Periodicity (MUSC533D) Research Paper

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Abstract

This paper will analyse the various time-shaping strategies occurring in a collaborative online konnakol video (link below) by South-Indian musicians B.C. Manjunath and Varijashree Venugopal. I will discuss the intriguing rhythmic sensations created by its non-isochronously divided tāla cycle in 75/16 and show how it challenges the very definition of meter. Using the tāla as a framework, the musicians then perform various durational augmentations and diminutions. I will also reveal some of the choices the musicians made and show the textural variety they achieved in this multi-tracked scenario.

https://www.youtube.com/watch?v=-mS06lEmY3s

The Context

This piece is an innovative konnakol[1] composition by B.C. Manjunath (born 1976, hereafter BC), a Mridangam player and konnakol artist based in Bengaluru (formerly Bangalore), who has toured the world as a performer, and often teaches Karnatic[2] music workshops at various Western institutions. When he isn't touring, BC films himself performing konnakol compositions (some traditional, some more innovative of his own devising) and uploads them to his YouTube channel, which many internet viewers have marvelled over. Particularly viral highlights include an extraordinarily virtuosic performance using a tāla derived from the proportions of the Fibonnaci series/golden ratio. Transcription videos of this particular performance went viral (18 million views on Facebook) and have been dubbed over by other musicians (often kit drummers) playing his incredible rhythms.

[1] *Konnakol* (*'Koni'* which means 'to recite' or 'to say'. This word was adopted in the Tamil language and put with the word *'Kol'* which means 'to rule' or 'to reign'." (Young, 1997)) is a South-Indian vocal performance genre which adapts the instructive rhythm solfege syllables (*solkattu*) used for teaching and learning the mridangam in a specific performance art beyond their pedagogical function.

[2] Karnatic means "traditional" in Tamil and refers generally to South-Indian classical music, distinguishing it from North-Indian Hindustani music.

In the video that I will analyse in this paper, BC invited Varijashree Venugopal (born 1991, hereafter VV), a Carnatic singer also from Bengaluru to record with him in 2018 in a composition of his own devising intended to demonstrate the performers' virtuosity and expertise. Incidentally, she has an equally interesting YouTube channel which features her singing along with Coltrane sax solos in Carnatic solfege with extreme precision.

From the video description, it seems that BC recorded his part, perhaps included some instruction on the *tāla* and told VV what he envisioned for her part, but ultimately let her create her own part as she was in the US at the time, not in Bengaluru, their shared home city. She listens to BC's part through an earphone as she records her part. Interestingly and innovatively, rather than simply speaking the solkattu[3] syllables, VV sings them, presumably to a melody of her own devising (not BC's).

Listeners will hear a fairly conventional konnakol performance media: a clapped tāla and vocalised rhythms in the solkattu rhythm solfege. The tāla serves its normal function as a fundamental rhythmic structure and is performed on the hands through clapping and tapping of fingers on the opposite palm. In more "traditional" Karnatic music, the tāla equates fairly neatly with our idea of meter. As I will show, however, this piece challenges that notion of tāla equating to meter. In this instance, there are two performers, so they exploit this by adding textural variety, both in their solkattu and the tāla. However, unlike a more traditional konnakol performance, there appears to be no improvisation, given the multitracked nature of the recording. Instead, BC very systematically manipulates the vocalised rhythmic material, discussed under the third heading.

Metric Concepts

Let us begin by covering some foundational aspects of time in music. In Indian classical music, a tāla is simply a rhythmic cycle (Nelson, 1991; Young 2010). Expanding on this definition slightly, a tāla forms the temporal framework of a piece of music and is usually made manifest in hand claps, finger-counts or other gestures, and it serves to measure (or "meter") time. In more "traditional" Karnatic music, the tāla equates fairly neatly with our idea of meter. A grid-based definition of meter

[3] *Sol* - syllable, *kattu* - bunch or group (Young, 1997); the word refers to the vocal syllables used for the *mridangam* and is the principal rhythmic vocabulary for *Konnakol.*

is the presence of two or more synchronised streams of events: pulse, a stream of equal durations; and beat (of which there may be multiple levels), a slower stream that is hierarchically related to the pulse. For example, *adhi tāla* (see figure 1) is a cycle of eight isochronous attacks, each of which divided into a faster stream of isochronous events, often four, allowing it to neatly slot into a time signature, in this case 8/4. Hasty's 1997 definition of meter provides a different outlook on meter. He suggests that meter is the expectation that a given duration will be reproduced. In the case of figure 1, the equal durations represented by the quarter notes show that we can entrain easily to this rhythm; we can successfully predict the next duration. Thus, *adhi tāla* aligns precisely with both the grid concept of meter, with its claps and taps forming the beat, and its subdivisions acting as the pulse, as well as Hasty's expectation-oriented definition of meter.

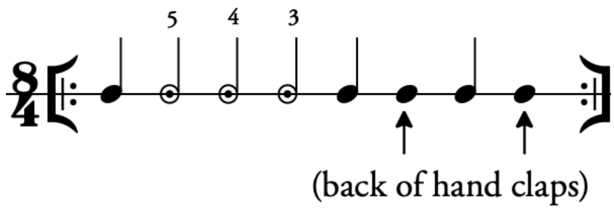


FIGURE 1: *ADHI TĀLA*. Regular note heads indicate claps, the other note heads are finger taps, the numbers above indicate which finger is tapping (thumb=1, pinky=5).

In most normal tāla patterns, the clapping and finger-counting is usually isochronous, involving a steady stream of beats which are divided into the same number of pulses, and thus poses no challenges in terms of the definition of meter. Odd numbered cycles such as *misra chappu*, a cycle of 7 beats (see fig.2), complicate the picture slightly. We have some level of even pulse (quarter notes or anything faster), but the tactus (the notated rhythm in fig.2), has uneven groupings. So, the beat can simply be the quarter notes, with 8ths or 16ths as the faster pulse. What durations can we successfully predict? On hearing the notated rhythm, we can expect 3 durations equivalent to the half-note rate. But then at the beginning of every cycle, there is a quarter note duration that regularly throws this projection off. However, with a cycle of this relatively short length, one can entrain to the cycle length itself (every 7 quarters). This would be dependent on tempo of course, but if the tempo is so slow that the cycle length is slower than the slowest possible tactus (2 seconds according to London), then the quarter note pulse will have shifted into an entrainable tempo range, and we can easily hear the durations being met, even when there are rests.

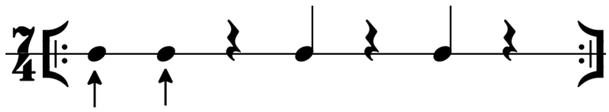


FIGURE 2: *MISRA CHAPPU*. Regular noteheads indicate claps

So, an odd numbered cycle length does still conform to meter definitions, with some negotiation. But notice that this conformity to Hasty's theory is predicated on relatively short cycles that are entrainable. Additionally, the number of pulses in the fastest stream (say, a 16th note), is actually even; in the case of *misra chappu*, there are 28 16th note pulses in each measure. So then, what can be said about cycles longer than this entrainable limit of 2 seconds, or cycles where the number of fast pulses is odd?

Well, BC Manjunath has created such a composition and performed it with high accuracy and precision. We will see that this piece's innovative tāla challenges the notion that tāla is equivalent to meter, and in fact we will see that there is *no meter at all* in this example, according to our current definitions. The tāla is actually outside the boundaries of the current understandings of meter, which are predicated on human biological and psychological limitations, and yet, these humans (BC and VV) are capable of not only conceptualising them but performing them. The conception of tāla for these South Indian musicians must therefore be either different to or more expansive than our concept of meter, and only coincidentally overlap in some examples, like *adhi tāla*. The fact that such a temporally precise, mathematically constructed and constrained rhythmic environment cannot be adequately described using meter as a framework exposes a weakness in our definitions. The tāla about to be discussed has properties that exist outside of the bounds of those definitions and all that we can seem to say is "well, it's not meter".

The Tāla

The example we will discuss is a rhythmic cycle. It is the temporal framework, and it measures time, so it certainly is a tāla, but it does not technically constitute meter. Let us explore. In this piece by BC, there is a stream of isochronous pulses that come by at a very fast 320bpm, or 187.5ms, which act as the pulse but are just faster than the 200ms of the shortest possible entrainable tactus according to London (2012). I have notated this stream as 16th notes and will refer to it as such. So, we have a pulse, albeit one that is too fast to entrain to reliably, meaning that if there is an isochronous beat or tactus, it must be at a slower rate than the 16th. In the rhythm created by the tāla, there are quarter notes. However, they are mixed in with 16ths and thus do not create a steady stream of beats. Rather, it switches between the two durational values in a pattern that can only be entrained to in localised segments (discussed later).

The tāla pattern used here is a cycle that lasts for 75 of these 16th note pulses, hence the time signature of 75/16. In clock time, this cycle lasts for 14s, making it about double the maximal length of our perceptual present (a store of up to about 6 seconds of auditory information); thus, we are reliant on our memory to take in the whole cycle. Additionally, this total length cannot be entrained to, as the slowest possible usable tactus according to London is 2 seconds. So, as alluded to earlier, the cycle used in this composition has an odd number of pulses and is too long to entrain to—the two aspects that allowed for the explanation of odd time signatures. So, it must be broken up into some smaller durations. If there is a meter with an isochronous tactus, it would involve either 25 groups of three 16ths or 15 groups of five 16ths (the only divisors of 75; there are no binary or quadruple divisions). However, BC uses neither of these isochronous options, and neither of them is explicitly manifest in the rhythms used in the composition. Instead, the 75-pulse cycle is comprised of an expansion process of one quarter note followed by one 16th, two quarter notes followed by two 16ths, incrementally up to five quarter notes followed by five 16ths. The interonset durations of the beginnings of each of the groups of the expansion process are 5, 10, 15, 20 and 25 16ths (see fig.3). The interonset durations between the first quarter note and the first 16th note in each group of the expansion form interesting linear ratios within each group: 4:1, 8:2, 12:3, 16:4, 20:5. Braking it down again into durations between individual attacks, we get the pattern 4,1,4,4,1,1,4,4,4,1,1,1,4,4,4,4,1,1,1,1,4,4,4,4,4,1,1,1,1,1. The tāla contains 30 attacks: 10 are clapped, and 20 are tapped with fingers and thus not always audible. It is clear that the number 5 is a strong theme throughout the work: there are five iterations of the expansion pattern; the cycle's total, the length of each iteration of the expansion process, and the number of clapped and fingered notes are all multiples of 5.

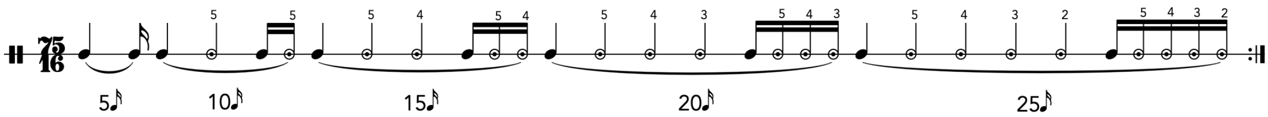


FIGURE 3: TĀLA IN 75/16. Slurs indicate groups of the expansion process, with interonset durations shown below. Regular note heads indicate claps, the other note heads are finger taps, the numbers above indicate which finger is tapping (thumb=1, pinky=5).

Over the course of the 2½ minute composition, this tāla is repeated twelve times. In the fourth and fifth cycles, BC and VV each take a turn to play the tāla backwards. See figure 4 to see how BC plays the regular tāla as VV is simultaneously playing the groups of the tāla in reverse. It is worth noting that the tapped notes of the tāla are not always completely audible because the tapping is often very quiet, but it is very much visible and is an important performance tool for the musicians, who in this case often stare directly at their hands with an intense focus, as these taps measure and indicate where in the cycle they are up to.

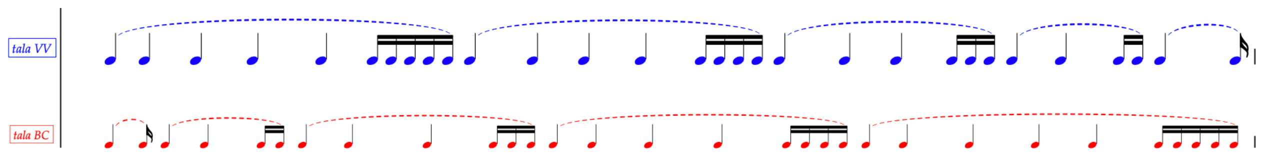


FIGURE 4: TĀLA PLAYED BACKWARDS by VV in the 4th cycle. Dotted slurs show groups.

So, if the total cycle cannot be our beat, then what is? Were a Western trained musician to look at this rhythm, they might be tempted to put barlines and time signatures in as follows: 1/4, 1/16, 2/4, 2/16, 3/4, 3/16, 4/4, 4/16, 5/4, 5/16. This mixed meter approach assumes a fairly erratic non-isochrony above the 16th-note level and does not actually tell us anything about a beat, only grouping. But perhaps the musicians are entraining to an imaginary tactus (at least one not manifest in the rhythms used), maybe one of the two possible divisions mentioned earlier—3s or 5s. Given that at only one moment in the whole tāla cycle do we hear an interonset duration with a length of three 16th notes (the end of the third group of the expansion), a ternary subdivision seems unlikely. So that leaves us with a quintuple subdivision, and 5s are already a strong theme. Figure 5 uses vertical lines to indicate where 15 regular beats with a quintuple division would land, with ties showing off-beat relationships.

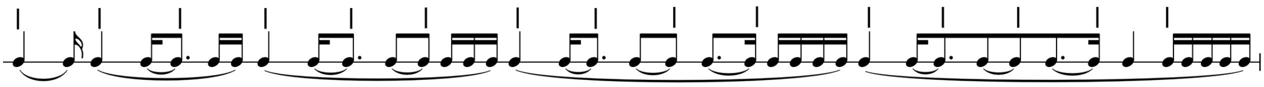


FIGURE 5: A POSSIBLE ISOCHRONOUS BEAT of 64bpm with a quintuple division, indicated by the vertical lines.

Only 6 out of 15 of these beats align with a clapped or tapped event, meaning the majority of the tāla's events happen off beat or are syncopated in some way. But importantly, this quintuple beat aligns with all the beginnings of the expansion groups, given that they are all multiples of 5 in length. In the 5th group of the expansion we hear 5 consecutive quarter notes, thus creating a 5:4 polyrhythm between the tāla and our quintuple "beat". We could thus hear the quarter notes of each group of the expansion as incrementally creating a complete 5:4 polyrhythm against this quintuple beat. The tempo of this quintuple beat is very close to 64 beats per minute, equivalent to 937.5 milliseconds. This is certainly within London's range of entrainable tactus tempi (2012), but lies just outside the most salient range, between 500ms and 700ms (85-120bpm). So, unless we accept the weak evidence for the possibility that the musicians are mentally entraining to a beat that is not aurally or visually present in the music and is highly syncopated against the rhythms actually present, it seems we do not have the necessary component of meter—the beat—for this tāla to constitute a meter according to the grid conception.

Perhaps then, Hasty's redefinition of meter will help us to explain the temporal framework used in this composition. So, what aspects of this tāla can we predict? A projective analysis is shown in Figure 6.

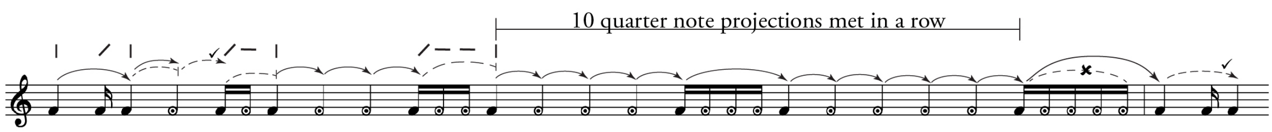


FIGURE 6: DURATIONAL PROJECTIONS IN THE TĀLA.

In general terms, there are some localised groups that are easily predictable, but a number of events (3 early and 1 late) cause us to reset our projections. The first interonset duration heard corresponds to a group of 5 16th notes. This is followed by a group of 4, so we are forced to contract our expectations. This projection is met; however, it is immediately followed by a group of 2 before landing on the beginning of a group, so again we are forced to contract. Next, we hear three quarter notes in a row, which we can predict until a group of three 16th notes again places the next beginning earlier than we expect. Following this there are 10 interonset durations corresponding to quarter notes, which lull us into a false sense of security before the final group of 5 16th notes, meaning we must expand and therefore delay our projection. At the beginning, it is most unpredictable due to the fairly constant rate of switching between the two durational values (quarter notes and 16ths). Over the course of the cycle, the tāla becomes more and more predictable due to the increase of identical durations that are heard in succession. The 16th note components of each group of the expansion process seem to act anacrustically to the next quarter note at the beginning of the next group, however by the fourth group (the thirtieth 16th note), this "anacrusis" is the same length as the quarter notes surrounding them, so this anticipatory sensation is diminished. This becomes even more the case with the group of five 16th notes at the end of the tāla (just longer than a quarter note) which creates the only late projection in this cycle—an expansion. In this moment the anacrustic sensation associated with the 16th note groups has morphed into a continuation. The changing density of the values also makes this pattern distinctive. Hearing the 16th note groups as anacrustic makes them an important reference point for beginnings of groups, and due to the expansion process these anacruses become more and more distant from each other.

These 10 successful projections in a row in figure 6 are enticing as evidence for a quarter note isochrony, but from an etic perspective this seems quite unlikely, given that 75 cannot be divided into groups of 4 and would assume a cycle *four times* as long, which comes in and out of phase with the tāla cycles (including with these localised quarter note projections). However, one aspect supporting this hypothesis is that the total number of tāla cycles is 12, meaning that there would be three complete repetitions of this much longer cycle. Additionally, and perhaps quite revealingly, at the very beginning of the recording, BC counts in four quarter notes (presumably to synchronise the multitracking, but also perhaps showing the conception of the musicians). A quarter note beat would be 80bpm, or 750ms, closer to this salient tempo range than a quintuple beat. But, while we can make some local durational predictions, the four little rhythmic hiccups described earlier throw these projections off in every repetition of the cycle. Thus, both beat options (4s and 5s) have caveats—it seems that this example conforms to neither of our definitions of meter, despite the fact that this a precisely measured and strictly performed rhythmic piece.

The Solkattu

As mentioned before, Konnakol is the vocal performance art based on the solkattu rhythmic solfege language, adapted from the mridangam. In this piece, BC explores a few particular vocalisations, most prominently a syllabic archetype or *jathi* for 5s: "*ta dhi gi na thom*". Throughout, BC speaks his parts and VV sings hers in a pentatonic scale, adding to the five-ness of the composition. For the first six (of 12) cycles of the tāla, BC uses this pattern of syllables exclusively and stretches them using very exacting rhythmic diminution and augmentation processes. For the first tāla cycle, VV sings solo the syllables "*ta dhi gi na thom*" five times with incrementally decreasing interonset durations as shown in Figure 5. The pattern of having a sequence of any number from three to seven equally spaced notes is called *tirmana* (Camón 2020). The interonset duration between them is called *matra*, (Camón 2020). Thus, the following pattern is five *tirmanas*, comprised of five notes beginning with a *matra* of 5, a *matra* of 4, progressing sequentially down to a *matra* of 1.

1. Ta----dhi----gi----na----thom---- (25)
2. Ta---dhi---gi---na---thom--- (20)
3. Ta--dhi--gi--na--thom-- (15)
4. Ta-dhi-gi-na-thom- (10)
5. Ta dhi gi na thom (5)

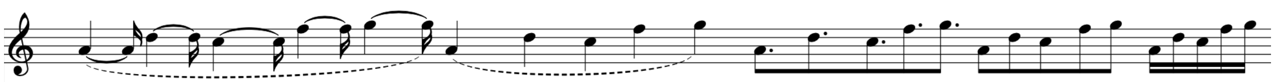


FIGURE 5: CYCLE 1: *TIRMANA* WITH DECREASING *MATRA* (hyphens in the text are rests), pitches are those sung by Varijashree Venugopal. Dotted slurs or beams show the groupings.

The totals of each line given on the right add up to 75, which makes it equivalent to one repetition of the tāla cycle. However, this decreasing order of group totals is the *reverse* of the tāla—the vocalisations are contracting (25, 20, 15, 10, 5) while the internal groups of the tāla are expanding (5, 10, 15, 20, 25). While these overlapping patterns do not align much, one important moment of alignment is the five final 16th notes, where the tāla and VV's singing are in unison. Next, BC joins the texture and they sing this same pattern but with doubled *matra* (10, 8, 6, 4, 2). VV begins five 16th notes later, and hockets with BC. However, in order to keep a strict even hocket and compensating for VV's delayed entry of five 16th notes to finish in alignment with a tāla cycle, she has to subtract one 16th note from the last note of each of her five *tirmanas*, visualised in Figure 6. Note that these expanded durations are very difficult to perform as the syllables in the first line occur at a rate of 32bpm, just above the threshold of human perceptual abilities.

BC

1. Ta---------dhi---------gi---------na---------thom--------- (50)
2. Ta-------dhi-------gi-------na | -------thom------- (40)
3. Ta-----dhi-----gi-----na-----thom----- (30)
4. Ta---dhi---gi---na---thom--- (20)
5. Ta-dhi-gi-na-thom- (10)

VV

1. -----Ta---------dhi---------gi---------na---------thom--------~~-~~ (49)
2. Ta-------dhi-------gi---- | ---na-------thom------~~-~~ (39)
3. Ta-----dhi-----gi-----na-----thom----~~-~~ (29)
4. Ta---dhi---gi---na---thom--~~-~~ (19)
5. Ta-dhi-gi-na-thom~~-~~ (9)

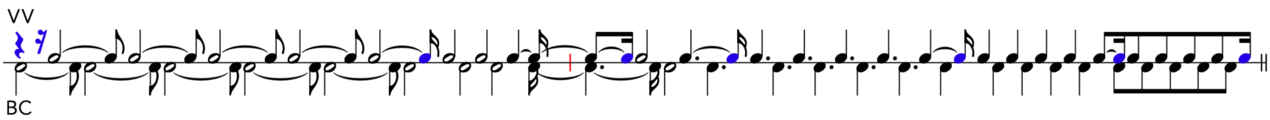


FIGURE 6: CYCLES 2&3: *TIRMANA* DOUBLED AND IN HOCKET. Blue noteheads and text show the 16th note subtractions that VV uses to adjust for the rest duration before beginning her doubled cycle.

Next, BC and VV come back into unison and *triple* the proportions. However, to successfully perform what would be interonset durations outside human abilities to perceive regularity—for example, notes with a matra of fifteen 16th notes would come by at a glacial 21bpm—they simply vocalise each line of the first cycle (seen in figure 5) three times, illustrated in figure 7. They are able to retain the groups of five syllables from the opening pattern—even though these new proportions were generated by a tripling process—because five is a common multiple of each of the new totals (75, 60, 45, 30, 15). This tripling naturally lasts for three tāla cycles, accounting for the 4th, 5th, and 6th repetitions of the tāla, remembering that in the 4th and 5th cycles BC and VV are taking turns to perform the tāla backwards.

1. Ta----dhi----gi----na----thom----Ta----dhi----gi----na----thom----Ta----dhi----gi----na----thom---- | (75)
2. Ta---dhi---gi---na---thom---Ta---dhi---gi---na---thom---Ta---dhi---gi---na---thom--- (60)
3. Ta--dhi--gi--na--thom-- | Ta--dhi--gi--na--thom--Ta--dhi--gi--na--thom-- (45)
4. Ta-dhi-gi-na-thom-Ta-dhi-gi-na-thom-Ta-dhi-gi-na-thom- (30)
5. Ta dhi gi na thom Ta dhi gi na thom Ta dhi gi na thom (15)

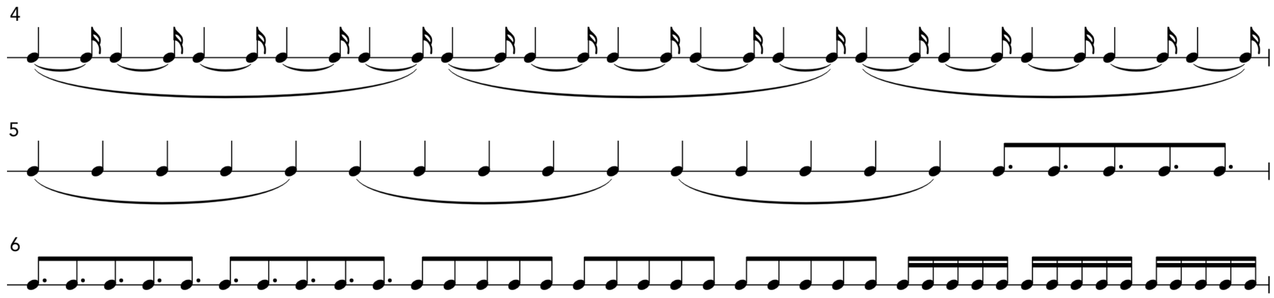


FIGURE 7: CYCLES 4, 5, & 6: *TIRMANA* TRIPLED. Red vertical bars show the cycle boundaries of the 75/16 tāla.

Now we reach the halfway point of the composition. This next section, which lasts for the remaining half of the piece, is referred to as the *korvai*, which Nelson (1991) defines as "an intricate rhythmic composition ending in a *mōrā*". In this *korvai* the performers explore a new set of durational values, and proceed to diminish them down, essentially mirroring the expansion (doubling and tripling) that has been occurring up to this point. The *korvai* is comprised of three sections: the first section lasts for three tāla cycles, the second for two, the third for one. The material for each of these sections is essentially the same, except tripled or doubled in proportions (hence lasting for three, two or one tāla cycles). The basic form of the material, only heard in the final twelfth tāla cycle, is groups of 16^{th} notes that last for the following amounts: 9, 8, 7, 6, 5, 4, 3 | 9, 3, 9, 3, 9 which adds up to 75 16^{th} notes. The material can be broken down into two processes, which I have indicated with a vertical bar. The first is a simple subtractive process, which according to Camón is called *gopuchayati* (pers. comm., 2020)—9, 8, 7, 6, 5, 4, 3, which lasts for 42 16^{th}s. Next, there is an alternation between two durations, 9 and 3, which happens three times before landing on the cycle boundary and lasts for the remaining 33 16^{th} notes of the 75/16 tāla cycle. In Karnatic music, this idea of a cadential rhythm which is repeated three times before landing on the end/next beginning of a cycle is called *mōrā* and is very similar to the term *tihai* that is used in Hindustani music. However, they begin with a tripled version of this *korvai*, then doubled, then single, so I will analyse them in this order. Much like in the tripled version of the *tirmana* pattern, to achieve what would be very long durations, they simply recite each line of the singular form of the pattern three times (see Figure 8). The *mōrā* used here relates in length to the *gopuchayati*, in that the longest version of the *gopuchayati* is worth 27 16^{th}s, and after all the incremental subtractions, its shortest version is nine 16^{th}s in duration. It highlights the contraction process that was enacted in the *gopuchayati*, almost like a kind of zooming effect immediately moving from telescopic to microscopic. Additionally, to add some textural variety, BC speaks the first third of each line of the *gopuchayati*, VV sings the second third, and they come together for the final third of each line. This complex interaction would have been especially difficult for BC because he had to record it alone with no reference.

BC VV Together

1. Ta ka ta ka di na tham - - Ta ka ta ka di na tham - - **Ta ka ta ka di na tham** - - (27)
2. Ta ta ka di na tham - - Ta ta ka di na tham - - **Ta ta ka di na tham** - - (24)
3. Ta ka di na tham - - Ta ka di na tham - - **Ta ka di na tham** - - (21)
4. Ta ki da tham - - Ta ki da tham - - **Ta ki da tham** - - (18)
5. Ta ka tham - - Ta ka tham - - **Ta ka tham** - - (15)
6. Ta tham - - Ta tham - - **Ta tham** - - (12)
7. Tham - - Tham - - **Tham** - - (9)
8. Ta - dhim - ta dhi gi na thom Ta - dhim - ta dhi gi na thom Ta - dhim - ta dhi gi na thom (27)
9. Tham - - Tham - - Tham - - (9)
10. Ta - dhim - ta dhi gi na thom Ta - dhim - ta dhi gi na thom Ta - dhim - ta dhi gi na thom (27)
11. Tham - - Tham - - Tham - - (9)
12. Ta - dhim - ta dhi gi na thom Ta - dhim - ta dhi gi na thom Ta - dhim - ta dhi gi na thom (27)

FIGURE 8: CYCLES 7, 8, & 9: FIRST SECTION OF THE *KORVAI*, in tripled form. Bold text in lines 1 to 7 indicates unison. Lines 8 to 12 are performed in unison.

Next, we hear a doubled form of the *korvai*, which lasts for two repetitions of the tāla. Here they sing/speak in strict alternation for the *gopuchayati*, this time beginning with VV, and the syllables remain much the same as in figure 8, only they are spoken twice instead of three times. However, for the *mōrā*, they vary the syllables and divisions, rather than simply reciting the syllables shown in figure

8 twice. To achieve a total duration of 27 in the tripled form, they used three groups of nine: *Ta - dhim - ta dhi gi na thom* x3. In this doubled form, which must have a total of 18, they could have chosen to use two groups of nine: *Ta - dhim - ta dhi gi na thom* x2 (see figure 9). However, to keep a consistent triple division of the total (18), they use three groups of six. They use the syllabic archetype for 5s that was the focus of the first section of the piece, with an added rest after the second syllable, creating a slight hiccup in the rhythm: *ta dhi - gi na thom* x3.

VV BC

1. Ta ka ta ka di na tham - - Ta ka ta ka di na tham - - (18)
2. Ta ta ka di na tham - - Ta ta ka di na tham - - (16)
3. Ta ka di na tham - - Ta ka di na tham - - (14)
4. Ta ki da tham - - Ta ki da tham - - (12)
5. Ta ka tham - - Ta ka tham - - (10)
6. Ta tham - - Ta | tham - - (8)
7. Tham - - Tham - - (6)
8. Ta dhi - gi na thom Ta dhi - gi na thom Ta dhi - gi na thom (18)
9. Tham - - Tham - - (6)
10. Ta dhi - gi na thom Ta dhi - gi na thom Ta dhi - gi na thom (18)
11. Tham - - Tham - - (6)
12. Ta dhi - gi na thom Ta dhi - gi na thom Ta dhi - gi na thom (18)

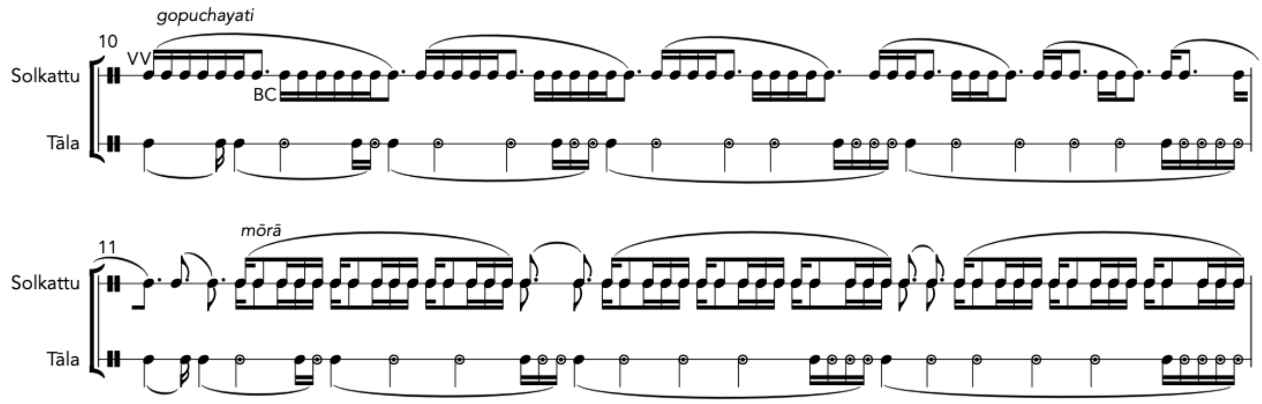


FIGURE 8: CYCLES 10 & 11: SECOND SECTION OF THE *KORVAI*, in doubled form. Lines 8 to 12 are performed in unison.

Finally, to tie the piece off, we hear the *korvai* in its singular form, which covers the twelfth and final repetition of the tāla cycle (see figure 9). We hear each part of the subtraction sequence (*gopuchayati*) only once each and in unison, but again we hear variations in the syllables used for the long part of the *mōrā*. The pattern as shown back on page seven is 9, 3, 9, 3, 9. However, the 9 component of this is broken up into three groups of 3 16th notes. One possibility might have been to use a common syllabic archetype such as *ta ki da*. Instead, BC uses *ta dhi gi na thom -*[4], except at a 32nd note rate, bringing us to an exciting, rhythmically dense finish and harking back to the syllables used in the *tirmana* section.

1. Ta ka ta ka di na tham - - (9)
2. Ta ta ka di na tham - - (8)
3. Ta ka di na tham - - (7)
4. Ta ki da tham - - (6)
5. Ta ka tham - - (5)
6. Ta tham - - (4)
7. Tham - - (3)
8. Ta dhi gi na thom Ta dhi gi na thom Ta dhi gi na thom (9)
9. Tham - - (3)
10. Ta dhi gi na thom Ta dhi gi na thom Ta dhi gi na thom (9)
11. Tham - - (3)
12. Ta dhi gi na thom Ta dhi gi na thom Ta dhi gi na thom (9)
13. Tham

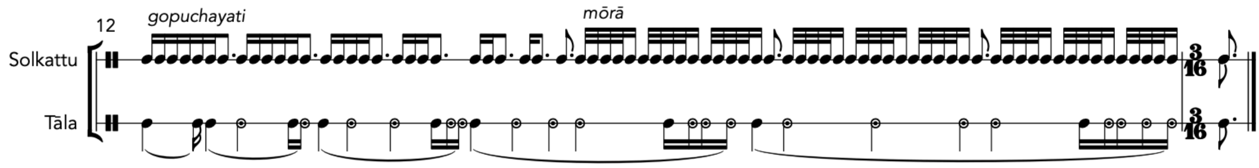


FIGURE 9: 12TH AND FINAL CYCLE: THIRD SECTION OF THE *KORVAI*, in singular form. Underlines indicate 32nd notes.

Mōrā typically repeat three times, but in this instance it should be noted that the *mōrā* in the tripled and doubled forms have been missing the final part of their third repetition (e.g. 9 9, 3 3, 9 9, 3 3, 9 9 in the second, doubled *mōrā*). With the addition of the final downbeat that completes the twelfth 75/16 tāla cycle, we hear 9, 3, 9, 3, 9, 3; a complete third repetition of the *mōrā* is finally realised. By having only incomplete versions of the *mōrā* prior to this, the musicians maintain tension until the very last moment of the piece when all the durations are finally completed.

Now that we have examined all the sections and techniques used in the piece, let us take a bird's eye view of the whole structure. Broadly put, it forms a <> shape.

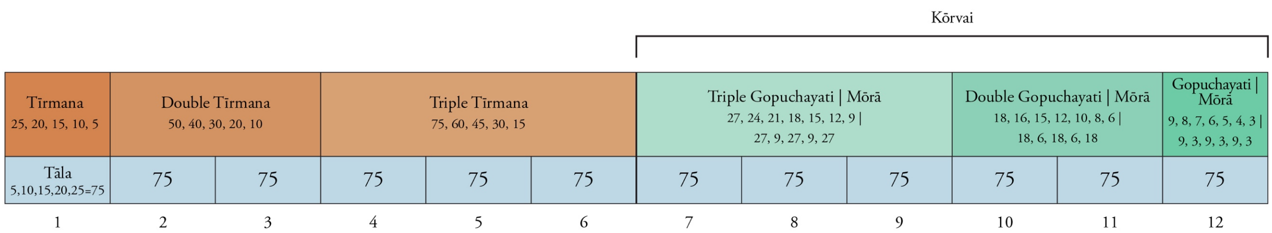


FIGURE 10: OVERALL STRUCTURE. Numbers are the totals from the ends of lines in previous figures, indicating the durational breakdown of each section, above the level of the solkattu and its divisions.

[4] Underlines are used in Konnakol notation to indicate a doubling of speed. They were probably adapted from the beams used for 8th notes. This idea is also used in Javanese *kepatihan* notation, which use an overline.

Conclusion

BC Manjunath's innovative composition stretches the very idea of meter beyond its conventional bounds. Our definitions of meter (London and Hasty) are not predicated on cyclicity, but rather seem to have size limits and require negotiation or conceptual contortions to explain instances where a temporal framework is comprised of an odd number of pulses, in this case a cycle of 75 pulses lasting 14 seconds. BC's composition shows that the concept of tāla is capable of stretching outside these limits. This appears to be possible because the definition of tāla is much simpler—a tāla is a rhythmic cycle (Nelson and Young). While this cyclic predicate will have its own boundaries, it seems that the concept of tāla can happily encompass the rhythmic virtuosity displayed in the performance analysed above. The rhythmic feats achieved by these South Indian musicians bring into question the ostensible limits of entrainability, and with them the very definition of meter. Perhaps there is nothing wrong with our definition of meter, but rather seems likely that the psychological research upon which the established definition is grounded, has not yet been rigorously tested by the world's musicians.

The section on the rhythms vocalised by the performers shows that this tāla does not just repeat in the background, but rather provides an exacting framework upon which the composition is grafted. BC manipulates the material in such a way as to align hierarchically with (in multiples of) the tāla cycles, a macrocosm of the grid conception of meter. The augmentation processes used to transform the material create tension in relation to the tāla cycles, as components of the solkattu extend over cycle beginnings, before realigning with the tāla eventually. Not only do these interactions show a structural integrity, but also that the composer put thought into offsetting these patterns in relation to their underlying structure, in a show of artistic subtlety and refinement. This high-level awareness of compositional design demonstrates BC's fine craft and reveals BC's and Varijashree's abilities to accurately perform these complex durational feats.

References

Camón, Marta. 2020. Personal Communication.

*Camón, Marta. 2019. Transcription of Composition by BC Manjunath. Sheet Music.

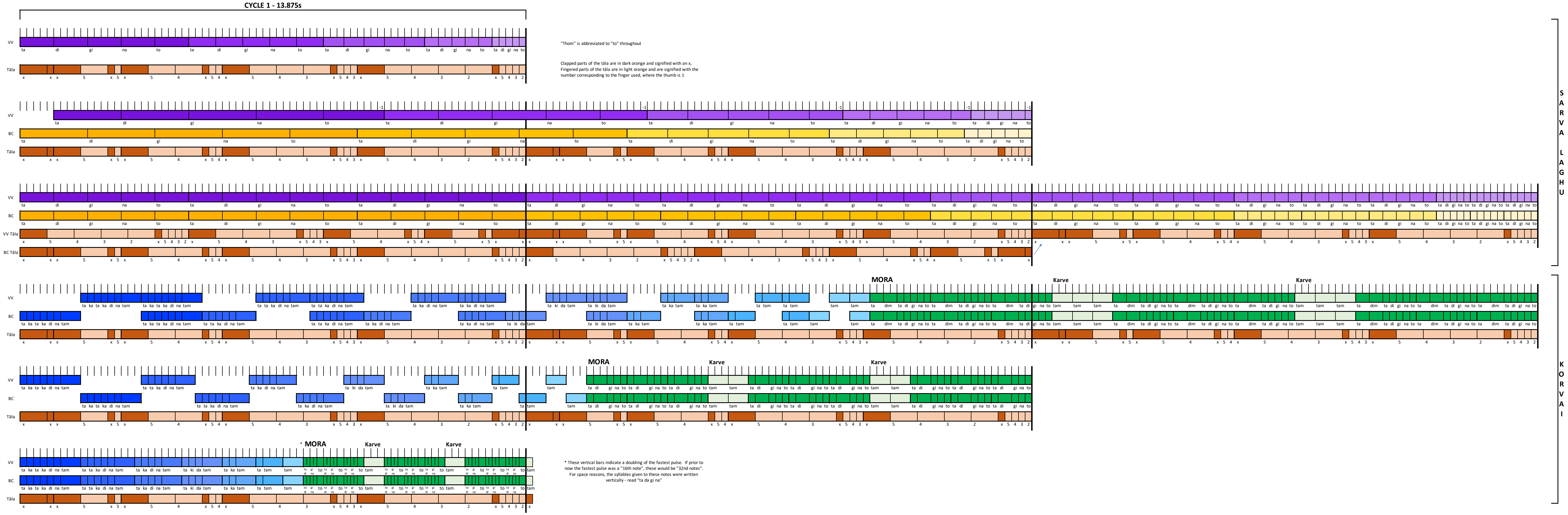
Hasty, Christopher. 1997. *Meter as Rhythm*. New York: Oxford University Press.

London, Justin. 2012. *Hearing in Time*. 2 ed. New York: Oxford University Press.

Nelson, David P. 1991. "Mrdangam Mind: The tani āvartanam in Karnātak music." Ph.D., Wesleyan University.

Young, Lisa. 2010. "Konnakol: The History and Development of Solkattu, the Vocal Syllables of the Mridangam." Ph.D., VCA, University of Melbourne.

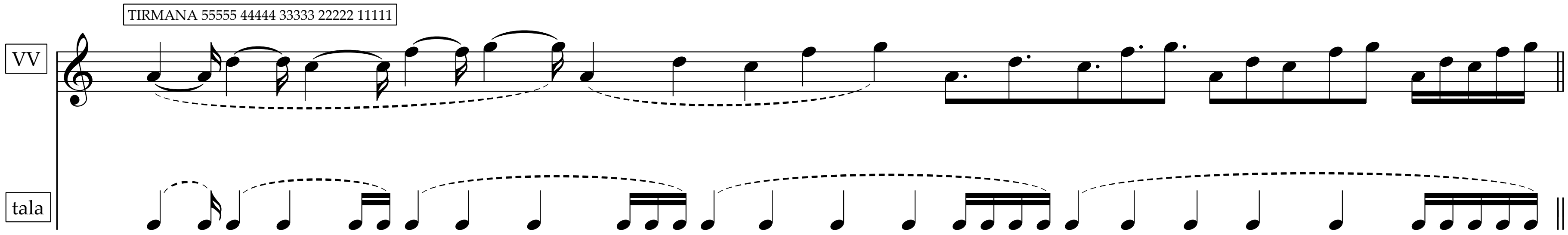
*This full transcription of BC's composition, created by Marta Camón, is reproduced below.

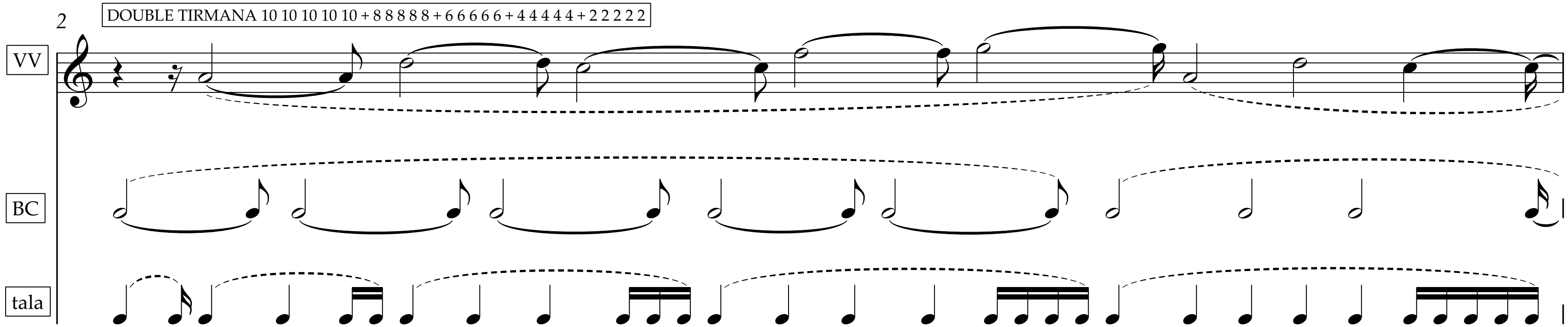

CYCLE 1 - 13.875s
"Thom" is abbreviated to "to" throughout
Clapped parts of the tāla are in dark orange and signified with an x, Fingered parts of the tāla are in light orange and are signified with the number corresponding to the finger used, where the thumb is 1
VV
BC
Tāla
VV Tāla
BC Tāla
MORA
Karve
* These vertical bars indicate a doubling of the fastest pulse. If prior to now the fastest pulse was a "16th note", these would be "32nd notes". For space reasons, the syllables given to these notes were written vertically - read "ta da gi na"
SARVA LAGHU
KORVAI

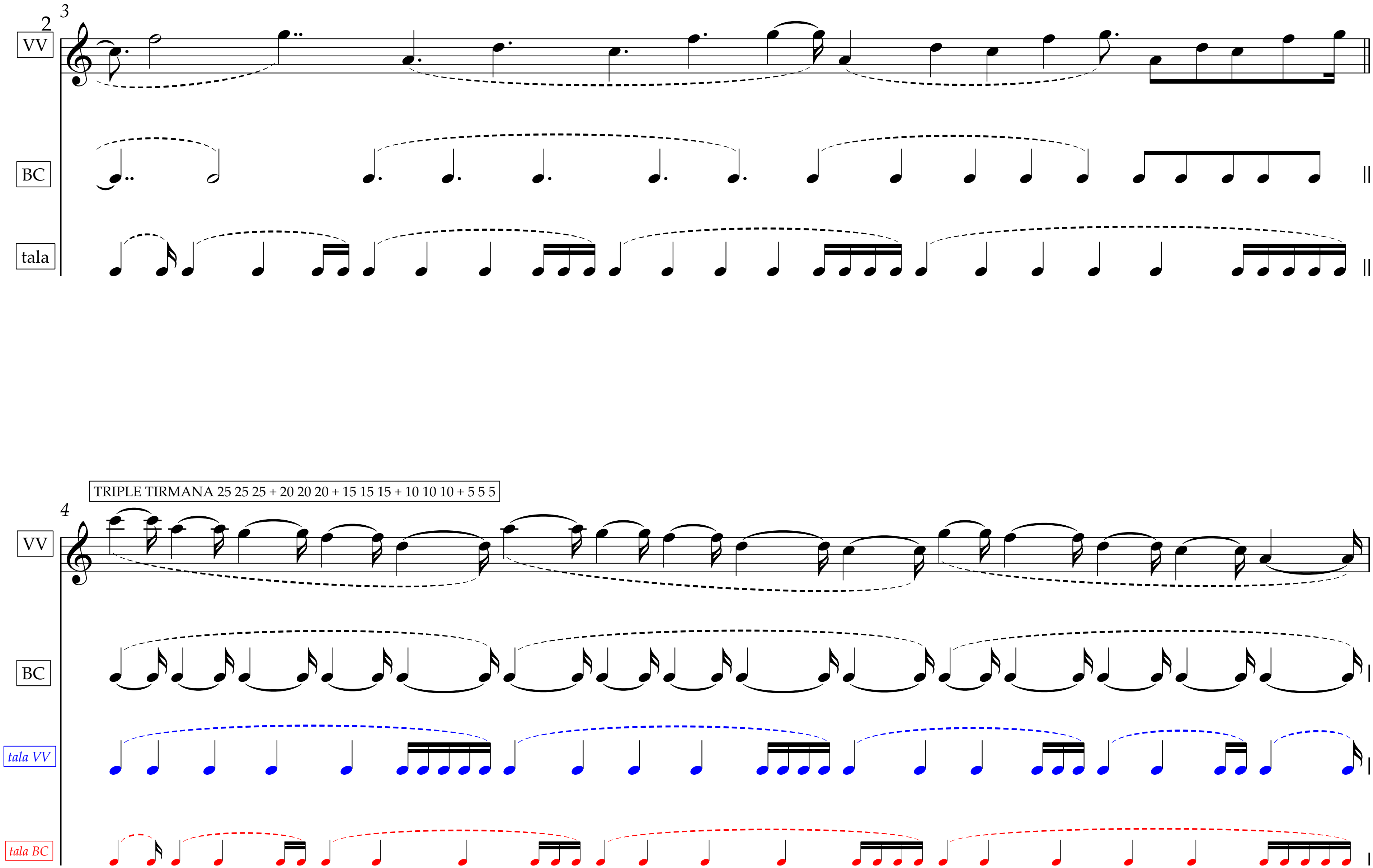
Manjunath BC & VV

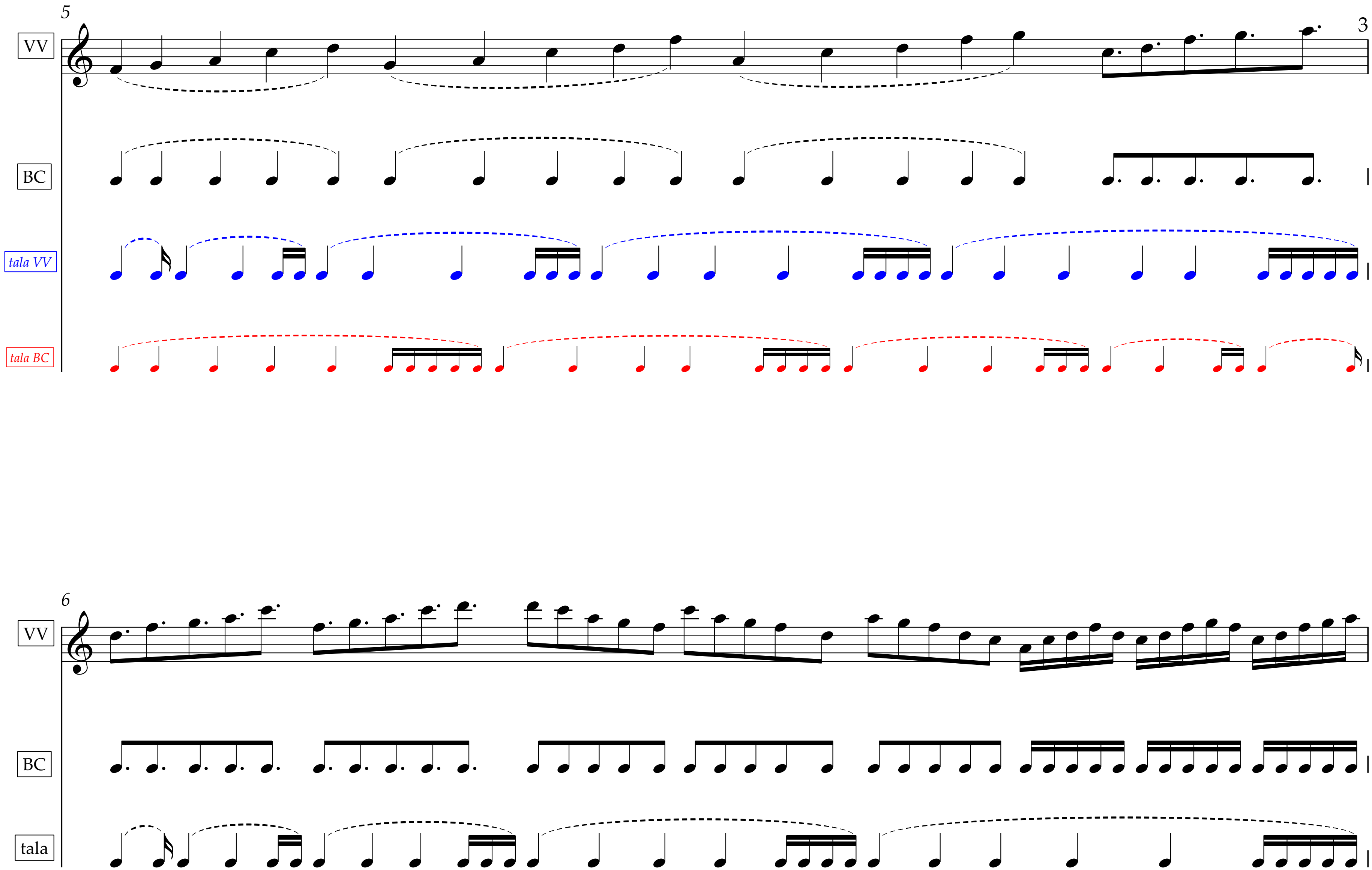
75/16 - (1 1 2 2 3 3 4 4 5 5)

Arr. Marta Camón






2
3
VV
BC
tala
TRIPLE TIRMANA 25 25 25 + 20 20 20 + 15 15 15 + 10 10 10 + 5 5 5
4
VV
BC
tala VV
tala BC


5
VV
3
BC
tala VV
tala BC
6
VV
BC
tala


KORVAI
1º MUKTAYA: triple gopuchayati 999 888 777 666 555 444 333 + sama mukthay 999 (333) 999 (333) 999
4
7
VV
BC
tala
8
9


2º MUKTAYA: double gopuchayati 99 88 77 66 55 44 33 + sama mukthay 666 (33) 666 (33) 666
10
5
11
VV
BC
tala
12
3º MUKTAYA: gopuchayati 9 8 7 6 5 4 3 + sama mukthay 333 (3) 333 (3) 333