats two and three. These three gestures which begin at various entrance points conclude at the end of measure two. Their three separate beginnings seem to confuse the cellos whose apparent responsibility is to begin the consequent phrase in measure three. The cellos here try to begin again, but a beat late. A quick correction begins the consequent phrase in measure four, but the cellos are fooled again, for their entrances that begin in measure five are separated by one and one-half beats.

[1] *Theories of Rhythm and Metre* is a half-year course offered at University of Toronto and is taught by the very competent and well-read Dr. Ryan McCelland.

Ex. 1 Score Pages 1-2

for Bart Feller

TWO QUARTETS

(desire, movement, love, stillness)

I. desire, movement

ROBERT MAGGIO

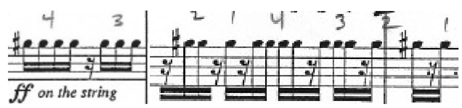
The flutes, unable to ascertain any clear beginning from the two disagreeing cellos, begin anyway, now on beat one of measure seven. In measure eight the cellos have come together to start yet another new beginning; now irritated, their gesture is aggressive and pitchless. In their frustration, they are unaware that they are entering on beat four of measure eight. This places the arco component of their 1-2-3 gesture in an anacrustic metric position and the flute entrances now in strong metric position, beat one of measure nine. While the flutes seem to be perfectly willing to play this game of *cat and mouse*, the cellos are becoming more and more uncomfortable with this metric ambiguity. In measure ten, the first 'cello proposes a solution. Counting off the ensemble for its new beginning in measure 12 proves successful as all of the ensemble's entrances are just as they were in the opening two measures. But, in measures 14-15 the second 'cello struggles to adopt the counting system and therefore prematurely begins the arco component of the 1-2-3 gesture, interrupting the first 'cello's efforts to "count-off" the group with entrances of the 4-3-2-1 figure.

These opening 16 measures consist of two opposing forces. One is the flutes who seem content to begin each time a beat late from the cellos, as well as a beat late from each other. These tardy entrances in the flutes introduce *phasing* in the piece as a musical force that sparkles and is liberated from any metrical constraints. The other force is the diligent effort of the cellos to hold the ensemble together in time by insisting on a conservative and rigid metrical grid. During the course of the first movement, these two forces both compete with one another and share with one another. To see how this is accomplished in the piece, one must first isolate the motivic material itself. While the flutes' material is marked by rhapsodic gestures that arpeggiate the symmetrical hexatonic scale, the cellos' contribution largely consists of rhythmic motives born out of the use of various counting systems.

In the opening, the first cello appoints himself the responsibility of counting-off the ensemble with an iteration of the series 4-3-2-1. This series is used to count the number of articulations grouped together in succession, what can be called *series grouping*. It is first presented as the palindrome 4-3-2-1-2-3-4 [Ex.2]. The palindrome 4-3-2-1-2-3-4 series is developed throughout the movement with a myriad of compositional devices such as augmentation/diminution, truncation/extension, interpolation, transposition and retrograde. The series appears in its simplest form in measure 16 [Ex. 3].

Ex. 2 Palindrome 4-3-2-1-2-3-4

Ex. 3 Series 4-3-2-1



There is a unique quality to each of these series. While the palindrome series is clearly a longer shape, it creates a balanced arch-like phrase shape, accelerating and decelerating to and from its center. The 4-3-2-1 series only accelerates to its end, creating a stronger drive forward, and when followed by repetitions of itself, it possesses a striking jolt between its groups of four and one. Later in the movement, the ‘cellos borrow from the pervasive phasing in the flutes and employ the 4-3-2-1-2-3-4 palindrome in canon [Ex. 4] separated by one beat resulting in near complete 16-note saturation.

Ex. 4 Series 4-3-2-1-2-3-4 in Canon

The discussion so far has involved the use of counting systems to generate rhythmic motives in the first movement. The second movement employs many of the same devices to achieve rhythmic motives or “melodies” but from the development of a different series as the subject.

The Fibonacci series is a well-recognized mathematical number series that is known to appear in natural biological structures. It is a series of numbers that is constructed by the addition of an integer to itself, the sum of which becomes the next integer in the series. That integer is then added to the previous integer to generate the subsequent number (1-1-2-3-5-8-13-21-etc.). In the second movement Maggio uses a subset of this series, 1-2-3-5-8, throughout the second movement. Because of the series' rapid augmentation, it would yield very long and uncountable *series groupings*, so another application of the series is necessary. If the series is applied to the duration of notes, then the application can be described as *durational series*. A unit of durational counting must first be assigned, then the durational values can be calculated and collected in succession to achieve a phrase that corresponds to the shape of the series. Consistent with the spirit of the second movement's title *love, stillness*, the Fibonacci series applied durationally yields a phrase that gradually decelerates; it becomes still. This use of the series first appears in the first flute in measure five [Ex. 5] as another palindrome, 8-5-3-2-1-2-3-5-8, which is built from the retrograde of the before-mentioned subset.

Ex. 5 Fibonacci Palindrome

The durational series application of the palindrome is interrupted at the half-way point by another application which can be described as a *sub-divisive series*. In this application each metric beat, equal in duration, as indicated by the given time signature is sub-divided equally into the number indicated by the series. Unlike the durational series application of the subset, as the numbers of the series grow larger, the sub-divisive series actually accelerates. All three types of series application when combined with a palindrome produce arch-like shapes. However, this particular combination of durational and sub-divisive applications creates a constant acceleration to the end when applied to a palindrome, despite the arch-like nature of the series. It should also be noted that the composer has elected to articulate these patterns on a single pitch. Any elaborate pitch motion would dilute or make unnoticeable the processes underlying these rhythmic phrase shapes.

Elsewhere in the piece, the composer uses rhythm in yet another interesting way, to relate two phrases to one another that together possess nearly identical pitch material. In measures 34-39 [Ex. 6], the composer introduces a syncopated triple-stop gesture in the cellos.

Ex. 6 Mm. 32-40

Antecedent	Consequent
3 + 3 + 5	3 + 3 + 5
2 + 3 + 5	3 + 2 +(5)

Not shown in the example are the regular flute entrances every quarter-note marking the beat as indicated in the time-signature. With the ‘cellos in rhythmic unison, these measures divide into two even groups, an antecedent phrase followed by its consequent phrase. When counting the *interonset durations*[2] between rhythmic articulations in these phrases (♪=1), one quickly notices the compositional change to the consequent phrase.

The interonset durations that begin the second half of the antecedent phrase (2+3 …) are reversed in the consequent phrase (3+2 …). To the reader this use of rhythmic shifting may initially seem like a simple device, unworthy of notice. But as a tool of compositional expansion, these minute displacements of events should prove to be very useful for composers when developing pitchless or pitch-static materials. Note the disparity between the interonset durations at the ends of each phrase. The end of the consequent phrase in the actual music amounts to a count of only three units, not actually five as indicated in parentheses. The given analysis is less concerned with this incomplete presentation of the consequent phrase due to the nature of interonset durations. Once the final attack point of the series has been achieved, counting for the listener basically ceases. This truncation of the counting system marks one of numerous occasions when the composer elects to drop the current count in order to intuitively place the new beginning of the subsequent phrase.

The following phrase in example seven was discussed early for its ill-timed entrances of the two 'cello lines. Regarded before as only the violoncellos' attempt to initiate a unison entrance with the flutes, this passage can be further explored for its use of phasing and insertion.

Ex. 7 Phasing and Displacement

↓ Eighth-note insertion

Vc. 1 | 2 + 2 | 1 |1 + 1 |1 |1 + 1* |
Vc. 2 | 2 + 2 | 1 | 1 + 1 | 1 | 1+ 1 |

*Repetition is placed on downbeat

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[2] *Interonset duration* is a term used to describe the time between the beginnings or attack-points of successive events or notes, the interval between onsets, not including the duration of the events.

In the first two measures of this example, the ‘cellos are presenting identical copies of five individual counting series, each enclosed within vertical brackets. The entire three measure phrase is not simply presented in canon, but each individual unit must complete before continuing to the next, resulting longer rests for Vc.1. The interonset durations (♪=1) indicated below the music reveal that the copy begins one eight-note later in the second ‘cello. Where the first presentation in the first ‘cello is syncopated, the copy initiates on the downbeat. The pizzicato component of the series begins with an upbeat in measure two. However the subsequent repeat of the rhythmic gesture is displaced by the insertion of a single eight-note rest, causing the repeat to begin in the third measure of the example on a downbeat.

One might ask at this point if any of these phrases actually serve as melody for this piece. The composer certainly does use more lyrical melodic material in the piece that is generated in somewhat similar ways. However, it would be unfair to characterize the rhythmic motives described so far as secondary to the moments in the piece that would be more easily recognized as thematic. All of these materials lie at the most immediate surface level and are treated and developed equally in the piece. One example of more lyrical melodic material occurs in measure three [Ex.8].

Ex. 8 Symmetry in Lyrical Melody

♩= 1 |---------------------------- 6--------------------------| |---------------------- 6 -------------------------|
♪= 1 | 2 3 + 3 2 + 2 12 + 12 |

In order to accept the two halves of this melodic figure as symmetrical in duration as indicated in the example, one must include the quarter-note rest that begins the line. This excerpt is immediately proceeded by strong metric phenomenal accents on beats one and three of the measure, so it is fair to conclude that a clear sense of 4/4 time has been established prior this entrance. That said, when counting interonset durations one can include the quarter-note rest as an experienced event that is significant enough to be included in the count as an onset. In quarter-note counting the phrase divides into two equal halves of six beats. At the eight-note counting level, the durational series that begins the melody (3-3) returns in the second half in augmentation at the quarter-note level. While this kind of symmetry is common in lyrical material throughout the work, it is not so systematic at its generative level that it should fall within the scope of this research.

All of the series applications discussed up to this point have involved the generation of motivic and/or melodic material. However, the larger portion of the work utilizes series applications to generate complex musical textures that can span several minutes in length. The earliest example of this type of series application arrives in the first movement at measure seventy-five. In the following example [Ex. 9], the second 'cello is already engaged in a durational application of the series 1-2-3-4-5-6 as a palindrome where the integer "1" equals one sixteenth-note. This series is the result of extending the original 1-2-3-4 series by two more integers. Note that at this point in the piece, the composer has taken the series one step further in that it is voiced with two pitches in oscillation. When there is an even number of both pitches and articulations in the series, each repetition of the series arrives on the same note. Later in the work, when the series changes to an odd number of articulations, each repetition begins with a different pitch. This is a subtle way of expanding the gesture to keep it just noticeably alive. This series actually *restarts* in measure 85, as the composer must feel it is time to introduce the second 'cello in canon. From measure 85 [Ex. 9], the palindrome is constructed as the others, 1-2-3-4-5-6-5-4-3-2-1. The second 'cello begins the series two beats after the first 'cello, and each new beginning of the palindrome thereafter is marked by an accent.

Another two beats later the flutes enter with similar material in to form a double-canon. Here the flutes are employing a subset of 1-2-3-4-5-6-5-4-3-2-1. The first and last integers are abandoned leaving 2-3-4-5-6-5-4-3-2. Furthermore, the basic durational unit is augmented so that the integer one equals one eighth-note. For the canon entrances in the flutes to have been durationally equivalent to those entrances in the ‘cellos, the second flute would have to have entered four beats after the first.

Ex. 9 1-2-3-4-5-6-5-4-3-2-1 Palindrome Texture

This must be the result of an intuitive choice on behalf of the composer. Note that series counting in the flutes involves the inclusion of rests, as the flutes must breathe at some point while the counting between attack points remains unaffected.

In the second movement the now familiar Fibonacci series is utilized in much the same way as the series of the first movement, however he does not utilize the palindrome. A similar texture begins the movement in two voices composed from a durational application of the series 1-2-3-5-8 in repetition [Ex. 10].

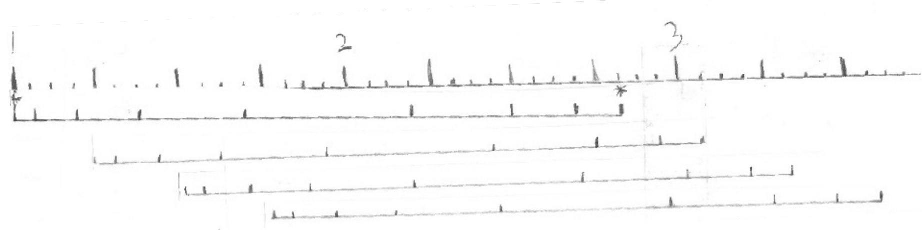
Ex. 10 Fibonacci Palindrome Canon Texture (Series 1-2-3-5-8)

While the series naturally decelerates, it enjoys a jolt across the repetition from integer eight to one. Later in the second movement this single canon is expanded to a double-canon without the use of augmentation [Ex. 11].

Ex. 11 Fibonacci Palindrome Double-Canon Texture

The decision as to where the second entrance of the series should be placed is not an arbitrary one. In the following diagram [Ex.12], the top line represents individual 16-note pulses, and one, two and three mark the beginnings of three measures of 4/4 time. The four lines beneath are actually four pieces of paper upon each of which the 1-2-3-5-8-5-3-2-1 palindrome is measured. Sliding the four copies of the series around, one can quickly see where the concentration of activity lies for the canon as a whole. Four entrances of the pattern separated by one beat (four sixteenth-note pulses) yield the greatest number of separately articulated pulses (least rhythmic unison).

Ex. 12 Double-Canon Maximum Yield Entrance Placement

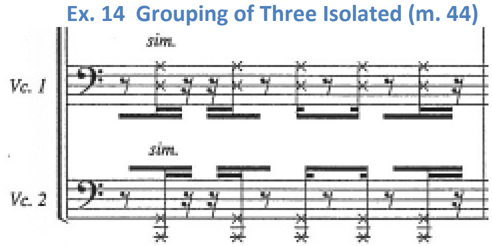


However, the attacks are largely concentrated at the beginning and ending of the series. In measure two of example 12, beats one through four, there is a drought of activity. It is likely that this is why Maggio chose to begin the second entrance of the series at the moment when the first voice reaches the duration of eight (Ex. 11, m. 51, Vc.2, beat three). Placement of the faster “1-2-3” component of the series compliments the longer inactive component at the end of the series, “5-8,” and balances the aggregation of rhythmic activity along the canon’s center. This effective texture is purely ametric in the sense that it does not allow any accents to occur with such regular periodicity that a metric grid can be inferred. There is, however, another texture in the work that seems to rely on implications of periodicity for its effect, though still it does not generate any lasting meter.

This texture occurs first in measure 29 of the first movement and is composed of two conflicting *groupings*[3] that are forced upon one another (Ex. 13). The second ‘cello oscillates between two pitches, the lower of the two occurring on the downbeat in strong metrical position, beat one of the 4/4 measure. This pattern strongly reinforces the duple sub-division of the measure. At the same time, the first ‘cello lands on a grouping of three whose lowest note E begins the repetition with an upbeat. These groups of three contradict the given meter 4/4 and the accent groupings in the second ‘cello. A grouping of three would create sense of 12/8 meter having triple division. This 3:2 conflict produces an unsettledness that leaves the listener without any sense of metrical orientation

Ex. 13 Conflicting Groupings (m. 29)

Ex. 14 Grouping of Three Isolated (m. 44)



The music that immediately follows this excerpt (eleven measures) is marked by duple accents, so the groupings of two do prevail against the groupings of three. However, in a following measure the

[3] This is not referencing the earlier term *durational series groupings* as coined in this research, but the term *grouping* as borrowed from the writings of Fred Lerdahl and Ray Jackendoff on rhythm. [*A Generative Theory of Tonal Music*. Cambridge: MIT Press, 2003.]

groupings of three return unhampered by anything. In fact, their accents are quite clear as the three sixteenth-note groups from example twelve are reduced to only the lowest pitches in the same rhythmic placement. Directly below the recurrence of the pitch “F” in example thirteen lies the later presentation of those accents in measure forty-four [Ex. 14].

One last device that is loosely related to this discussion and is worth briefly mentioning appears in measures 115 of the piece. What is commonly referred to as metric ritardando or “written out ritard” is the musical result of lengthening durational values to achieve attack points that occur farther and farther apart from each other. Most often when metric ritardando is used, it is very brief and the interonset durational rate is the result of an either arbitrary or a simply intuitive choice. In this instance the gradual slowing is very carefully controlled by simple addition. However, what makes this occurrence of metric ritardando unique is its superimposition against steady quarter-note melodic articulations in the flutes. The ‘celli seem to be gradually separating themselves from the flutes by the addition of one sixteenth-note value, then two, and then four to each repetition.

4 4 4 4 4 5 5 5 5 6 6 6 8 8 10 12 14 18

Ex. 15 Metric Ritardando

All of the discussion so far begs three very important musical questions. What role does meter play in the animation of this music? When does the composer choose to rely on a counting system in order to generate musical material?, and alternately what might motivate him to break away from a system in order to make more intuitive compositional choices? Finally, can any larger structural or formal shape for the piece be attributed to the sequence of the various counting systems that appear in the work? Any effort to solve these difficult questions would involve delving further into other sections of the piece that do not appear to involve counting systems, which are the focus of this research. However, some conclusions can be drawn from the material already discussed and perhaps a peak at a few other moments in the piece.

In the first sixteen measures of *Two Quartets*, one can see the conflict between the notated meter and the perceived metrical groupings. The gestures in the first two measures that are so very recognizable, even very early in the movement, begin again numerous times, usually unsuccessfully, at widely varying interonset durations. Shifting the notated meter to accommodate these irregular beginnings would controvert the nature of what is happening here. Perhaps a more convincing explanation for the 4/4 notated meter is for shear ease of performance. These gestures are highly disorganized from one another in these opening measures and for a lot of the rest of the piece. The performer who callously stomps his foot through these measures might stand a good chance of reaching the end with relatively little effort. For the sections of the piece that use series in canon and double-canon to create undulating textures, the composer does employ changes of time signature to mark significant beginnings of series or player entrances. Still, these metric indications have no bearing on the performance of, or the perception of this ametric music.

The sections of *Two Quartets* that were not addressed in this research were omitted because they were not as strongly motivated by counting systems in their creation. Alternately, in the larger stretches of the composition where the composer did elect to employ counting systems, he may have resorted to various series applications in order to release the piece from his own intuition. Counting systems, when used very strictly, can free the composer from some compositional decision-making. However, if the results are not tamed by meaningful organization, the outcome can be pedantic, contrived and uninspired. This is surely the very reason Maggio regularly pollutes his counting systems.

These intuitive moments which can be very brief, almost unnoticeable in a litany of number streams, are the very pinch the listener needs to break from the repose of series repetition. A small addition to an integer here and a subtraction from another there can be just enough to give breath to an otherwise mechanical phrase. These minute changes to the 1-2-3-4-3-2-1 and Fibonacci series motivate the composer to create a third series of numbers for the closing of the entire work.

The first series to appear in the piece was 1-2-3-4 along with its respective permutations. This series is simple in its construction, rigid and offers few surprises for the listener. It is followed by another series in the beginning of the second movement, the Fibonacci subset 1-2-3-5-8-(and eventually 13). This particular series is more interesting in that is the result of a more complex generative system. Each subsequent duration is a welcomed surprise for the listener. The piece benefits from the transition between these two series. The shift creates large structural motion in the music, characterized by a contrasting durational expansion and the introduction numerical irregularities. Still, this large structural motion does not end here, as the conclusion of the second movement is marked by a similar canonic texture created from a series of durations that, refreshingly, has no immediate mathematical structure. By the composer's indication in the score, "*a new world*" is identified at the end of the work. It is a moment at which the whimsy of the flutes and the caprice of the 'celli win over the counting series, a staple in the piece whose constancy has made itself lumbering and predictable. As durations of six, seven, nine, ten, fourteen, eighteen and even 28 unfold, this new series no longer resembles its former self. It is no longer a series at all. The counting system earlier in the work proved to be the solution to a conflict between the two couples of the ensemble. However, in the conclusion of *Two Quartets,* the counting series, earlier constrained and wooden, is revealed to have always been a musical problem, a problem for which the solution all along was the flexibility and freedom of the four instruments.