PROJECT 2.2
TIME OUT: EXPLORING RHYTHM NOTATIONS

You have seen two kinds of rhythm representations so far: space-for-time graphics (rhythm bars) and Impromptu number notation (drumblocks). For this project you will be looking at, comparing, and reflecting on these representations along with others including conventional rhythm notation (CRN). The primary questions will be: what kinds of features and relations does each representation capture, what difference do the differences make, and under what circumstances is each representation useful?

Representations for rhythm, like representations for things that are in motion (wheels turning, swings swinging, balls bouncing, and drummers drumming) makes it possible to hold still that which is always "going on." Held still to be looked at all at one time, like the frames on video film, we can see and describe how moving things work--their changing internal structures. Conventional rhythm notation (CRN), like a map or an engineer's blueprint, also provides directions -- directions for performing what a composer intends.

But static representations re-present experience in particular, sometimes peculiar ways. As mentioned before, we don't usually measure time relations as we listen. And yet, we need to do just that in order to notate the relations we hear. And to read these static notated rhythms to perform these notations, we have to learn how to re-animate them. A notation, then, is an intermediary between what you know how to do in real time/motion, and what you want to help someone else do. But it's never just the same--the reader/player must re-invent your rhythm, as he/she makes it. All of this depends ultimately on our internal ability to pulse, and our ability to turn this action know-how into units outside ourselves which we can count and measure.

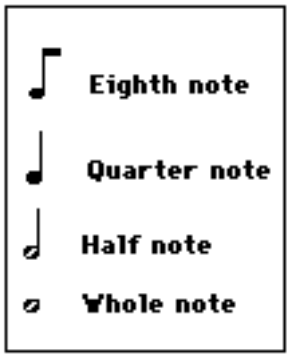
To prepare for counting and measuring, we need a more precise description of the critical term, "duration." In the performance of a musical sound, its duration is taken to be the time from the start (the attack) of the sound to the start of the next sound. However, with regard to drum sounds, the duration of the sound, itself, is usually brief; thus the differences in duration among drummmed events depend mostly on the duration of the silence, the "gap," between attacks of successive events. The single duration number on drumblocks, then, includes a "package" made up of the brief sound, itself, together with the silence between attacks. You may have noticed, in this regard, that you need at least two percussion events to hear the duration of even one. This is another kind of boundary issue.

Multiple Representations

There are two basic principles that relate most Impromptu notations to conventional rhythm notation (CRN). Moving from Impromptu number notation (the numbers on drum blocks) to CRN is easy once these principles are kept in mind:

- Impromptu numbers and the symbols of CRN tell you the rate that events are to be played relative to one another.
- Both conventional rhythm notation symbols and the numbers on drumblocks represent proportional duration values.

Due to the long and sometimes circuitous evolution of rhythm notation as we know it today, CRN symbols for durations are labeled as proportional fractions-- a quarter note is twice as long as an eighth note; a half note is twice as long as a quarter note, etc.



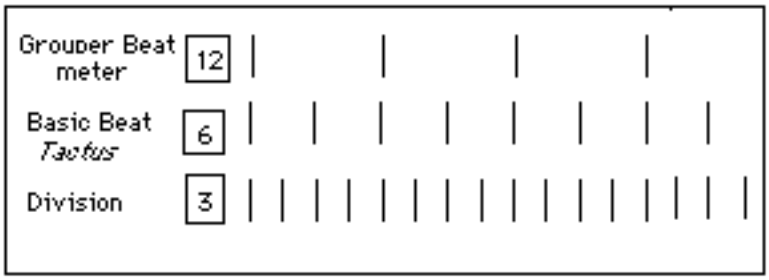
Impromptu numbers are not absolutely correlated with any particular notational symbol in CRN, even though the whole numbers that represent durations in Impromptu notation and the fractions that represent durations in CRN are proportional to one another. However, once you assign a drum block number to a CRN symbol, the mapping between all other drum block numbers and CRN symbols will follow. For example:

CRN					or				
Drumblocks	2	4	8	16		3	6	12	24

Table 1: Mapping CRN and Drumblocks

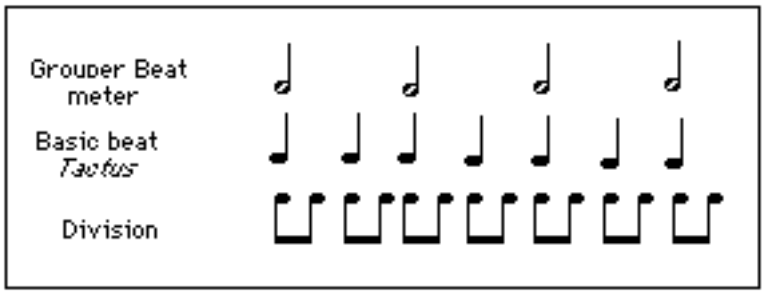
As the table shows, if a 6-drumblock is represented as a quarter note ( ), then a 12 drumblock, which is twice as long, will be represented as a half note ( )--the same 2:1 relationship. In turn, a 3-drum-block would be represented as an eighth note ( ). But if we should choose instead to represent a 4-block as a quarter note ( ), then an 8-block would be represented as a half note ( ) and a 2-block would be represented as an eighth note ( ).

These mappings can be seen quite clearly if we compare Impromptu notation for ANYA's duple meter hierarchy with conventional notation for this same duple meter hierarchy. In Project 2.1 we used a 6-block for the tactus:



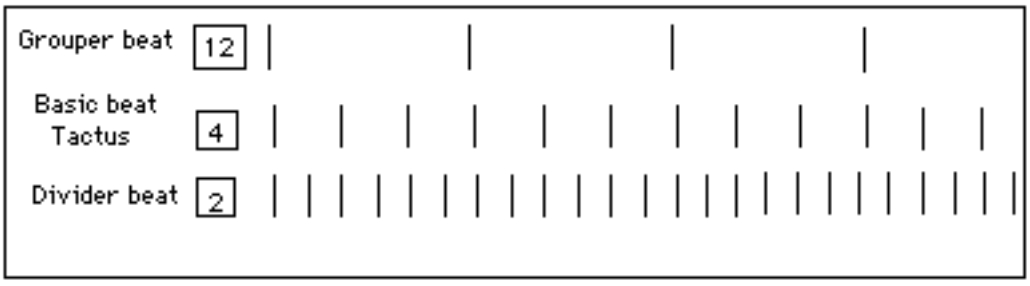
Impromptu Notation: ANYA'S Duple Meter Hierarchy

If we represent the Impromptu 6-block (tactus) as a quarter note (♩), and follow the mapping shown in Table 1, the same duple meter hierarchy would look like this in CRN:



Conventional Notation: Duple Meter Hierarchy

A triple meter hierarchy might look like this in Impromptu notation:



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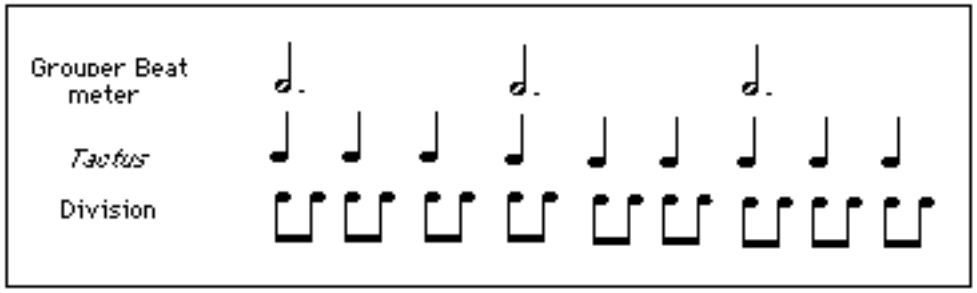
Impromptu Notation: Triple Meter Hierarchy

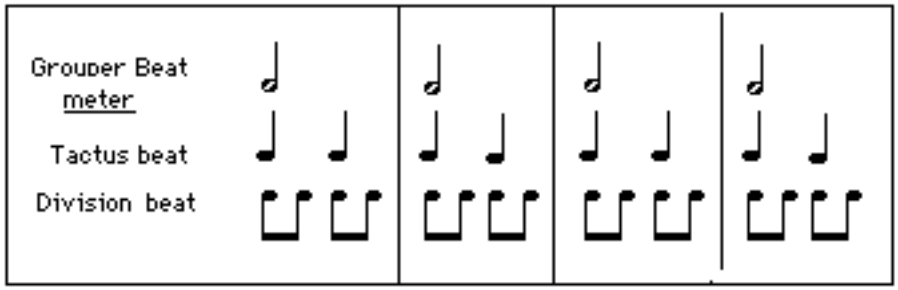
And if we choose to represent the Impromptu 4-block as a quarter note (♩), the triple meter hierarchy would look like this in CRN:



Conventional Notation: Triple Meter Hierarchy[1]

Question: Why is the same 12-block mapped to a half note in the duple meter example and to a dotted half note in the triple meter example?

CRN has an additional notational convention called the bar line. Bar lines are a graphic sign that shows you the relationship between the tactus beat and the slower, grouper beat. In duple meter, where there is a 2:1 relation between grouper beat and tactus, the bar line marks off two tactus beats per measure. The number of tactus beats enclosed by bar lines is called a "measure."

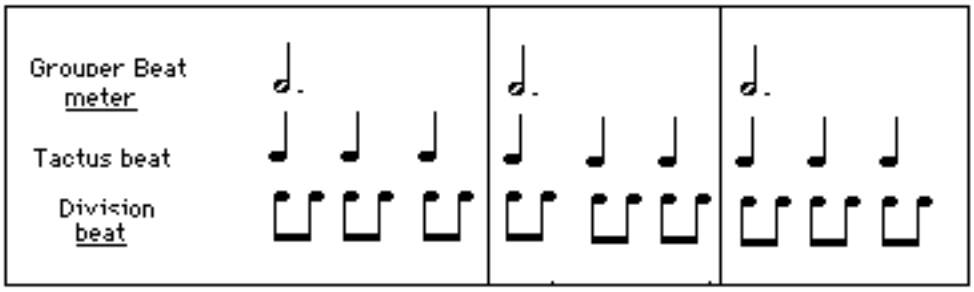


Duple meter: Four Measures[2]

[1] For more information on the symbols of standard rhythm notation, see Additional Materials at the end of Part II.

[2] While triple meter and duple meter are clearly distinct, the "two-ness" of duple meter generalizes to include a 4:1 relationship between grouper beat and tactus, as well. Thus, the metric hierarchy shown below can also be called "duple meter:"

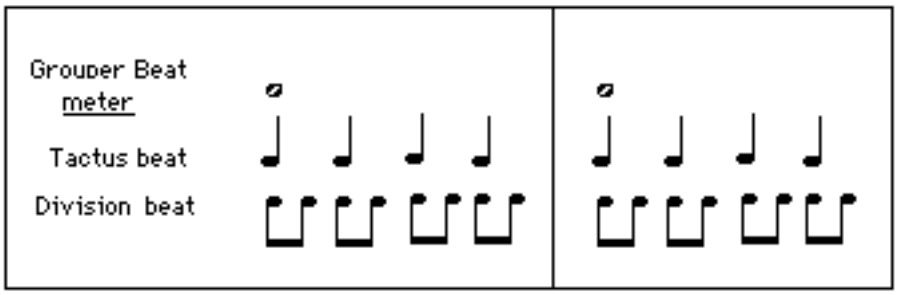
In triple meter, where there is a 3:1 relation between grouper beat and tactus, the bar line marks off three tactus beats per measure.

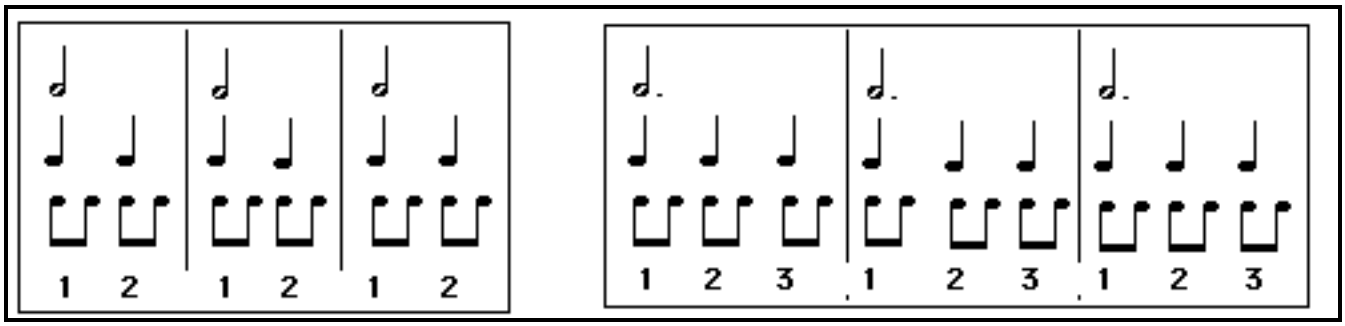


Triple Meter: Three Measures

As pointed out earlier, when grouper beats and tactus beats coincide they reinforce one another to generate an "accent" or "downbeat." There are conventions for counting in duple and triple meter which reflect the arrival and departure of these downbeats. The procedure is as follows: Call the down beat "1," then count up, giving each tactus beat one count, until you come to the next downbeat; then start over again with "1."

Counting Beats





Duple meter Triple meter

Using the Tactus to Measure Varied Durations

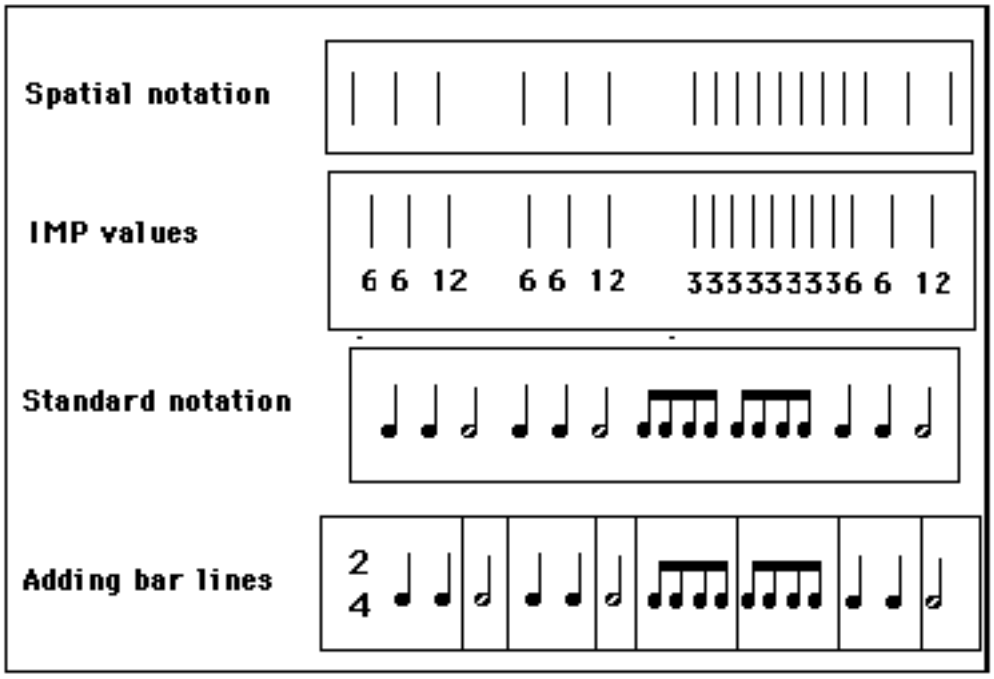
So far you have been .working mostly with notations for beats and their internal proportional relations. What about the varied durations of melodies? Spatial graphics, such as those for ANYA shown in Figure Q, come close to representing the intuitive feel of performing a rhythm. Indeed, if you clap the rhythm of ANYA, you will find that the relative spaces standing for varied durations roughly correspond to the relative distances between your hands as you clap the varied durations.

Figure Q: Spatial Graphics

But what about showing <u>how much</u> longer or shorter events are in relation to one another? How can you measure and thus notate these varied durations? To do that, you need to compare events not just to one another but to the tactus beat. The trick in notating the rhythm of a melody, then, is to make a concordance between the beat and the particular durations of the melody, and that is not always so easy. As someone once said: "You can't put the melody <u>on</u> the beat, you have to find the beat <u>in</u> the melody." But once found, the beat can function as a temporal ruler. <u>Using the tactus as a basic time unit for measuring varied durations is the principle behind most representations of rhythm.</u>

Understanding this principle will help you to translate from one representation to another. Moreover, the process of using and comparing representations will help you better understand the principles they share.

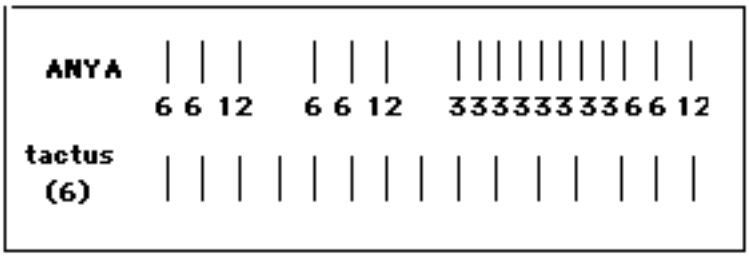
The table below shows you the rhythm of ANYA in a series of notational transformations: from spatial graphics, to Impromptu numeric notation, to CRN, and finally CRN with added bar lines. Each notation is useful depending on when and for what you want to use it. Comparing representations with one another, each one gives you a different kind of information and even a different feeling for the rhythm. Think about these differences as you explore the common principles they all share.



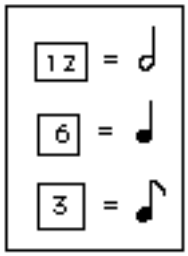
Multiple Representations[3]

[3] The sign, 2/4 is NOT a fraction! The bottom number (4) indicates that a quarter note represents the tactus. The top number (2) means that there are two tactus beats in a measure. For more on standard rhythm notation, see Additional Materials.

Spatial graphics (rhythm bars) give you a general picture of the proportional time relations of a melody. As such, these space-for-time graphics can serve as a model illustrating the underlying principal involved in representing rhythms in other notations. For example, the spatial unit representing the tactus beat can be given a numeric value in relation to which we can measure the varied durations of a melody. If we assign a value of 6 to this spatial unit, we can translate the proportional spatial relations into Impromptu number notation.



And once we have translated spatial relations into numeric values, it is easy to translate the numeric values into CRN symbols using the table shown below:

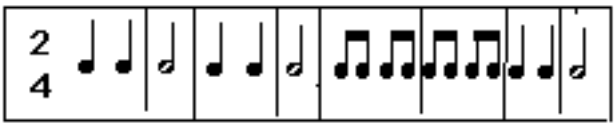


Table

With 6 = ♩ , the rhythm of ANYA in CRN looks like this:

ANYA: Conventional rhythm notation

Given a grouper beat of 12 or 𝅗𝅥, you can put in the bar lines, too:



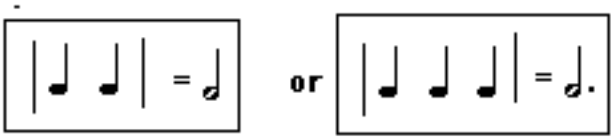
Putting in the bar lines

Bar Lines and Beams

While bar lines and beams look quite different, they have a similar notational status but at different levels of the hierarchy. Horizontal beams join together faster notes whose values together equal the mid-level tactus.

notes beamed together equal the tactus

Similarly, bar lines "box together" notes whose values together equal the top level grouper beat.



notes boxed together equal the grouper beat

Thus, with the tactus as reference beat, beams and bar lines are notational symbols that indicate the respective relations of the top and bottom levels of the metric hierarchy to the mid-level basic beat (tactus).

But there is also an important difference in the musical status of bar lines and beams: horizontal beams tell performers exactly what they are to do--how fast they must play the beamed notes (their duration value). Vertical bar lines tell the performer about the metric structure, but not something explicitly to do.[4]

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[4] Novice performers sometimes do "play" the bar line: In an effort to play the notated rhythm correctly, they will mark the beginning of every measure (every downbeat) by playing it louder. This has the effect of stopping, breaking-up, the figural motion towards structural goals. (See also the section on figural and metric entities, P. .)

Bar lines have another useful function for performers: like mileage markers on a map, they can be used to point to a particular location on the "map" of the piece--i.e., the printed score. For instance, in rehearsing a work, a group of performers often need to focus on a particular passage somewhere in the middle of a piece. To facilitate finding the passage to be worked on, measures are counted up and the cumulative numbers (usually every 10) printed on the score.

[picture of score]

In rehearsing, then, one of the performers or the conductor of an orchestra will say, "Please begin at measure 44." The members of the quartet or the orchestra will look for Measure 40 marked in the score, count up four measures from there, and begin to play the passage at that location. {See Note 2 and Some Basics for more on counting and on rhythm notation.)

Tempo

Finally, what about tempo? Tempo refers most simply to the rate of the underlying beat or tactus. For instance, in clicking on the right arrow for speed, you increased the rate of the tactus and relative to it, the rate of all the other events. But in doing so, the proportional relations among durations remained the same; everything went proportionately faster. In terms of the computer, when you speed up the tempo by clicking on the right arrow, Impromptu sends a message to the computer clock to appropriately decrease the value that the computer clock is giving to Impromptu's basic time unit.

In conventional notation, tempo is often indicated in a general way by various terms borrowed from Italian such as Allegro (fast and lively), Andante (moderately slow), Vivace (fast and brisk)[5]. But composers most accurately indicate tempo by reference to a clock-like device called a metronome. The rate of the underlying beat, or tempo, is shown in relation to this outside fixed reference which measures

[5] See Some Basics at the end of Part II for more on these terms.

beats per minute. For instance, if ♩ represents the tactus or reference beat, and a composer indicates the tempo of a piece as ♩ = 60, then the performer's tactus beat will go along at a rate that concides with the seconds of a clock. Similarly, if ♩ represents the tactus, and the composer changes the tempo so that ♩ = 120, then the performer will adjust the tempo such that the underlying beat will be moving along twice as fast as seconds on a clock and twice as fast as before.

But there is an important difference between Impromptu notation and the symbols of conventional notation: While both notations tell you about the durations of events relative to one another, the symbols of CRN do not tell you anything about the absolute duration of events. For instance, if we listen to the rhythm figure, [2 2 4] and to the figure [3 3 6], the absolute values of the two figures are obviously different: the [2 2 4] figure is clearly faster--each of its events is shorter and the whole figure also takes less time. However, just listening to the two figures, we might notate both of them the same in CRN--only the tempo would differ:

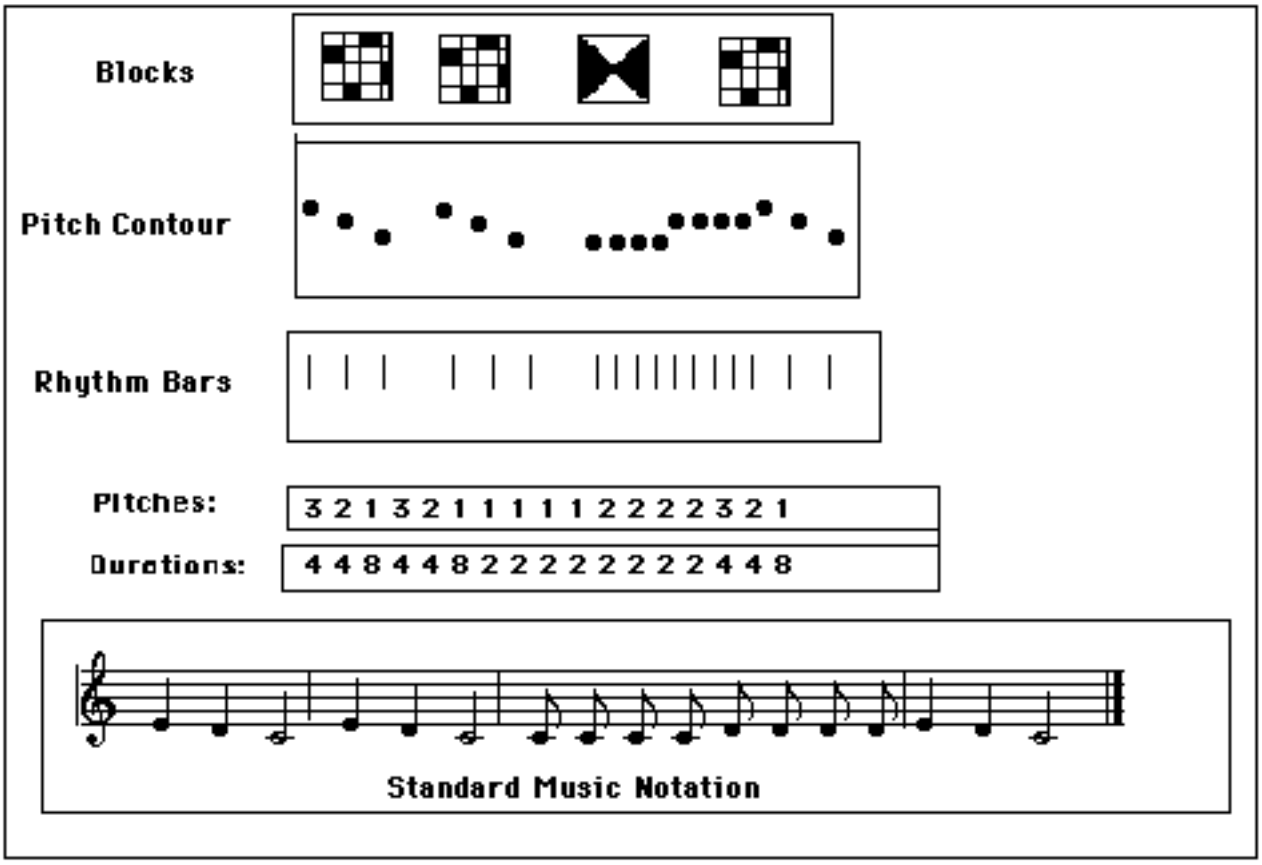
The distinction helps to differentiate between tempo which affects all durations, and internal duration values which are relative only to each other. So, a piece might "speed up" in the sense that the tempo increases, or a piece might speed up in that the note values change from quarters to eighths. For instance, repetition of a 3-block will go twice as fast as repetitions of a 6-block irrespective of a change in tempo. And eighth notes (♫) will go twice as fast as quarter

notes (♩) regardless of change in tempo. Changes in tempo will change the relative rate of all events. Thus, the relations among durations in the duple meter hierarchy shown in CRN, above, would continue to sound internally the same even if the tempo changed from ♩ = 60 to ♩ = 120.

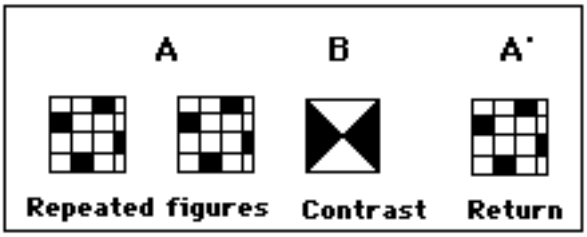
Figural Groupings and Metric Units

With these notational issues in mind, we need to return to a question that harks back to the projects in Part I: what is the relationship between the metric entities that have been the focus in Part II, and figural entities such as tuneblocks which were the focus in Part I? Indeed, the question is an occasion to look back at the spectrum of multiple representations that have been accumulating and their implications for moving up and down the ladder of musical structure. Consider these representations for "Hot Cross Buns:" [6]

[6] Notice that the rhythm of "Hot Cross Buns" is the same as the rhythm of ANYA--only the pitches differ.



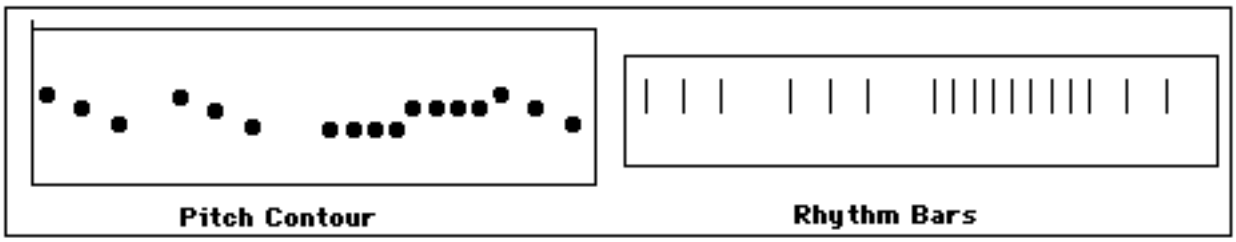
You began by re-constructing Hot Cross Buns with tuneblocks--a task that was immediately obvious for most. But the act of construction simultaneously became a process of "constructive analysis." Looking at the completed sequence of blocks on the screen and listening back to it, the larger structural relations of the tune emerged: two repeated figures (A), contrast (B), and return (A').



Structural Relations

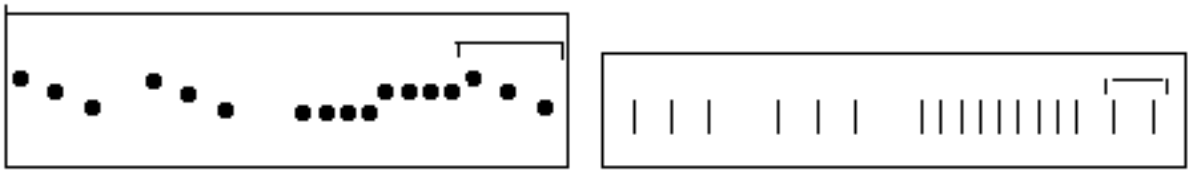
While you were reconstructing Hot, you could choose to see either pitch contour graphics or rhythm bars in the graphics window. Each of these more

fine-grained representations conformed to the larger relations shown by the blocks. However, comparing the representations reveals distinctions that are hidden in the more aggregated blocks representation.



Revealing Distinctions

For instance, the return to the opening figure after the contrasting middle is perfectly clear in the tuneblocks representation, and it is also perfectly clear in the pitch contour representation: the same three-note descending configuration stands out both at the beginning and at the end of the tune. But looking at the rhythm bars, the return is strangely obscured. Specifically the boundary between the contrasting middle figure and the return seems to have disappeared--the tune ends with just two events instead of three.



The 3-note return is clear Just 2 events; the return has disappeared

Indeed, if you clap just the rhythm of the tune, or play just the rhythm using an Impromptu drum, you hear the same effect--two events at the end, and the boundary between contrast and return seems in the wrong place. Why?

The boundary is obscured because when only temporal relations are represented, the faster events of the middle figure run right on into the return;

there is no change to generate a boundary. Looking again now at the pitch contour graphics where pitch relations stand out, it becomes clear that it is the pitch dimension which is critical in creating and accounting for the perceived boundary --temporal relations alone will not succeed.

It should be clear, now, that there is a critical distinction between metric units and the melodic gestural elements we have called figures or phrases. Figures, of course, are not "units" in the metric sense, if only because they vary in their time-spans. But there are other, more general differences and these are also reflected in the distinctions between tuneblocks and drumblocks:

- a TUNEBLOCK is a structural element of a melody that represents and plays a group of notes (pitches and durations) which together comprise a meaningful structural entity--a segment of a tune.
- a DRUMBLOCK represents and plays a single sound which, in itself, has no structural meaning. However, when drumblocks are repeated, the invarient, measured time-units become structurally meaningful by generating a pulse or beat.

It is particularly important for the performer, especially the beginning reader of conventional music notation (CMN), to distinguish between these two kinds of entities. The figural groupings embodied by tuneblocks are not represented at all by the conventional symbols of CMN. While various kinds of markings may be overlaid on the score to show figural groupings, there is no consistent notational symbol indicating these structural entities. In contrast, metric units, as you have seen, are clearly marked by the symbolic conventions of CMN. (Recall the analogy with Leonardo's spatial grid in contrast to his elegant shapes.)

Beginning readers are often tempted to read the graphics of metric notation which show durational equivalents, as if these beams and bars were indicating

figural groupings. For example, notes that are graphically beamed together, will often be seen as "going together" to form a small figural group.

beams show metric equivalents

But, as you have seen, the graphic beam is a metric symbol and as such refers to an entity that is <u>different in kind from a figural element.</u> The beam is meant to indicate notes that "go together" in relation to the tactus--that is, notes that together are equal to the tactus. Similarly, the bar line, as a prominant graphic sign, may also seem to be marking off figural groups. As a result, the novice performer is often tempted to "perform" the bar line. The result may be to interrupt, break up, the figural gesture since the bar line may occur in the middle of a figure. In doing so, the performer is again confusing a graphic symbol that refers to metric entities with figural entities which are, in fact, not clearly represented by the symbols of CMN at all.

For instance, the tune, Auustrian, is in triple meter. If we mark the boundaries of figural groups (tuneblocks) with brackets, and mark the boundaries of the 3-beat metric groups with bar lines, you can see that figural groups entirely overlap metric groups.

AUSTRIAN

And this presents another interesting paradox: While figural groupings seem to be the groupings that we intuitively attend to as listeners in following the motion of a melody towards structural goals, performers in learning to play a piece, are faced with the problem of quite literally <u>constructing</u> these groupings.

This leaves performers with a sometimes difficult but essential task: In order to create what we would call a "musical performance" when given only the metric units shown in the score, the performer must first develop an appropriate hearing of a piece. This includes listening for, experimenting with, and making decisions concerning possible boundaries of figural groupings. At the same time, the performer must develop means for projecting these perceived elements that are appropriate to his or her instrument--what is often called "shaping a phrase."

Sometimes composers, themselves, or editors who help to prepare published scores add markings to CMN to help performers with the task of hearing and projecting figural groupings--or what performers often call "phrasing." For example, here are two excerpts from the score of Bach's Gigue from the Partita #2 for solo violin (Example 1.7). The first score is unedited--just the pitch and metric information as Bach wrote it. The second score is an edited version where markings have been added to show the figural groupings that the editor hears.. These include "slurs" to show pitches that are to be grouped together to form figures and phrases, and also "bowings" that show violinists where he or she can change the direction of their violin bow ("up bow" or "down bow" to project and articulate the boundaries of these figures and phrases. Listen to Example 1.7 and try to follow the scores.

[insert scores here]

As you go on, now, to Project 2.3, these issues will take on pratical importance for you. Specifically, as you make your own percussion accompaniments to tunes, you will need to take into account both the metric and the figural structure generated by that tune.