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Meter isn't everything: The case of a timeline-oriented Cuban polyrhythm

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ABSTRACT

Meter serves as a robust temporal referent for the creation and perception of musical rhythm. In music from Africa and the diaspora, a parallel referent is often present in the form of repetitive rhythmic patterns known as timelines. This paper examines how a well-known timeline (the standard pattern) serves as a grounding framework for quinto (lead conga drum) rhythms heard in different drumming performances of Afro-Cuban rumba columbia. Focusing on the layout of alignment points between the constituent elements of the various temporal layers—rhythm, timeline, and possible meters—indicates that the quinto players may be orienting their playing according to the timeline's onsets.

1. Introduction

Meter serves as a habitual and dependable backdrop for the study of musical rhythm. Familiar concepts such as triplets, downbeats, dots, syncopations, and time signatures all stem from its time-tested logic. For music theory, meter offers a formal system that capably accommodates the durational and hierarchical properties of rhythm in different stylistic contexts (Lerdahl & Jackendoff, 1983; Temperley, 2000).[1] For cognitive science, meter is a gift that keeps on giving, a mental framework encompassing aspects of prediction (London, 2012), categorization (Desain & Honing, 2003), clock induction (Povel & Essens, 1985), enculturation (Honing, Ladinig, Háden, & Winkler, 2009), lateralization (Vuust et al., 2005), synchronization (Tierney & Kraus, 2014), production (Pfordresher & Kobrina, 2017), spatio-temporal modulation (Fujioka, Fidali, & Ross, 2014), cross-modal perception (Celma-Miralles, de Menezes, & Toro, 2016), language comprehension (Vuust, Roepstorff, Wallentin, Mouridsen, & Østergaard, 2006), evolution (Spierings, Hubert, & Ten Cate, 2017), and more. Connecting all the above strands is the principle that meter acts as an abstract temporal referent, a ground upon which rhythmic figures are set.

However, meter need not be the only referent. Instead of orienting their playing toward meter's implicit structure, performers can lean on rhythmic elements that are acoustically present in the musical fabric, explicit patterns that may be only tangentially related to the underlying meter (Chor, 2010). In much African and African-diasporic music, for instance, one such type of referent rhythm is known as a *timeline*, a repetitive pattern played continuously on one instrument in ensemble performance. Timelines provide regulative reference markers that musical participants attend to when singing melodies, performing rhythms, and coordinating dance steps (Locke, 1982; Pantaleoni, 1972; Simpson-Litke & Stover, 2019). There is no consensus on whether timelines "are determined by meter, or are themselves metric determinants, or even are meter in some sense" (Stover, 2009, p. 9), but there is no disagreement regarding their referential function.

Much is still unknown about how the referential functions of meter and timelines interact. Locke (2019) suggests that timelines provide "a 'go-between' that connects explicit and implicit dimensions of the music" (p. 108). Under that view, musicians employ the referential markers offered by both meter and timeline to structure their rhythmic phrasing, an idea supported by Benadon's (2019) analysis of how jazz-rock drummers shift back and forth between the two types of referent during improvised solos.[2] A key distinction that often gets blurred in such discussions, and which is central to the present article, is that between *interaction* and *orientation*. Rhythmic interaction occurs when a musician engages with specific features of a separate temporal entity. For example, using syncopation by placing musical accents on offbeats is a way of interacting with meter's hierarchical arrangement of beats, and replicating another instrument's rhythm in the ensemble—either in unison or with a temporal offset, as in call-and-response—is a way of interacting with that specific durational pattern (and with the musician who produced it, of course). Orientation, on the other hand, involves listening for temporal markers, be they silent or sounding, in order to regulate the timing of one's own actions. Pantaleoni (1972) describes a

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[1] This is not to say that meter is applicable to all music (e.g., Clayton, 1996; Kvifte, 2007), or that music theorists hold a unified view of what meter is and how it works.

[2] See also Prieto (2016, p. 222).

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call-and-response process in Anlo drumming from southeastern Ghana whereby the responding drummers identify the call by its starting location within the timeline cycle. The process "gives the responding drummers an extra moment to prepare themselves and ensures that the response will enter smoothly after the call" (p. 60). Ligeti (2018) describes a type of ensemble music from Buganda in which two of the three players performing simultaneously on the same xylophone create fast interlocking rhythms by orienting their playing to different parts of a steady pulse sounded by the third player (see also Kubik, 1964, p. 152). He proposes that the two interlocking players are able to do this because

> while the musicians share an elementary pulse (of which each musician plays every other onset), they both perceive of themselves as playing on the beat and regard their respective opposite as syncopating. In other words, while they are always in coordination with one another, the musicians have different ideas as to when within the music the beat occurs. (pp. 6–7)

The present article examines two specific Afro-Cuban rhythms that foreground the complex interrelationship between meter, timeline, and rhythmic expression. Comparing the distribution of onsets in each of these rhythms with those of the timeline and with the beats of the underlying meter(s) allows us to surmise how the drummer in each recorded example is orienting his playing. We will posit that one of these rhythms is fully grounded on the timeline and detached from the meter, and offer a less conclusive claim regarding the other rhythm's referential frame. In the forthcoming examples, both rhythms—we will call them R and R2—are played on the quinto (the lead conga drum) as part of an improvisation during an ensemble performance of rumba columbia. To begin, it will be necessary to clarify the metric framework in question.

2. Metric options

As Toussaint (2015) points out, discussions of meter tend to fall in two general camps: one that takes into account the hierarchical arrangement of strong and weak beats and their divisions, and a more narrow one that almost exclusively considers the isochronous pulse stream (generally understood as beat subdivisions in Western music theory) as the "railing on which rhythms ride" (p. 3). Our view here falls somewhere in between. When we speak of meter below, we are primarily emphasizing the beat level, sometimes called the tactus, as well as the implicit pulses contained within each beat. This approach is supported by a general agreement among scholars that, beyond the timeline's central timekeeping function, African and Afro-Cuban musical participants grant the beat level a prominent role (Ladzekpo & Pantaleoni, 1970; Locke, 2019, p. 105; Stover, 2009, p. 131).

Rumba columbia is a Cuban solo dance whose characteristic rhythms are typically represented using 12/8 ("twelve eight") meter.[3] This meter has four beats per measure and therefore resembles 4/4 ("four four"), a meter with which readers may be more familiar. However, whereas each beat of 4/4 divides into two faster pulses to give a total of eight eighth-notes per measure, 12/8 beats divide into three for a total of twelve. Non-musician readers can grasp the difference with this simple exercise. Count 1, 2, 3, 4 at a uniform rate—these are beats. Now instead of counting, tap the four beats with your hand while saying "jour-nal" evenly (isochronously) four times, with "jour-" coinciding with each tap and "nal" happening midway between taps. This is one measure of 4/4: four binary beats, eight pulses. Now tap again at the same speed as before while repeating "scholarly"—make sure the syllables have a uniform rate—four times, with "scho-" on each tap. This is one measure of 12/8: four ternary beats, twelve pulses.

A basic mathematical property of the number 12 gives music in 12/8 access to a creative outlet not available in 4/4's octuple layout. Namely, 12 can be parsed symmetrically in three musically fruitful ways, depending on whether the measure's pulses are grouped every three elements (3 + 3 + 3 + 3 = 12), every four (4 + 4 + 4), or every two (2 + 2 + 2 + 2 + 2 + 2). The first, which has four beats, is our now familiar 12/8. The other two have three and six beats, respectively, and are represented as 3/2 ("three two") and 6/4 ("six four"). Fig. 1 shows the three meters using music notation. Note that all three consist of the same sequence of 12 pulses moving at exactly the same rate. A given meter emerges once we draw attention to a particular grouping, usually by emphasizing certain pulses with a salient timbre, pitch, and/or phrase boundary.

Since meter is an emergent cognitive process rather than an intrinsic property of the acoustic signal, a piece of music that is ostensibly in 12/8 can morph into 3/2 or 6/4 if the emphasis is shifted accordingly through accentuation and other phrasing devices (see Locke, 1982, exx. 14 and 21, for examples from West African drumming). Locke (2011) describes such "multidimensionality" in African music as stemming from a "metric matrix," a multi-layered temporal structure whose multiple strata of beats "guide rhythmic creative choices" (p. 52). Metric fluidity of this kind is widespread in African music and a staple of many rumba columbia performances, so we will keep all three meters in mind as we proceed.

3. Rhythm R

The first few notes of rhythm R are transcribed in Fig. 2, with reference beat locations for 12/8 displayed above. This instance of R is from a field recording made by Andrew McGraw in Santiago de Cuba in 2013.[4] R is isochronous and its basic speed is the dotted eighth-note, or 1/8th of the measure. Only the first measure of R's longer performed span is shown; its continuation would look identical to the given transcription because R's onsets always fall on the same metric locations within the measure.

We can see that R never coincides with a 12/8 beat. Every other onset of R is played after a beat by exactly one sixteenth-note, or 1/24th of the measure. We might be tempted to attribute this lack of alignment to metric displacement, a technique used by musicians whereby an ostensibly on-the-beat rhythm is offset by a fixed number of metric subdivisions so as to fall on offbeats (Locke, 1982; Pressing, 2002, p. 301). Since the dotted eighth-note in 12/8 is equivalent to the eighth-note in 4/4 (they have the same speed despite being notated differently), and since 12/8 and 4/4 have the same structure of four beats per measure, perhaps the quinto player in our example is simply offsetting a chain of 4/4 eighth-notes to create syncopation. In other words, as Fig. 3 illustrates, removing the initial sixteenth-note rest so that R shifts left to begin on the downbeat—with the first beat—results in a plain and clearly grounded rhythm where every other drum onset aligns with a beat.

There are good reasons to discard this possibility. For one, the size of the supposed displacement (65 ms, given the tempo of this performance) is far too small to be considered a feasible metric subdivision. Even though highly skilled musicians are able to perform complex rhythms at very fast tempos, timing measurements from across musical

[3] We are not suggesting that all musicians necessarily assign this denomination to rumba columbia, only that those who have notated its rhythms for teaching, composition, and analysis have found 12/8 to be a suitable metric choice.

[4] For the sake of simplicity, the transcription omits the high- (H) and low-pitched (L) arrangement of conga strokes into groups of five: HLHHL, HLHHL, etc. The quinto player is Daniel Poyoux Vargas, performing along four other musicians. The full ensemble is composed of three congas, a primary timeline (the standard pattern) played on a cowbell, and a secondary timeline (palito) played on a temple block. See Benadon, McGraw, and Robinson (2018) for details about the recording session.

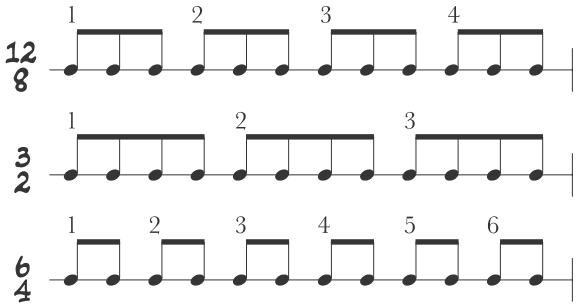

Fig. 1. Grouping 12 divisions into 3s (12/8), 4s (3/2), and 2s (6/4).

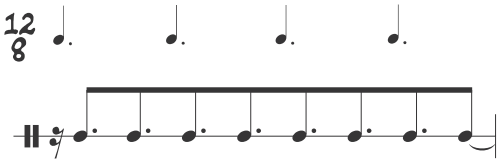

Fig. 2. Introduction to R.

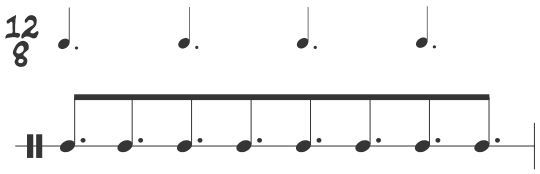

Fig. 3. Hypothetically non-displaced R.

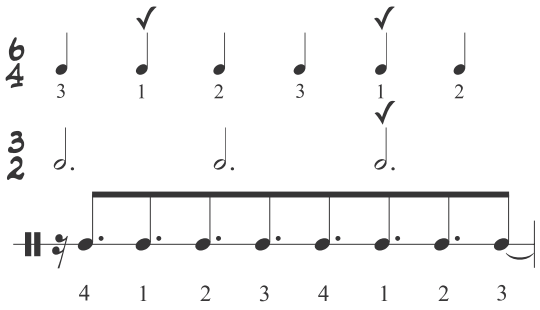

Fig. 4. R aligns twice with 6/4 in a 3:4 polyrhythm.

repertoires suggest that the threshold for the fastest metric subdivisions is in the range of 80–100 ms (Polak, 2018). It is therefore highly unlikely that the initial rest in Fig. 2 is the catalyst for a metric displacement.

Fig. 4 casts further doubt on the theory that R is a displaced rhythm. When juxtaposed with 3/2 or 6/4 instead of 12/8, some points of alignment begin to emerge between meter and R's onsets. Quinto players often structure their improvised phrases to highlight different metric feels, switching back and forth between them throughout a performance. It is therefore quite possible that, at this point in the performance, either 3/2 or 6/4 is present in the drummer's mind as the main anchoring framework for R. Of the two, 6/4 has the advantage, not because of its higher incidence of alignments with R but because of how these are distributed. If we consider either of 6/4's two checkmarks as the principal anchor point used by the quinto player to orient R, the result is two symmetrical halves of three beats each, as annotated with small numbers in the 6/4 layer (1 2 3, 1 2 3). Within each of these halves, R places exactly four strokes, as annotated under R (1 2 3 4, 1 2 3 4). This gives a 3:4 ratio, a close form of 3:2—music's simplest polyrhythm and one frequently encountered in African and Afro-Cuban music (e.g., Jones, 1959, p. 102; Stover, 2009).

Fig. 5. The standard pattern.

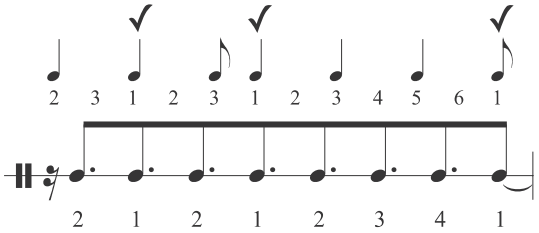

Fig. 6. The timeline aligns with R and forms a basic polyrhythm.

Fig. 7. YouTube screenshot. The quinto player is on the right.

A further possibility is that R bears only an indirect relation to either 3/2 or 6/4, and is instead locked in to an entirely different kind of timekeeping framework. The so-called standard pattern, shown in Fig. 5, is heard in music throughout Africa as well as in some Afro-Cuban repertoires, including rumba columbia. Its asymmetric configuration of 2 + 2 + 1 + 2 + 2 + 2 + 1 (or 5 + 7) does not readily suggest a specific meter, and is equally at home in 12/8, 3/2, and 6/4 while generating different sets of syncopations in each (Pressing, 2002, p. 90; Stover, 2009, pp. 121–126). Agawu (2006) remarks that even though the standard pattern—like most timelines—repeats continuously and without alteration throughout a performance, its timekeeping role is unlike that of a metronome. "Whereas a metronome notionally marks time rather than carves time, [a timeline] uses a carved rhythmic pattern to mark time" (Agawu, 2006, p. 7). Unlike the beat-based roadmap projected by meter, a timeline provides a constellation of acoustic events that not only comprise a recognizable rhythmic figure but also give rise to an alternate form of temporal referent.

Fig. 6 shows that R aligns with the timeline with greater frequency than it did with either 12/8 (zero times), 3/2 (once), or 6/4 (twice). Clearly, this detail alone is insufficient to advance the claim that the timeline, and not meter, undergirds R. But the distribution of alignments does suggest a compelling relational logic between both rhythms. The same polyrhythmic coupling we observed earlier between 6/4 and R is present here as well, but with even more frequent points of unison. We find these by setting the cycle boundary at the timeline's middle checkmark (its fourth note). The timeline's two halves are then 6 and 3 + 3 pulses; in R, they are 4 and 2 + 2 conga strokes.[5] The

[5] The same basic symmetry holds if the cycle boundary is set instead at the third checkmark (the timeline's last note). In such a case, its coupling with R is 3 + 3 followed by 6.

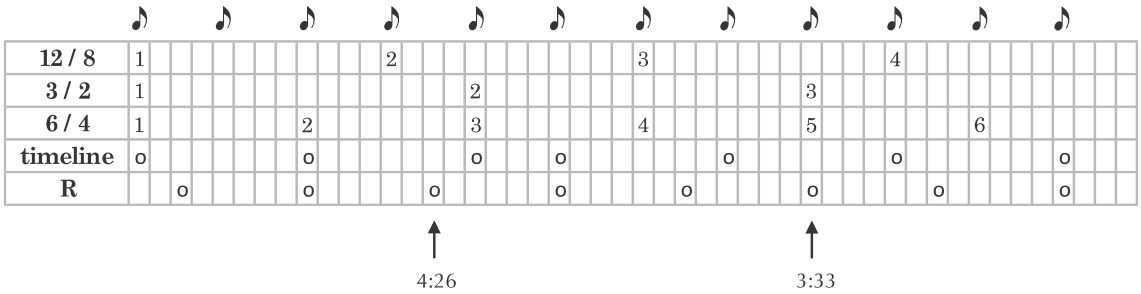

Fig. 8. TUBS comparison of temporal layers. Circles and numbers denote sounded onsets and metric beats, respectively. Arrows indicate R's starting points in the Moperc performance.

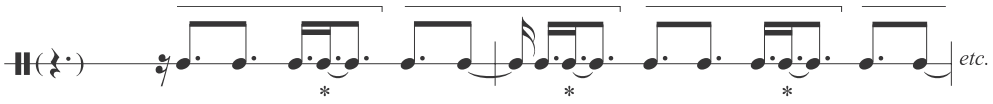

Fig. 9. R2 is like R, with one difference (*).

relationship of each half across the two instruments is therefore six timeline subdivisions vs. four conga onsets in the first half, and (twice) three vs. two in the second. In sum, not only does the timeline offer multiple alignment points for R, but it also divides the entire complex into two equal halves related by a basic polyrhythm.

We have seen how R's apparent untetheredness is tempered when we place the rhythm in relation to either the timeline or 6/4. The slightly tighter coupling to the timeline suggests that R is conceived in reference to an audible pattern present in the ensemble's soundscape, and not to an implicit metric framework. However, 3/2 and 6/4 do offer alignment points, so we cannot fully discard meter as a possible referent. We need further evidence if we are to claim conclusively that R is hitched to the timeline.

Additional appearances of R can be heard on a drumming video of rumba columbia uploaded to YouTube by the percussion manufacturer Moperc in 2011 (Fig. 7).[6] In a similar setup to the earlier example, one player sounds the standard pattern continuously on a bell, and three conga players provide additional rhythmic layers. It bears mentioning that in this recording the bell player produces two steady rhythms simultaneously: with his right hand he sounds the timeline; with his left, on a separate cowbell, he marks the beats (dotted quarter-notes) in 12/8, bringing the four-beat metric referent to the same acoustic plane as the timeline.

The quintero first plays R during three measures about halfway into the six-minute performance, and then again for the same duration a minute later.[7] The moment within the measure when he begins playing R is different in the two instances. These starting points are indicated with arrows in Fig. 8, which uses TUBS notation to display how the various temporal layers line up within the span of one measure.[8] The grid subdivides the measure horizontally into 48 slots, as this is the slowest fast pulse common to all layers in question. In the passage starting at 3:33, R begins on a metric location that aligns with the third beat of 3/2 and the fifth beat of 6/4 but not with the timeline. At 4:26, there is no alignment whatsoever between R's first note and the other layers; likewise with the Santiago improvisation discussed above, where R began right after the measure downbeat (cf. Fig. 2). The variety of beginning points suggests that R sits on a temporal stratum with no privileged point of departure,[9] which does not help elucidate the question of R's anchoring.

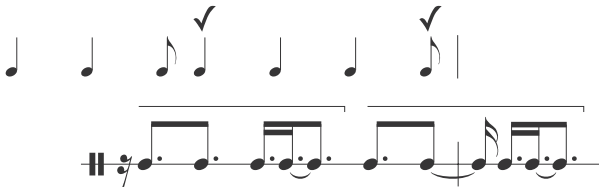

Fig. 10. R2 splits the timeline into 6 + 6 eighth-notes.

4. Rhythm R2

The above evidence offers equally weighted arguments in favor of either meter or timeline as R's temporal referent. For additional evidence, we turn to the measures immediately preceding the 4:26 version of R, where the quintero plays the rhythm shown in Fig. 9. The horizontal brackets show that this rhythm, which we are calling R2, repeats every four notes and has a total cycle duration of half a measure (four dotted eighth-notes, or six eighth-notes). With the exception marked by an asterisk on the pattern's fourth note, R2's onsets fall on the same locations within the measure as R. In other words, if we delay the fourth onset of every R2 repetition by 1/16th of a measure, we get R.

Given the high degree of similarity between R and R2, plus the fact that in the Moperc performance the two rhythms are played in direct succession, it is reasonable to assume that they share the same orientative DNA. The asterisked discrepancy may therefore represent a surface divergence, a particular musical realization of several possible options stemming from a single rhythmic blueprint. This realization is

[6] "Rumba Columbia with Moperc congas" (https://www.youtube.com/watch?v=YKSs9la8Lfw), last accessed on June 11, 2019. The players are listed as Luisito, Orlandito, Devis, and Figurin. This author's attempts to contact Moperc for additional information about the session and the players' identities have been unsuccessful.

[7] There is a structural difference between these cases and the Santiago example discussed earlier (cf. footnote 4). In the Moperc recording, R's segmentation of high and low pitches is in groups of three: HHL, HHL, etc., as opposed to HLHHL in the Santiago example.

[8] TUBS (Time Units Box System) is a notation method devised by James Koetting (1970) that is sometimes used by ethnomusicologists to represent rhythms. Its application in this paper differs from the usual approach, in which the unit of subdivision—the width of each box—corresponds to a "common denominator" fast pulse that is cognitively viable and acoustically present in some form. Here, by contrast, the subdivision value is the 45-ms thirty-second-note, an abstraction that is neither practicable nor acoustically realized.

[9] The observation still holds if we assume that R begins not with the first written note but with what musicians call a pickup (also called an anacrusis): a note or group of notes leading to the phrase downbeat (in this case, the hypothesized beginning of R). For example, assuming a one-note pickup in Fig. 8 would align the 4:26, 3:33, and Santiago "downbeats" with (respectively) the timeline, nothing, and 6/4 plus timeline. For a two-note pickup, the respective R downbeats are similarly noncommittal: nothing (4:26), timeline (3:33), and nothing (Santiago).

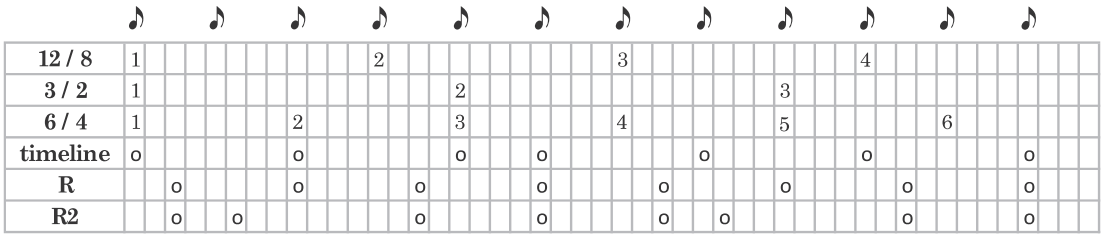

Fig. 11. TUBS comparison of all temporal layers.

important because it supplies the piece of evidence we were missing when trying to resolve whether R was hitched to the meter or the timeline. Recall from Fig. 4 that the only two points of alignment between R and meter occur on the rhythm's second onset (with 6/4) and on the third-from-last onset (6/4 and 3/2). These onsets are absent from R2 and account for the sole difference between the two rhythms. R2 therefore contains zero alignment points with either meter, pointing us to the possibility that R2 uses the timeline for reference.

Let us examine how R2 fares with the timeline. As shown in Fig. 10, the half-measure partition we noted in R (cf. Fig. 6) is also a feature of R2. The second onset of R2 coincides with the timeline's fourth onset and then again with the last onset, dividing the timeline into two equal halves of six eighth-notes each. This arrangement suggests that R2's first onset acts as a pickup. The significance of the 6 + 6 configuration becomes apparent when we point out that all other possible partitions of the timeline yield unequal halves of 5 + 7 (or 7 + 5). (For instance, rotating the timeline's 2212221 by one place results in 2122212, which cannot be split into equal halves.) By tapping into the timeline's only symmetrical partition, R and R2 enjoy the kind of symmetrical predisposition offered by 12/8 and 4/4 (but not 3/2 or 6/4)—namely, two beats plus two beats.

A TUBS-notation summary of the relative positioning of beats and onsets in all six layers considered above appears in Fig. 11. Notice how R2 not only manages to stay clear of all meters' beats, but also avoids coinciding with most of the timeline's onsets. This lends R2 an even more freestanding quality than we observed in R.

5. Conclusion

For performers and listeners alike, meter—even in its mutable multiplicity—is not the only kind of referent for contextualizing rhythm. As an alternative or complement to the implicit referential framework of meter, musicians can conceptualize and articulate rhythmic ideas by tethering them to timelines. While this has been long noted by scholars of African music, here we present a tentative exploration that focuses on two closely related Cuban rhythms, one of which (R2) appears exclusively oriented to the timeline known as the standard pattern. Two converging pieces of evidence support this conclusion: R2 features two alignment points with the timeline but none with any of the available meters, and these alignments are spaced apart in a way that corresponds with the only division of the timeline into two equal halves. Moreover, both of these halves articulate a familiar polyrhythm. Because R closely resembles R2, it is possible that it, too, follows the same orientative mechanism, and that its observed alignments with 6/4 and 3/2 are secondary or coincidental.

Interaction and orientation are both dependent on entrainment mechanisms, but they are fundamentally different behaviors driven by different goals. One concerns musical expression and creativity; the other concerns a pragmatic need to locate (and not lose!) one's place in the performance—what Anku (1997) calls the "internal holistic perspective" by which African musicians "find their cues and maintain their relationship with other composite parts of the ensemble" (p. 217). In post-hoc analysis, it can be difficult to definitively characterize a given musical action as either interactive or orientative. If a drummer struck the cymbal on beat 3 in unison with a timeline onset, did the drummer interact with the timeline or the meter (or both, or neither)? Did meter or timeline (or both, or neither) serve as referent? Apropos the study of musical rhythm, Chor (2010, p. 23) advises us to be wary of "the assumption that quantified outcomes of behaviors provide evidence related to internal mental processes." Absent brain scans or self-reporting by the musicians themselves, a good amount of conjecture based on contextual information is needed to tease out the two types of behavior.

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