

Appendix 5: Compositional Methods and Processes — Major and Minor Artefacts

Minor Artefact *Beginner's Mind*

Background

The solo improvisation *Beginner's Mind* is included as the dissertation's minor work.

Beginner's Mind is a short (5 minutes and 56 seconds) improvisation presented as a composition one might create in conjunction with the described models that exemplify the process of non-vectorial, globally cyclic development applied to a Western instrument, albeit altered.

In *Beginner's Mind* the solo instrument is the 6-string fretless octave guitar. This guitar is a primarily Western instrument. The tuning is, however, an Eastern tuning, details of which follow.

The fretless octave guitar

The 6-string fretless octave guitar is tuned with a novel “octave” tuning — that is, where all strings are either the fundamental tone or the perfect fifth, as the first harmonic of the fundamental frequency. The fretless octave guitar is thus tuned: C2 – G2 – C3 – G3 – C4 – G4.

At the time of designing the instrument, I was unaware of any similar tunings for guitar, or for that matter, any other instrument. I have since discovered that a similar tuning over four strings is used by Indian violinists.¹

Such a tuning is advantageous in that it easily permits linear melodic movement. Additionally, because of its regular inter-string tuning, it facilitates a natural octave and dominant and subdominant transposition movements.

Being fretless, the fretless octave guitar permits perfect intervals, untempered pitches, nuances, and vocal-like techniques. The absence of frets thus permits a style of playing similar to the Indian sarod. Like the sarod, the strings, when not being played, may also function as sympathetic strings. Unlike the sarod (or sitar), however, all strings on the 6-string fretless octave guitar are playable.

I conceived the necessary modifications and designed the final instrument in conjunction with my Melbourne-based luthier, Ruben Becker, who modified an existing Cordoba Iberia classical guitar to achieve the required alterations.²

Beginner's Mind as improvisation — East and West, traditional and contemporary

The improvisation was recorded in a single unedited recording at Four4ty Studios in Eltham, Australia, just a few days after the physical creation of the newly designed instrument.

The recording represents not only a meeting of East and West but also a meeting of the traditional and the contemporary. It also represents an interface between the musical lineage of the past and the possibilities and openness of the future.

¹ Lakshminarayana Subramaniam and Viji Subramaniam, *Classical Ragas of India: A Practical Guide* (New Delhi: East West Press, 2018), 10.

² The Cordoba Iberia classical guitar was also used as the basis for the 8-string regular interval guitar. This guitar is described in further detail in Appendix 6.

The non-lineage of a newly conceived instrument

The instruments are so unknown that as you explore ... you are not dealing with your memory and your taste.³

In the moment of playing the instrument, however, there was no past lineage to refer to.

Nor was there any sense of a future to aspire to.

There was just a newly conceived instrument and the present moment.

It was in that present moment that *Beginner's Mind* was played and recorded as a spontaneous solo improvisation, recorded without editing, on a previously unplayed instrument, in real time, for 5 minutes and 56 seconds.



Figure 1: Fretless octave guitar

Major Artefact Oscillation 1

1. Background and caveat

This section describes the method used for the composition of the submitted creative work, *Oscillation 1*. It includes the processes of conceptualisation, instrument design, composition, graphical representation, notation, recording, and assembly of musical parts. It also demonstrates the relationship between the artefact and the written theoretical work. (Refer to section 8 below: *Operationalisation of philosophical concepts to the compositional process.*)

A caveat is included because, consistent with the emergent process that characterises the methodology, multiple alternatives were considered for the research questions, process, artistic work etc. In the context of the emergent process, they are characterizable as *precursors* from which the final dissertation and submitted creative work emerged.

The caveat thus acknowledges these precursors for what they appear to be — part of a necessary pathway and process, and nascent to the final research question, process, and artistic work of the

³ John Cage in Thom Holmes “The Cage Interview” Recordings 3, no. 3 (1981): 3, in Feisst “Negotiating Freedom and Control in Composition: Improvisation and Its offshoots, 1950 to 1980,” 10.

dissertation. For the current research, however, the method references the emergent process that began after my meeting and subsequent collaboration with Dr Sam Evans. The method is thus a description of *what was done* during the research to produce the submitted creative work, *Oscillation 1*, and how the artefact's compositional structure and processes exemplify the concepts of the theoretical work.

2. Preliminary challenges

The process of producing the composition faced several preliminary challenges. These had to be addressed well before attempting to compose and record the creative work. Some of these challenges were *conceptual* and related to compositional design. An example of this was the question of how to represent metaphorically and operationalise within a composition such abstract concepts as *form and void*, and the *linearity and cyclicity of time*.

Others were of a *practical but non-material* nature. An example of this was deciding whether it was possible to record multiple tabla drums with different tunings in real time. If so, how many? If not, how could this limitation be alternatively accommodated in the studio?

Still others were both *practical and material*. The most significant of these were challenges over the design and construction of the modified instruments themselves. For instance, if new instruments were to be custom-designed and custom-built for the composition, would they be capable of playing outside their normal ranges while maintaining satisfactory musical and physical properties? For the case of both the 8-string regular interval guitar and the 12-drum harmonic tabla set, this meant determining whether the strings and drum materials would withstand the extended ranges required for the composition and whether they would remain in tune.

Other challenges were of an *ergonomic and playability* nature. For example, even if the instruments could be built with their imagined extended ranges, and even if their material structure were satisfactory enough to play in tune and not break under the strain required to meet the extended ranges, would they be playable? For the tabla, the literature provided an approach to this ergonomic problem.⁴ For the 8-string guitar, this process was essentially one of trial and error, working with Melbourne luthier Ruben Becker. Ultimately, however, the composition, the instrument design and the methods for playing the instruments went hand in hand — thus, the instrument formats and the composition developed mutually and concurrently.

Questions unanswered prior to the research were as fundamental as the following:

- Is it possible to produce a playable low A [A1] below normal range on a standard-length guitar neck?
- Would the neck need lengthening to produce playable string tension?
- Would there be a need for “fanned” (i.e., angled) frets (a solution used by some luthiers to permit different neck lengths for different strings)?
- Would the fingerboard need widening and, if so, would it be possible to play the frets on all strings?
- Is it possible to tune a high E string to high A-flat [A^b4], without the string breaking or going out of tune? This was the pitch required for the highest string to play the composition as it was initially imagined.

⁴ Evans, *Tabla without Borders*.

Table 1 (in this appendix) summarises the tabla and bayan tunings used so that the tabla could play in 12 keys.

Error! Reference source not found. provides further details of the process and development of the 8-string guitar and the 12-drum tabla set.

Error! Reference source not found. provides further recommendations for the 8-string guitar — specifically, proposed fingering positions for the harmonic movement implied by the equi-harmonic cycle.

3. *Scope of the compositional method*

As is often the case in practice-led research, the dissertation's research process produced a considerable amount of interdisciplinary knowledge relevant to other disciplines, especially the disciplines of instrument construction, instrument design, and musical ergonomics. A detailed discussion of such interdisciplinary knowledge is, however, beyond the scope of the current study. Suffice to say, it functions as “seeds” for further research across multiple ancillary disciplines.

The method thus focuses primarily on the processes that permitted the composition, notation, graphical representations, recording, and production of the composition *Oscillation 1* as an exemplification of the concepts in the written dissertation. These processes were the following:

- The process of representation of interculturality as it applies to music composition.
- The process of representation of the concepts of form and void using the associated musical devices of sound and silence and phenomenological attribution of “away-ness” versus phenomenological attribution of “home-ness” as these apply to functional harmonic movement.
- The process of representation of contrasting Western and Eastern concepts of time as linear and cyclic using the musical devices of linear and cyclic harmonic modulation and linear and cyclic global organisation.

Artefact RPs. While other research processes were interesting and satisfying explorations in their own right — for example, the process of designing and building the instruments for the composition — they were considered as ancillary to the central RPs of the research and beyond the scope of the current dissertation. In **Error! Reference source not found.** (Chapter 1), such ancillary investigations are listed as artefact RPs. The four artefact RPs are only minimally discussed as they do not in themselves play a major role in the development of the RPs. Discussion of the artefact RPs is thus limited and occurs *locally* — that is, in the context of their presentation within this appendix rather than in Chapter 3 (Discussion).

4. *Depth of descriptions*

In some instances, a reference is made to more detailed documentation outside the current document and within the appendices. This is the domain primarily of Appendix 6.

Regarding the 8-string regular interval guitar design and construction, Appendix 6 puts this instrument and its variations in a historical context. It does this also for the 12-drum harmonic tabla set, focusing primarily on its prior melodic and harmonic use, particularly as exemplified by Sam Evans. The main prerogative, however, is to document the logical and chronological method that made the production of *Oscillation 1* and its associated documents possible.

5. Overview of the composition

Oscillation 1 is an *intercultural duet* for an 8-string regular interval guitar and a 12-drum tabla set, both instruments being novel re-configurations of traditional Western and Eastern instruments.

Summary of composition parameters and organisation

Tempo. The tempo of the composition is crotchet = 192 beats per minute.

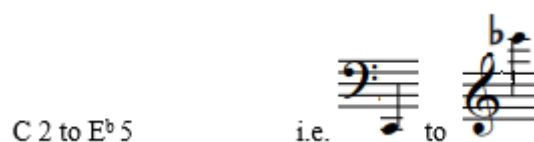
Duration. The duration of the composition is 1 hour and 48 minutes (not including a three-minute introduction and three-minute outro during which the tabla does not play).

To demonstrate application to other creative disciplines, an abridged (one-hour) music video version is also provided, comprising the first 54 minutes of the composition and a two-minute fade out. The music video should be considered a stimulus for further research.

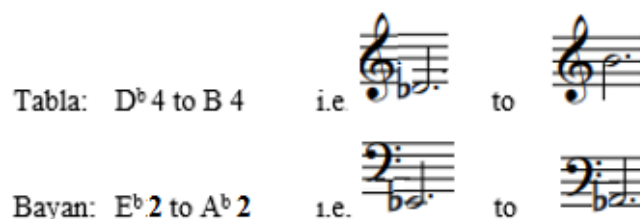
In contrast to the submitted audio recordings and manuscripts — that is, the dissertation's examinable artefacts (refer to Appendix 1 for a list) — the music video (an abridged version of the composition) is presented as a demonstration of concepts for further research, *not as an examinable artefact*.⁵

Range.

The range of the composition for the guitar part is as follows:



The range for tabla and bayan is as follows:



Time signature. In Western musical terminology, the time signature alters between 3/4 and 4/4 such that the pattern of 3/4, 3/4, 4/4, 3/4, 3/4, 4/4, 4/4 repeats every seven bars, as described below.

Metric cycle. In Eastern musical terminology, the tabla is made up of a 24-beat metric cycle. At the first level of metric organisation, *major accents* occur at beats 1, 11 and 21, effectively dividing the 24-beat metre into three bars of 10, 10 and 4 beats. At the second level of metric organisation, *minor accents* occur at beats 4, 7, 14 and 17, effectively dividing the 24-bar metre into seven bars of 3, 3, 4, 3, 3, 4 and 4 beats.

This structural organisation at the level of metre, as it relates to RP 1A, is summarised in Appendix 7, which also summarises the structural organisation of the composition at the levels of melody, harmony, modulation, global form, and equi-harmonic cycle.

⁵ The abridged music video version permits listening (and watching) within a one-hour period, as might occur during a lunch break or a break in a schedule organised in hourly slots.

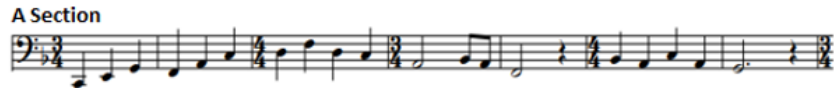
Sections. The composition comprises the following definitions of sections and movements:

- **A-section:** The A-section is a 19-note, 24-beat melodic phrase played over seven bars within the following time signatures: 3/4 3/4 4/4 3/4 3/4 4/4 4/4.

Bars duration: 7 bars

Time duration: 7.5 seconds

The A-section functions as the *call* of an A-B call-and-response couplet. The key centre of the A-section is in the tonic key of one of six primary key centres: F, E^b, D^b, B, A and G. An example of the A-section, played in the tonic key of the opening key of F-major, is as follows:



In the graphic representation of the equi-harmonic cycle (presented later in Figure 10), the key centres of the A-section are represented by the six keys that form the *inner* circle.

- **B-section:** The B-section is an alternate 19-note, 24-beat melodic phrase, also played over seven bars within the same time signatures: 3/4 3/4 4/4 3/4 3/4 4/4 4/4.

Bars duration: 7 bars

Time duration: 7.5 seconds

The B-section functions as the *response* of an AB call-and-response couplet. The key centre of the B-section is in the subdominant key of the A-section.

An example of a B-section, played in the subdominant key (B^b) of the opening primary key of F-major, is as follows:



In the graphic representation of the equi-harmonic cycle, the key centres of the B-section are represented by the six keys that form the *outer* circle.

- **AB-section.** An AB-section is a combined A-section and B-section (i.e., 1 AB-section = A + B).

Bars duration: 14 bars

Time duration: 15 seconds

A-sections are thus in the six primary key centres: F, E^b, D^b, B, A and G, and their respective B-sections are in the subdominant key of these six primary key centres. Thus, B-sections are in the keys of Bb, Ab, Gb/F#, E, D and C.

An example of an AB-section, functioning as call and response — and as “home” and “away” — is as follows:



This first AB-section of the composition is in the primary opening key of F-major and the secondary opening key (B-section) of B^b-major.

- Whereas the tabla changes key to play *within* the harmonic framework of the equi-harmonic cycle, the guitar part *outlines and defines* the harmonic movement.

Also, whereas the harmony of the guitar part for the B-section is different from the guitar part for the A-section because of different pitches in the A and B melodies — effectively *announcing* the modulation — this is not the case for the tabla part. Instead, the tabla tunings within any AB-section are common tunings to both the key of the A-section and the key of its corresponding B-section. Thus, the tabla and bayan pitches remain unchanged across the A and B sections. Because of the modulation, however, the same pitches have different harmonic functions in the B-section compared with the A-section.

For this reason, and unless described otherwise, references to musical parts such a A-part and B-part are references to the guitar parts.

- **AB-AB-section (linear modulation).** An AB-AB-section is a repeated AB-section (i.e., AB-AB = AB + AB).

Bars duration: 28 bars

Time duration: 30 seconds

In an AB-AB-section, both AB-sections are in the same key.

In an AB-AB movement because the A-section (following the B-section) returns the music to the same A-key (AB-A movement), an AB-AB section contains within it, linear modulation.

This is evident in the first 15 bars of the composition, when the key centre moves from (in the first A-section) F, to (in the B-section) Bb and then (in the second A-section) back to F.

Details of this concept are discussed in section 8 (*Operationalisation of philosophical concepts to the compositional process*) under “Guitar part”.

AB SECTION

8

AB SECTION [SAME KEY]

15

22

- **AB-A'B'-section (cyclic modulation).** An AB-A'B' section is an AB-section followed by an AB-section in a *new modulated key*.

The new modulated key for the A'B' segment is the flat seventh of the harmonic centre of the preceding AB-section. This modulation is achieved via a modulation down a major second interval, except where such a modulation takes the composition beyond the lower range of the guitar (A2), in which case the modulation is an upwards one to the harmonic equivalent (i.e., up a flat seventh). The octave “adjustment” allows the composition to fit within the range of the 8-string guitar and to “cycle” perpetually through all 12 keys.

Bars duration: 28 bars

Time duration: 30 seconds

In an AB-AB'-section, the A'B' is in a modulated key, relative to the preceding AB-section.

AB SECTION

15 C F Dm Am B \flat Gm C 7

22 F B \flat Gm Dm E \flat Cm F 7

A'B' SECTION [NEW KEY]

29 B \flat E \flat Cm Gm A \flat Fm B \flat^7

36 E \flat A \flat Fm Cm D \flat B \flat m E \flat^7

Linear void-form-void movement. Linear void-form movement is the movement A-to-B-to-A. This movement is linear because it is a *two-directional, uni-dimensional* (i.e., linear) back and forth harmonic movement from A to B and then back to the same A-section, in the same key as the original A-key. Such linear harmonic movement is analogous to the back-and-forth movement of a pendulum bob, appearing as a straight line when viewed from the side. An example is the harmonic movement from the key of F (A-section) to B \flat (B-section) and then back to F again (F-B \flat -F).

Cyclic void-form-void' movement. This is the movement A-to-B-to-A'. It is cyclic because it is a *uni-directional* (continually forward moving), *two-dimensional* (akin to circular movement) from A to B and then onwards to a new A-section (A') — that is, in a new key. Such cyclic harmonic movement is analogous to the circular movement of a pendulum bob, moving in circles (i.e., in two dimensions) viewed from above. An example is the harmonic movement from the key of F (A-section) to B \flat (B-section) and then onwards to a new A-section (A') — that is, in a new key (E \flat). Thus F-B \flat -E \flat modulation is an example of cyclic modulation.

Equi-harmonic cycle. The equi-harmonic cycle comprises a sequence of 12 AB-AB sections (using the term AB-AB generically, in reference to form but not key — in this description, both AB and A'B'-sections are included in the reference to the AB-AB sections). Because the key centre of the B-section is in the subdominant key of the A-section, such progressive modulation eventually traverses all 12 major key centres. The equi-harmonic cycle is thus a repeating cycle of alternate linear and cyclic modulations, traversing in this process all 12 major keys. (See Figure 10.)

Bars duration: 168 bars *Time duration:* 3 minutes

Oscillation. An oscillation is the term given to the tabla's single extended void-form-void movement, which lasts the entirety of the 108-minute duration of the composition. During this time, in its role as accompaniment, the guitar plays 36 equi-harmonic cycles. For the first 18 cycles (the first 54 minutes) of the oscillation, the tabla part's rhythmic density (RD) progressively increases, peaking at 54 minutes and thereafter progressively decreasing for the final 18 cycles.

Figure 2 graphically captures the cyclic global form of the guitar part and the linear form of the tabla during the tabla's oscillation.

Bars duration: 6048 bars *Time duration:* 1 hour 48 minutes

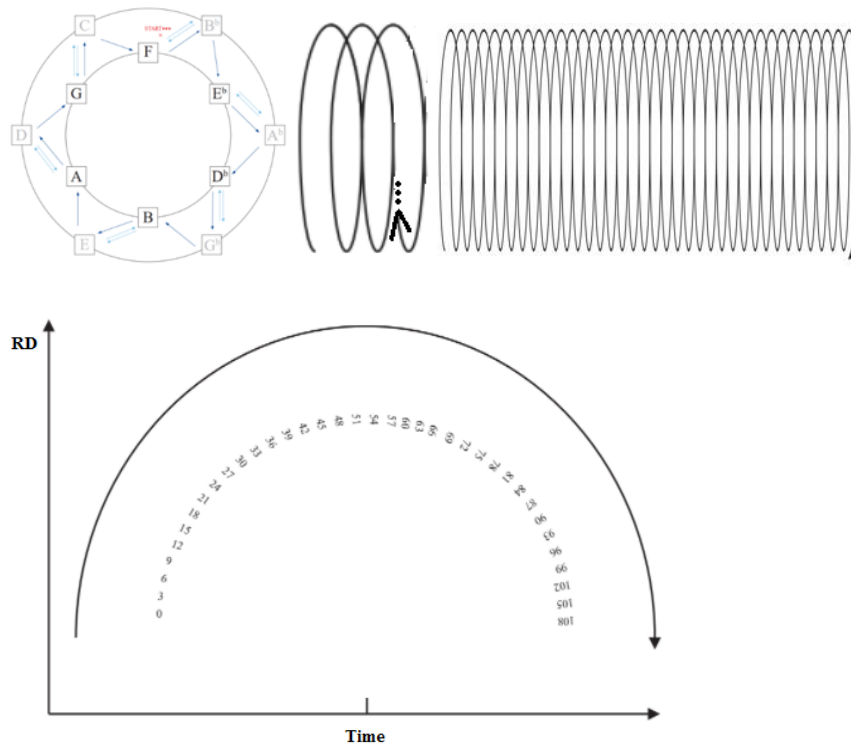


Figure 2: Guitar part (upper, l to r): equi-harmonic cycle, equi-harmonic cycles x 3, total of 36 cycles; tabla part (lower): oscillation x 1

Overall cyclic and linear compositional organisation. The 108-minute duration of the composition is achieved via the following structure:

- *Overall cyclic structure.* The overall cyclic structure of the composition is as follows: 36 cycles of three-minute equi-harmonic cycles. This process defines the guitar part.
- *Overall linear structure.* The overall linear structure of the composition is as follows: 1 oscillation = 54 minutes linear development of linear intensification + 54 minutes linear resolution of intensification. This process defines the *oscillation*, which is the tabla part.
- *Graphic representation of cyclic and linear movement.* The contrasting cyclic and linear movement of the guitar and tabla are graphically represented in Figure 50.

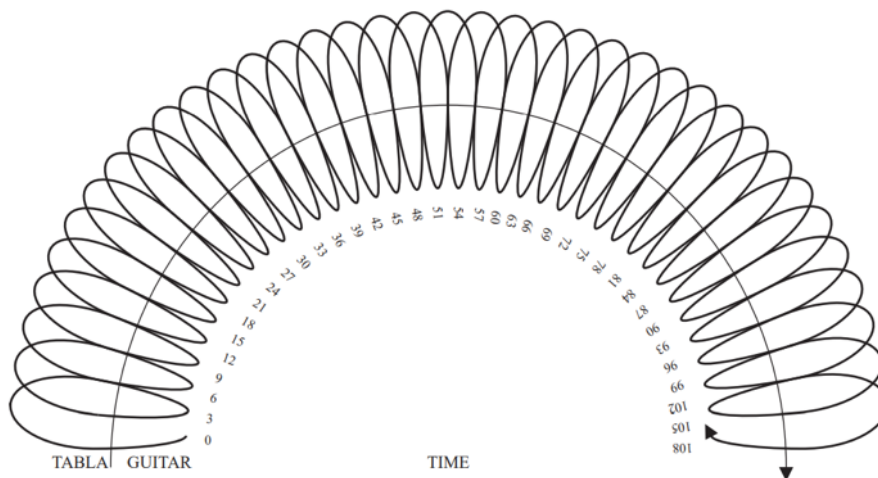


Figure 3: Contrasting cyclic and linear movement of the guitar and tabla

6. Preliminary considerations

Design and construction of modified instruments

The 8-string regular interval guitar used in the current dissertation is an adaptation of the standard 6-string guitar. In simple terms, the guitar has two significant modifications:

- two additional strings, one extending the lower range, the other extending the higher range
- tuned in regular fourths, commencing from low A and ending in high A-flat. The tuning of the guitar, from low to high, is thus A E D G C F B^b A^b.

Justification of modification — guitar

The rationale for modifications of the standard guitar is described in more detail in Appendix 6. A summary of the rationale as it is relevant to the current chapter is as follows.

The earliest known existing 6-string guitar was built in 1779 by Gaetano Vinaccia of the Vinaccia family of luthiers in Naples, Italy. The standard acoustic guitar in its current 6-string format has thus been around for about 250 years.⁶ This format is adequate for a wide variety of uses in popular, folk, classical, and jazz idioms.

In the words of guitarist and teacher Brian Bunnell, “the current model of six strings in a standard tuning has been settled on because it offers an adequate range of pitches and the hundred or so most used chords can be played by the human hand fairly comfortably”.⁷ The modification of such a “satisfactory” arrangement thus warrants justification beyond that of novelty alone.

The justifications are summarised below, organised in terms of *general considerations* (i.e., potential “improvements”) and *specific considerations* (i.e., “improvements” specific to the playing requirements of the submitted creative work, *Oscillation 1*).

General considerations — guitar

The general considerations for the guitar are:

1. Increase in range

The 8-string octave guitar increases the range of the guitar by almost an octave. Specifically, it increases the lower range by a perfect fifth and the upper range by a major third, increasing the overall range by 11 semitones.

2. Horizontal and vertical inter-string interval regularity

In contrast to a “standard” guitar tuning of E A D G B E, where four of the five (ascending) inter-string intervals are a perfect fourth and one interval — the G to B inter-string interval — is a major third, the inter-string intervals of the 8-string regular interval guitar are consistent. All ascending inter-string intervals on the 8-string regular interval guitar are thus a perfect fourth.

The advantage of this tuning is that the inter-string intervallic regularity permits universal transposition and modulation of playing positions of musical content not only up and down the fretboard but also *across the fretboard* — that is, from string to string. On the 8-string regular interval guitar, notes, melodies, scalar movements, arpeggios, chords, chord sequences, and entire songs can thus be transposed without any adjustments to hand position or fingering beyond moving up and down the fretboard horizontally or across the fretboard

⁶ “History of the 6-String Guitar.” <https://lunaguitars.wordpress.com/2011/11/27/history-of-the-6-string-guitar/>

⁷ Quora. “Why Do Most Guitars Have Six Strings?” <https://www.quora.com/Why-do-most-guitars-have-six-strings>

vertically. Such regularity of transposition permits the unaltered transposition of multi-string passages, not unlike the regular transposition of musical segments on the piano.

3. Improvisational orientation

Having such ease of transposition, the 8-string interval guitar, because of its regularity, also lends itself to improvisational capacity, particularly regarding more advanced musical forms rather than simple diatonic music.

4. 12-tone and equi-harmonic orientation

Having both horizontal and vertical interval regularity, the 8-string interval guitar is ideally suited to 12-tone, functional-harmonic, and modulation-based music.

Specific considerations — guitar

The 8-string octave guitar is specifically advantageous for the purpose of playing the submitted creative work, *Oscillation 1*. Except for the guitar part being an improvised part, all the other general considerations apply. Thus, the 8-string regular interval guitar is particularly advantageous for the playing of the guitar part because *Oscillation 1* is a composition that demands an extended range and continuous regular modulation and is equi-harmonic.

Justification of modifications — tabla

Like the 8-string, regular-interval guitar, the 12-drum harmonic tabla set is an adaptation and modification of a traditional instrument. Also like the 8-string, regular-interval guitar, the 12-drum harmonic tabla set has specific applications to *Oscillation 1*, as well as broader application.

Through the process of adaptation described in the next section, the tabla, which is normally a monophonic instrument, can play a composition in all 12 keys. This process of adaptation to a traditional instrument such as the tabla is outlined below.

Effectively, the 12-drum tabla set is the combination of three contributing novel processes:

1. establishment of tuning ranges and tolerances of drums
2. 12-key tuning framework achieved by determining a matrix of paired tunings for both right-hand tabla drum and left-hand bayan drum capable of accommodating 12-key harmony
3. development of a studio process that accommodates the physical playing or recording of 12 drums.

Outlines of these three processes are individually described below. Further detail is also provided in Appendix 6.

1. Tuning ranges — determination of range and tolerances

The first of these requirements was the establishment of a *tuning framework* that would permit the tabla to play within increased tuning ranges and tolerances.

As previously noted, significant work in this regard has already been accomplished by Dr Sam Evans.⁸ By using modern synthetic materials for ties etc., trial and error, and previous experience, Evans was able to establish the following ranges for tabla and bayan. These related to the intent to find tunings for the tabla and bayan that would accommodate a 12-key tuning framework without undue compromise to sound and with a performance tolerance that could permit recording of the composition.

⁸ Evans, "Tabla without Borders."

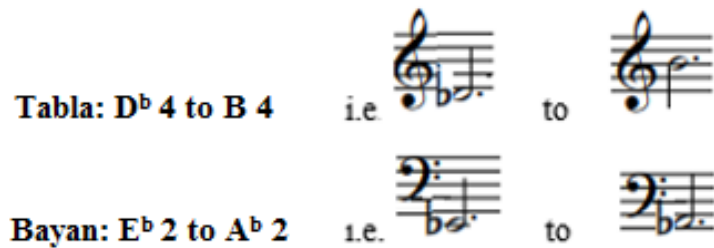


Figure 4: Tuning ranges

2. Tabla — 12-key tuning framework

The second of these requirements was the establishment of a *tuning framework* that would permit the tabla to play within 12 keys, within the limits of its tolerances as a physical drum with limited tuning range.

The outcome of this process is summarised in Table 1. The process through which the tuning framework was achieved precedes this summary, as follows.

Available pitches for tabla drum, based on range. As noted above regarding the specific requirements of the composition, the range of the tabla drum is the *flat seventh* — specifically, the flat seventh interval range from D^b 4 to B 4. This is the tabla range that was found by Evans to have tuning and durability properties acceptable for performance.

The potential tunings of *tabla drum* within this range thus included the following pitches: D^b 4, D 4, E^b 4, E 4, F 4, F[#] 4, G 4, G[#] 4, A^b 4, A 4, B^b 4 and B 4.⁹

By a process of trial and error, the range of the bayan was found to be perfect fourth. The potential tunings of *bayan drum* within its determined range thus included the following pitches: E^b2, E2, F2, F[#]2, G2, A^b2.

Necessity for multiple-interval bayan-tabla tunings. It was apparent from such potential tunings that if a 12-drum tuning framework could be determined, it could not happen within these range limitations on a *single bayan-tabla interval* basis. In other words, it was not possible to simply *transpose* any given bayan-tabla drum pair combination of pitches to accommodate the capacity for playing 12-tone music, be that from a melodic perspective or a harmonic perspective.

Multiple bayan-tabla interval solution. To facilitate the playing of a 12-key composition within these limited ranges, a *multiple bayan-tabla interval* solution was required. Whereas the *standard* bayan-tabla interval is typically an octave or a fifth, to accommodate its need for 12-key harmony, the composition *Oscillation 1* uses two different bayan-tabla intervals:

- Bayan-tabla interval (i) [I-Octave] I-I [A-section] and V-V [B-section]

For AB-sections where an AB-section is in F-Bb, Eb-Ab, A-D and G-C major keys:

- A-section: Bayan I – Tabla I
- B-section: Bayan V – Tabla V

⁹ If it were possible to extend this flat seventh range by one more semitone (i.e., to a major seventh range), then the tabla drum could, in theory, be used to play any melody, contingent upon the octave in which the scale tone is played being variable to fit within this 12-tone range. The current dissertation does not say that this cannot be done. Rather, where the tabla and bayan drums do not play melodically but harmonically, such an interval (and the additional note, be that C4 or C5) was simply not required to achieve tabla and bayan pitches concordant with the 12-key harmonic requirements of the composition.

- Bayan-tabla interval (ii) [Fifth Octave] V–I [A-section] and XI–V [B-section]

For AB-sections where an AB-section is in A^b-D^b and F[#]-B, major keys:

- A-section: Bayan V – Tabla I
- B-section: Bayan IX– Tabla V

A summary of these *multiple bayan-tabla interval solutions* — specifically tabling the keys in which each of these bayan-tabla intervals are used so that all the tunings fall within the empirically determined ranges for the drums — is provided in Table 6.

Table 1: Tunings for the bayan and tabla

Bayan-tabla tuning	Bayan		Tabla		Harmonic key	
	Pitch of Bayan	Pitch of Tabla	A-section (Bayan, Tabla)	B-section (Bayan, Tabla)	A-section	B-section
[A] [B] 1: [F][B ^b]	F 2	F 4	F Maj	[I, I]	B ^b Maj	[V, V]
[A] [B] 2: [E ^b][A ^b]	E ^b 2	E ^b 4	E ^b Maj	[I, I]	A ^b Maj	[V, V]
[A] [B] 3: [D ^b][G ^b]	* [High] A ^b 2	D ^b 4	D ^b Maj	[V, I]	G ^b /F [#] Maj	[XI, V]
[A] [B] 4: [B] [E]	* G ^b /F [#] 2	B 4	B Maj	[V, I]	E Maj	[XI, V]
[A] [B] 5: [A] [D]	A 2	A 4	A Maj	[I, I]	D Maj	[V, V]
[A] [B] 6: [G]	G 2	G 4	G Maj	[I, I]	C Maj	[V, V]

* In [A][B]3 & [A][B]4 sections, the bayan is tuned to the V rather than the I, relative to the tabla. Relative to the harmonic key of the [A] section, the bayan functions as the V. Relative to the key of the [B]-section, holding this same tuning, the bayan functions as a *ninth* (or major second).

3. Tabla — studio process solution: ergonomic considerations of multiple drum tunings

The tabla is traditionally played as a two-drum set only — the left hand for the bayan and the right hand for the tabla. The challenge in composing for the tabla within a Western melodic or harmonic context is that to play in this way, it must have multiple tunings so that the instrument approximates more a melodic or harmonic instrument and less a percussive-only instrument.

The first challenge was overcome, at least to some extent (as described above), by determining the ranges and workable inter-drum intervals that would permit the instrument to play in the extended capacity necessitated for an equi-harmonic composition — that is, a 12-key, harmonically equally distributed composition — as is *Oscillation 1*. This solution provided the tolerable tunings that were physically possible for the instrument. It was, however, only the first challenge to be addressed in the realisation of the composition. The second challenge was the actual ergonomic playing of such an instrument.

Integral to its history, the tabla is played in a specific sitting position with the hands (particularly the left hand) resting on the drums, the body positioned in support of playing. As such — regardless of tunings, and apart from experiments to advance this possibility (including the use of up to three tabla drums and one bayan, as used by Evans¹⁰) — in most instances, the number of drums that can be played at a time is determined by the number of hands that are free to play them.

Several accommodations were considered. Here, it is sufficient to conclude that, of the considered options, the accommodation that permitted *Oscillation 1* to be recorded and mixed, and thus realised from score to tangible audio recording, was the *studio process* solution.

The studio process permits the recording of a 12-drum tabla set by recording sections that use one of the six paired drum combinations before changing drums to another drum combination. For compositions in a single key, no changes are required. For a 12-key composition, however, as is *Oscillation 1*, six pairs of drums are required.

The studio process solution is thus a method where sections of the compositions that require a particular drum combination are recorded in a *batch*; drums are then changed or re-tuned to the next section, recorded again etc. At the end of the process, the relevant sections are cut and pasted into their appropriate corresponding section in the composition. Importantly, this process is simply one of rearrangement of sections — it is not one of digital correction, punching in and out, or studio enhancement.

It is timely at this point to reprise the distinction made between the general RPs and the artefact RPs. The reason for this is that, even though several novel processes have been discovered, as is the purpose of this method section, priority is given to describing the process through which it was possible to translate a concept into a compositional form and then play and record this composition. (See **Error! Reference source not found.** in Chapter 1 for a list of the major RPs of the dissertation.)

Ancillary details, however, may be found in the appendices, and this is particularly so regarding the processes of instrumental design, both for the 8-string guitar and the 12-drum tabla set. These are notable as opposed to being directly relevant to the production of *Oscillation 1*.

The purpose of the above is to maintain the *navigation* of the dissertation through the landmarks of the major RPs, which seek to plot a single, rationally connected journey to the dissertation's conclusion. In the spirit of the above, details of processes not immediately relevant to the method are included in Appendix 6.

Further details of the studio process solution, which permitted the equi-harmonic tabla part to be recorded, are described in section 9 below (*Specifics of the compositional process — tabla*).

Manuscripts: Western, Eastern, graphic, formulaic notations

Notations — guitar

The guitar part is notated in traditional Western notation. However, because of its extended range, it uses *concert-pitched* (rather than octave-transposed) *treble clef and bass clef*, alternating between the two as required. Thus, rather than being written in the traditional (for guitar) octave-transposed single treble clef with upper and lower ledger lines, the guitar part is written in a single un-transposed concert pitch, which uses bass clef and treble clef as required.

¹⁰ Evans, “Tabla without Borders.”

Additional to this standard traditional Western treble and bass clef notation, the composition references a *Guitar lead sheet and chord chart* for the equi-harmonic cycle (with notes and chord symbols).

A purpose-designed *8-string TAB notation* is also provided as Appendix 9. The latter is, however, not a representation of the composition but rather a chord fingering chart for the 8-string guitar, providing suggested chord shapes and fingerings for the chord tones of the lead sheet. The purpose of this is to provide initial fingering positions that permit a guitarist to “comp” (accompany) the composition or improvise around the suggested chord shapes (or both). Examples of each of these notations are given in Figure 52 and Figure 53 below.



Figure 5: Lead-sheet notation

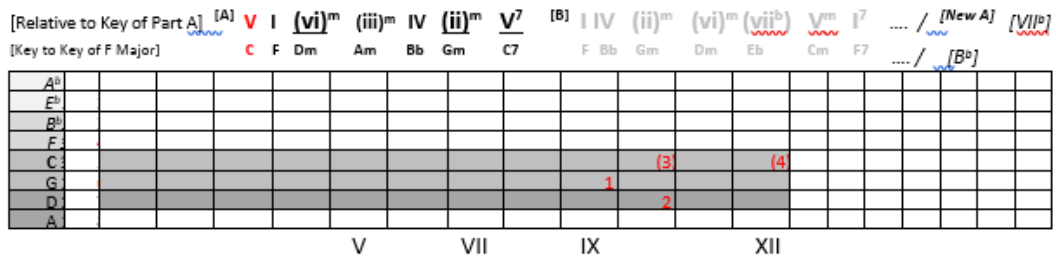


Figure 6: 8-string TAB notation

Notations — *tabla*

In *Oscillation 1*, the tabla part has the non-traditional property of being able to play multiple pitched notes. Such a property permits melodic and harmonic possibilities but necessitates a suitable notation system to represent these extended capacities.

The tabla notation used in *Oscillation 1* is thus a hybrid notation that captures both Western and Eastern elements of the music. Specifically, the hybrid notation used captures the Western representations of both pitch and rhythm while retaining the traditional North Indian classical music *bols* (i.e., rhythmic figures, techniques, and patterns).

The tabla notation used is the same as, and directly borrowed from, the notation used by Evans in notating melodies for the tabla drum (right-hand drum).¹¹ *Oscillation 1*, however, uses multiple tunings not only for the tabla drum (right-hand drum) but also for the bayan (left-hand drum).

The hybrid notation used by Evans was thus ideal for this purpose, noting that the pitch of the tabla (right-hand drum) is notated on the upper *treble clef* and the pitch of the bayan (left-hand drum) is notated on the lower *bass clef*. An example of the notation is given in Figure 7.

¹¹ Evans, “Tabla without Borders.”

Figure 7: Hybrid notation example

Combined guitar and tabla score notation

The main score of *Oscillation 1* covers both guitar notation and tabla notation, including both Western and Eastern elements of the tabla (i.e., pitch, rhythm, and *bols*), as described. An example of the main combined guitar and tabla score notation of *Oscillation 1* is as follows:

Figure 8: Main combined guitar and tabla score notation of *Oscillation 1*

Graphic and formulaic “scores”/compositional representations

In addition to scoring/notating the guitar and tabla parts of the composition via the described Western, Eastern, and *hybrid* scoring systems, the composition is also represented graphically and formulaically. The purposes of such graphic and formulaic compositional representations are multiple and include the following:

- Graphic and formulaic representations capture the *global compositional form* or shape of the composition, both the entire composition and its constituent parts.
- Graphic and formulaic representations capture the *compositional processes* on which the global compositional form or “shape” of the composition is constructed.
- Graphic and formulaic representations may also reveal a *hidden logic or order* within the form of the composition.

In the current dissertation, graphic compositional representation facilitates the demonstration of linear and cyclic movements within the composition. This supports Secondary RP 2B, which states that *Oscillation 1* metaphorically contrasts Western and Eastern concepts of linear and cyclic time:

The submitted creative work *Oscillation 1*, in its harmonic organisation of alternating linear and cyclic modulation, is a metaphor for linear-oriented and cyclic-oriented representations of time in Western and Eastern philosophical and cultural paradigms.

These representations are addressed below, beginning with an introduction to the use of graphical figures as representations of elements of the composition.

Representation of global compositional form. Both graphic and formulaic representations of the composition can capture and clearly represent the *global compositional form* of the composition — that is, the overall compositional movement or shape. This concept is introduced here with examples from the perspective of graphic representations of the composition.

An example of such a graphic compositional representation is the graphic “symbol” for the composition *Oscillation 1*, displayed on the title page of this dissertation and captured in section *Relationship between theoretical and creative work*.

The relationship of exemplification

The artefacts exemplify the concepts of the theoretical work.

Major artefact

Oscillation 1 exemplifies the concept of RP 1A—the proposition that the experience of directional motion in music is representable as a “phenomenologically determined, hierarchically organised, multi-parameter, form-void vector field”. **Error! Reference source not found.** (in Appendix 7) provides a summary of the analysis of *Oscillation 1* in terms of the above proposition.

Additionally, *Oscillation 1* exemplifies the concept of RP 3A — the geometrical model of Western musical compositional form as *helix*. This is visually apparent when one examines the graphical representation of the global form of *Oscillation 1*, as demonstrated in **Error! Reference source not found.**

Minor artefact

The minor artefact, *Beginner’s Mind*, exemplifies the concept of RP 3B — the geometrical model of Eastern musical compositional form as *vortex*.

The relationship of metaphor

Oscillation 1 is also a *metaphor* for the theoretical concepts of the dissertation (Western linear and Eastern cyclic time) — specifically, in its linear and cyclic global form and harmonic structure. This concept is demonstrated graphically in **Error! Reference source not found.** Details of these compositional processes are also presented in Appendix 5.

As the following section demonstrates, this graphic representation is a combined representation of the primary cyclic and linear organisational forms of the guitar and tabla, respectively.

Representation of compositional process. Secondly, both graphic and formulaic representations of the composition can capture and clearly represent the *processes* by which *global compositional form* or overall compositional shape is achieved. Examples of this are apparent in the guitar part, both in graphic and formulaic representations.

Graphic representation of compositional process in the guitar part. Referring to Figure 9, which demonstrates the global form of the guitar part, it is apparent that the repeating cyclic structure labelled “guitar” is a global representation of the guitar part as comprising 36 cycles.

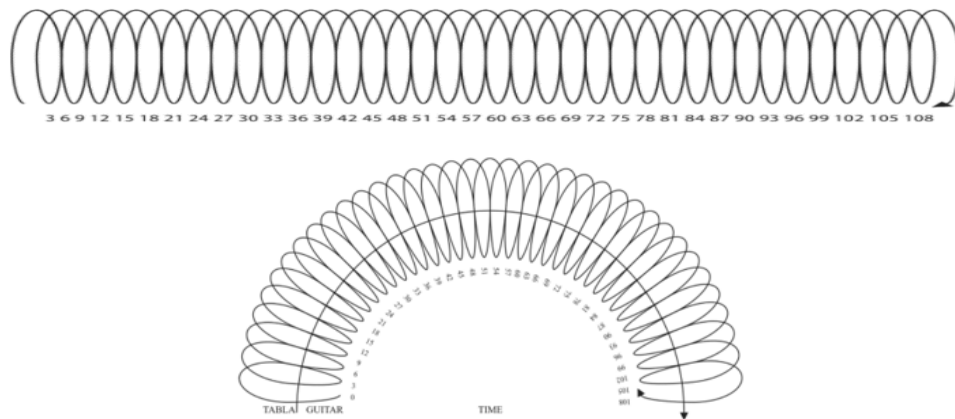


Figure 9: Top: Global form of the guitar part. Bottom: Representation of the global form of the whole composition as contrasting cyclic and linear global forms of guitar and tabla parts, respectively

Within this, and represented more granularly, the graphic representation of the guitar part as an equi-harmonic cycle demonstrates the harmonic movement that constitutes cyclic modulation within each equi-harmonic cycle. This is shown in Figure 10.

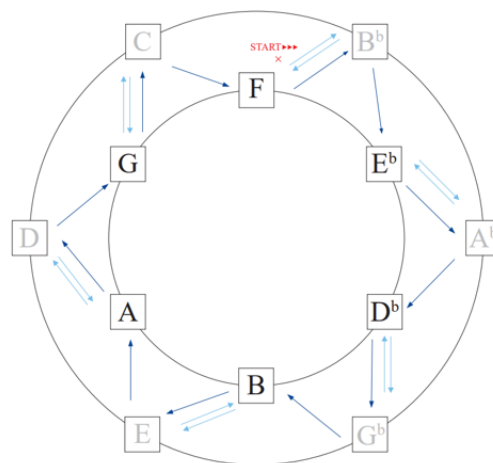


Figure 10: Equi-harmonic cycle

Graphic representation of compositional process in the tabla part. Within the composition, the tabla part is also “scored” in terms of graphic representation. The figures below thus demonstrate the concept of graphic compositional representation and apply it to the tabla part.

Figure 11 is a graphic representation of the tabla part for the parameter of global compositional form. At this level, the compositional shape of the tabla part as globally *linear* is apparent.¹²

¹² Linearity, as the concept is used in this context, is opposed to cyclicity. In characterising linear and cyclic movement, one may imagine the movements of a pendulum bob and two of its possible movement pathways, when viewed from above. It may move in a line (representable as movement in one dimension — backwards and forwards). This is linear motion. It is uni-dimensional, bi-directional movement. Alternatively, it may move in a circle (representable as movement within two dimensions) — around and around. This is cyclic motion. It is characterizable as two-dimensional, uni-directional movement.

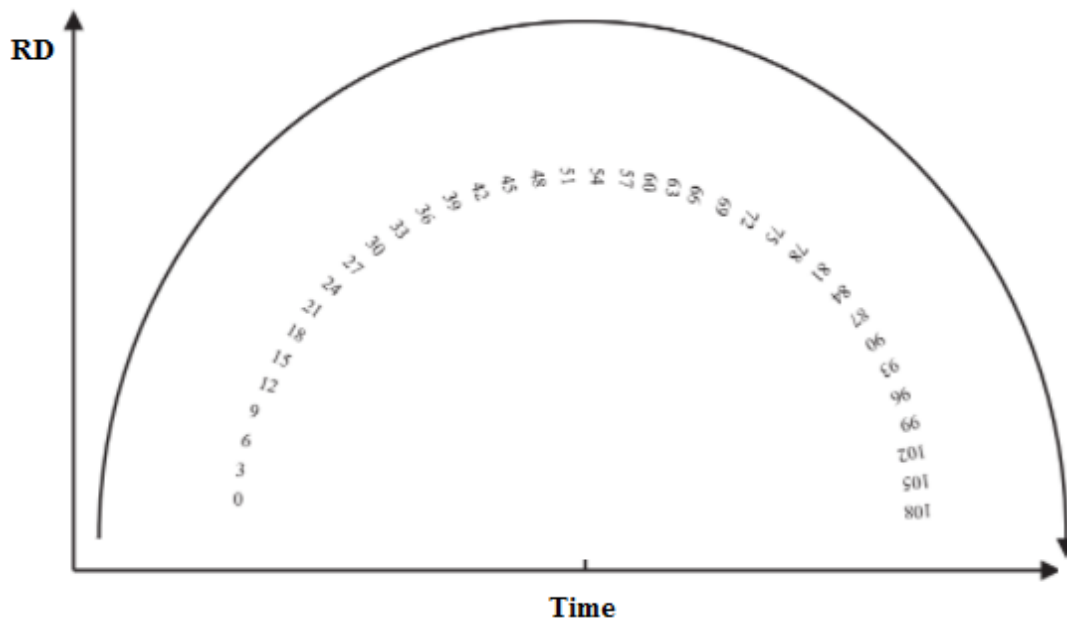


Figure 11: Tabla-rhythmic density RD

Figure 12 is another example of graphic representation of the composition. In contrast, however, to Figure 11's representation of the global form of rhythmic density, Figure 59 is a representation of the global form of the composition in terms of its three improvisation parameters — *key*, *CDP* (compositional development parameter) and *RD* (rhythmic density).

Because each AB-section has a unique specification regarding the level required of the three parameters (6 levels of key x 6 levels of CDP x 6 levels of RD = 216 uniquely specified recordings), Figure 12 is an alternative graphic representation of the tabla part.¹³

¹³ Figure 12 elaborates on this concept using the same figure to demonstrate the contrasting sequences in which the 216 x 15-second tabla recordings were *assembled* (i.e., mixed), as opposed to recorded.

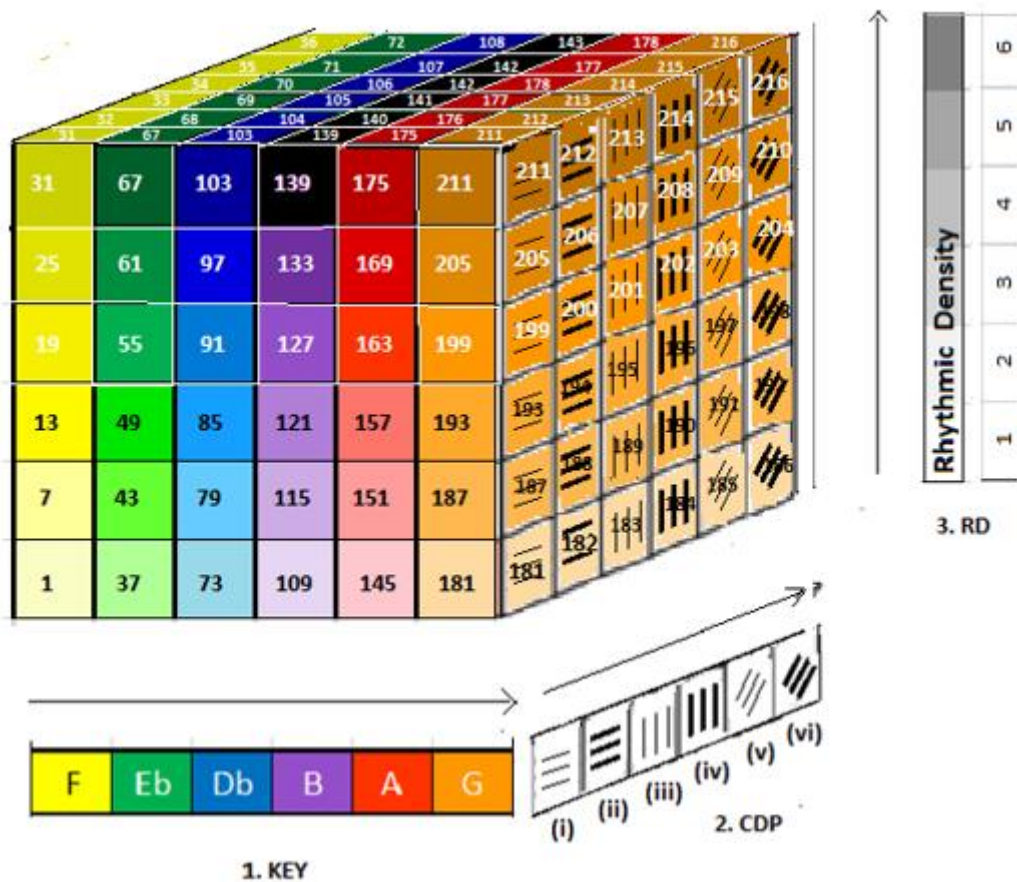


Figure 12: Alternative graphical representation of tabla part

Linear and cyclic movements as metaphors for Western and Eastern concepts of time

By applying the graphic compositional representations provided in Chapter 1 to the use of graphical scoring/notation as it applies to the method of *Oscillation 1*, it becomes apparent that the composition has graphic forms that are linear and cyclic, consistent with Secondary RP 2B.

In addition to graphic compositional representations, the method of the composition also uses formulaic representations of the composition. These are concise representations of the algorithmic processes on which the compositional process is formulated. Like graphic formulaic representations, such formulaic approaches to compositional representation are useful for demonstrating both global organisational form and the processes from which such forms originate.

Formulaic compositional representation, to the extent that it describes the method of *Oscillation 1*, is summarised as follows. It is also further elaborated on in Appendix 6.

- **Formulaic representation as it applies to the guitar part.** In *Oscillation 1*, the algorithm that determines the harmonic movement of the guitar part may be represented formulaically. Such a formula determines the process of modulation within the equi-harmonic cycle. As a result, the formulaic representations specify the rules of modulation on which the harmonic movement within the equi-harmonic cycle is predicated. This formulaic representation of compositional process as it applies to the guitar part of *Oscillation*, as an equi-harmonic composition, is further described in Appendix 6.

- **Formulaic representation as it applies to the tabla part.** The tabla parameters are key, CDP, and RD.
 - **Key.** Like the guitar part, whose formulaic representation determines the keys in which the A-section and B-section are to be played, the formulaic representation of the tabla part of *Oscillation 1* also determines the key in which the tabla is to be played. Thus, the same formula that determines cyclic modulation in the guitar part equally applies to the tabla part. In the guitar part, the key specified by the formula applies to the playing of the A-section and B-section. In the tabla part, however, the key specified by the formula determines the bayan and tabla paired tuning (see Table 1 above), which permits the tabla to play in the specified key.
 - **CPD.** Compositional development parameter — CDP governs the musical parameter, melodic or rhythmic, on which the tabla part is improvised. Essentially, it is an instruction for the tabla to either *outline the metre* of the bar to varying degrees or to play (also in varying degrees) *in accordance with the rhythmic structure of the melody* or to *improvise freely and rhythmically* over the 15-second AB-section. The details of how the formulaic compositional representation of the tabla part determines rhythmic and melodic approaches to improvisation as particular values of CPD are provided in section 8 (*Operationalisation of philosophical concepts to the compositional process*) and section 9 (*Specifics of the compositional process — tabla*).
 - **RD.** Rhythmic density is the third tabla parameter whose values are determined by a formula. In the context of *Oscillation 1*, which metaphorically contrasts Western and Eastern concepts of linear and cyclic time, RD is an important parameter of the tabla part. The reason for this is that RD is the parameter by which linear movement is metaphorically represented in the composition. It does this via the composition’s formulaic nature and algorithmically determined *incremental progressive increases in RD* to the midpoint of the composition (54 minutes) and thereafter *incremental progressive decreases in RD*. Furthermore, RD is particularly important as an improvisational parameter in *Oscillation 1* because it functions as an example of *intensification* — as opposed to vectorial development — a concept that accords with Clayton’s description of the mechanism by which Eastern (i.e., North Indian) classical music develops.¹⁴

The compositional process that permits formulaic representation of the tabla part of *Oscillation 1* is as per Figure 13.¹⁵ These concepts are discussed in further detail in sections 8 and 9 and again in Chapter 3, in the discussion of the composition from the perspective of minimalism.

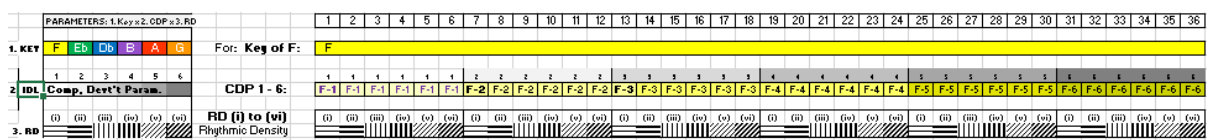


Figure 13: Compositional process that permits formulaic representation of the tabla part

¹⁴ Clayton, *Time in Indian Music*, 25.

¹⁵ Figure 13 applies to the recording for bayan and tabla paired within the F tuning, which is the same formulaic representation for the other five keys.

In *Oscillation 1*, formulaic representation thus plays an important part. Like graphic representation, it provides a concise representation of the global form or shape of the composition, as well as a mechanism for understanding the process by which such global form or shape is achieved.

In the case of the guitar part, formulaic representation is represented numerically, determining the key, the details of which are discussed in section 8 below and Chapter 3 (Discussion).

Artefact RPs

Finally, at the conceptual level, graphical representation is used for the presentation of the artefact RPs 4A and 4B, incorporating Western and Eastern contrasting concepts of time — as reiterated below:

- **RP 4A.** The dissertation presents the model of the helix as a geometric model incorporating the Western compositional concepts of vectoriality, linearity, and horizontality of time.
- **RP 4B.** The dissertation presents the model of the vortex as a geometric model incorporating the Eastern compositional concepts of intensification, cyclicity, and verticality of time.

Unlike, however, the graphical representations thus far discussed — the contrasting representations of musical form as *helix* and *vortex* — are not representations of the global form of *Oscillation 1*, nor for that matter of any composition. Rather, the musical forms of helix and vortex represent the global forms of Western and Eastern music, *in general*, based upon their contrasting representations of time, in accordance with the theoretical positions presented in the Introduction, in particular Secondary RP 2A, reiterated below:

- **RP 2A.** Western and Eastern musical forms can be considered metaphors for the philosophical and cultural paradigms in which they originate, and specifically, for contrasting Western and Eastern representations of time.

Summary of preliminary considerations

In the overview of the method section presented thus far, I have deliberately tried to keep separate the distinct parts of the process by which the composition was created and recorded. In accordance with this principle, I now introduce the preliminary considerations that had to be considered before starting the actual composition of the submitted creative work, *Oscillation 1*.

The two major preliminary considerations were: (i) the design and construction of the modified instruments, and (ii) the *formats* in which the composition was to be recorded and presented. The first has been described in the preceding sections. The second is described below.

Formats

For *Oscillation 1*, the major formats were decided as *sound recording* (music recording) and *written recording* (a score/notation in a suitable Eastern or Western, or hybrid notation format). In addition to these formats, the composition is presented in the form of a *music video*, which has two formats — the full 108-minute (less introduction and coda) version and an abridged 54-minute (plus credits and 2-minute fade out) version. The latter, as previously noted, is designed to be viewed and listened to within a one-hour time slot. This abridged version is suggested as a suitable *first introduction* to the artefact because, as a combined visual and sonic experience within a shorter time format, it is the most accessible of the various formats.¹⁶

¹⁶ Importantly, although the video accompanies the music (and itself is a metaphor for the concepts of the dissertation *applied to video*), from the perspective of assessment of the dissertation, the video is not presented as assessable in its

In addition to deliberately keeping the composition process *a creative process*, irrespective of its preceding conditions (instrument design and creation, establishment of media for recording, and notation), the process of the composition's *recording and production* has also been separated from section 8 below (*Operationalisation of philosophical concepts to the compositional process*).

It is worthy of comment that formulaic processes were used in the method not only in the composition of the submitted creative work itself but also in the recording and mixing process. It was a precise method for recording sections of the composition in an order that was pragmatic and indeed possible, based upon the ergonomics of playing 12 drums.

As previously mentioned, the recording process involved recording all parts for each bayan and tabla tuning pair as a batch and to continue this process until all recordings had been made for each of the paired tunings. This permitted the 12-key composition to be recorded. Afterwards, by formulaically *re-positioning* the recorded sections (without enhancement or correction) in their appropriate section within the compositional grid, the composition was *assembled* in accordance with the specifications and formula discussed in the previous section.

This process of *re-positioning* of recorded sections applied to the tabla part only. (The guitar part was recorded in real time, without repositioning, albeit with some recording breaks due to the length of the composition.) For this reason, having presented the formulaic representation of the tabla part (Figure 13) *as it applied to the method of composition*, it is appropriate now to present the formulaic representation of the recording of the tabla part as it *applied to the method of recording and production*. The mixing and recording algorithms are thus presented next.

7. Concept of formulaic recording and mixing formula

Each of the 216 squares of the grid represents a 15-second AB-section played by the tabla.¹⁷

Recording formula

As shown in Figure 14, each of the 15-second recordings (represented as a cell on the grid with a number from 1 to 216) represents a 15-second recording of the tabla over one AB-section, improvising in accordance with three parameters: key, CDP, and RD. Each of these three parameters has a value of 1 to 6 and thus each of the 216 x 15-second improvisations represents a unique and non-repeated combination of key, CDP, and RD.

own right — rather it is presented as a *visual accompaniment* to the music, which, in certain contexts, supports, with visual media, the listening experience of the composition.

¹⁷ The 216 x 15-second recordings make up 54 minutes of music. This comprises the first 54-minute development section of the composition. As is further described later in this chapter, the *resolution* section was constructed by assembling these 216 x 15-second recordings in reverse order. The reverse order recordings were, however, not a reverse order recording of the 216 sections *per se*, but rather a reverse order assembly of the recordings grouped in 12s. The reason for this was that 12 of the 15-second recordings constituted one three-minute equi-harmonic cycle. Thus, it was the order of equi-harmonic cycles (rather than the order of the 15-second recordings) that comprised the remaining 54-minute resolution section of the composition. This method kept each of the equi-harmonic cycle recordings generated by the recording and mixing process intact. Thus, the resolution section of *Oscillation 1* is the reverse order assembly, not of the single recordings themselves but of *the first 18 equi-harmonic cycles* that comprise the first 54-minute developmental section. In contrast, the guitar part was played in real time for the duration of the 108-minute recording.

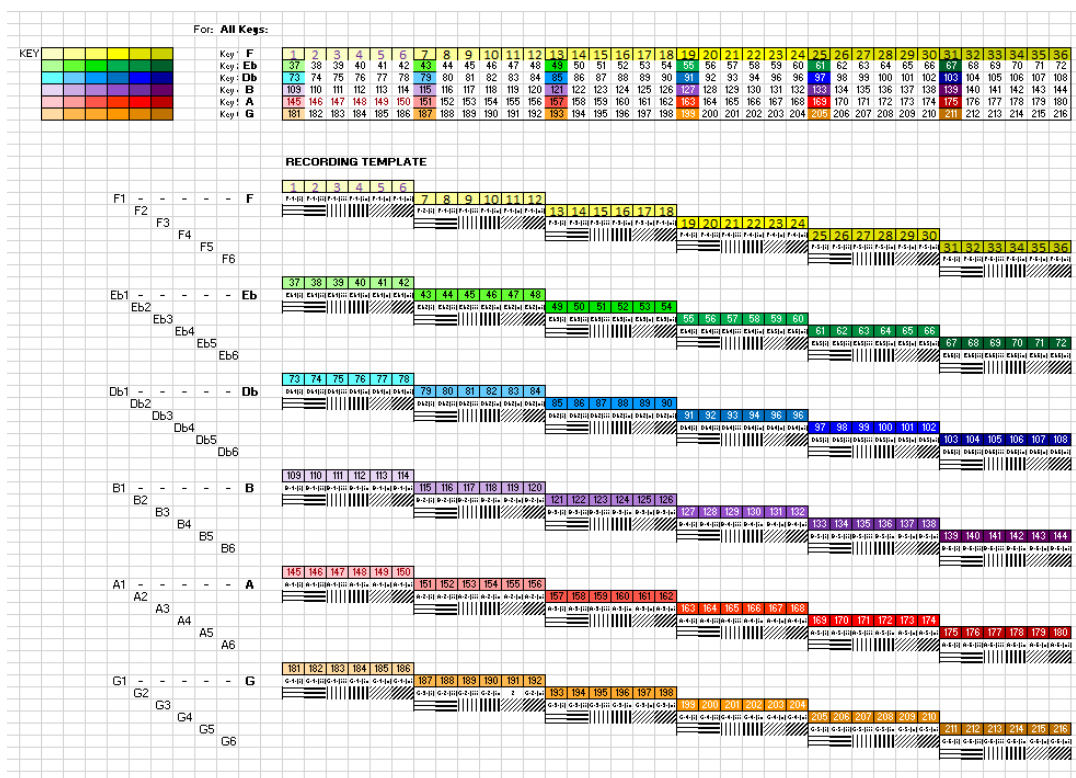


Figure 14: Recording template

- For the parameter of key, the values are F, E^b, D^b, B, A, G.
- For the parameter of compositional development parameter (CDP), the values are as below:
 - Rhythmic outlining of the primary 24-beat metre as a 10-10-4 beat
 - Rhythmic outlining of the secondary 24-beat metre as a 3-3-4-3-3-4-4 beat
 - Rhythmic improvisation based upon the melodic phrasing of the AB-sections — simple
 - Rhythmic improvisation based upon the melodic phrasing of the AB-sections — extended
 - Rhythmic soloing over 24-beat sections (A-section and B-section separately)
 - Rhythmic soloing over 48-beat sections (combined AB-sections)
- For the parameter of rhythmic density (RD), the values are 1, 2, 3, 4, 5, 6, where 1 is rhythmically the least dense and 6 is rhythmically the most dense.

Thus, 216 unique and musically distinct 15-second AB-AB¹⁸ sections were recorded in sequence from 1 to 216, each 15-second improvisation having a unique key-CDP-RD improvisation instruction combination, in accordance with the *recording template*, as follows.

The 216 recordings were rearranged in the order shown in Figure 15. This process produced 18 unique and incrementally progressive (regarding RD) three-minute equi-harmonic cycles, each cycle

¹⁸ The 15-second AB-sections for the tabla reference key but not specific notes. Thus, the term AB-AB section has different specific meanings for the tabla and guitar parts. For the guitar part, the AB-AB section is a melodic sequence. For the tabla part, the AB-AB section is an improvisation on the tabla and bayan drums, tuned to the tunings of a specific key, in accordance with compositional stipulations for the parameters of CDP and RD. The term AB-AB section used in this context also includes the AB-A'B' sections referenced in the previous section — i.e., sections where there is cyclic modulation as opposed to linear modulation.

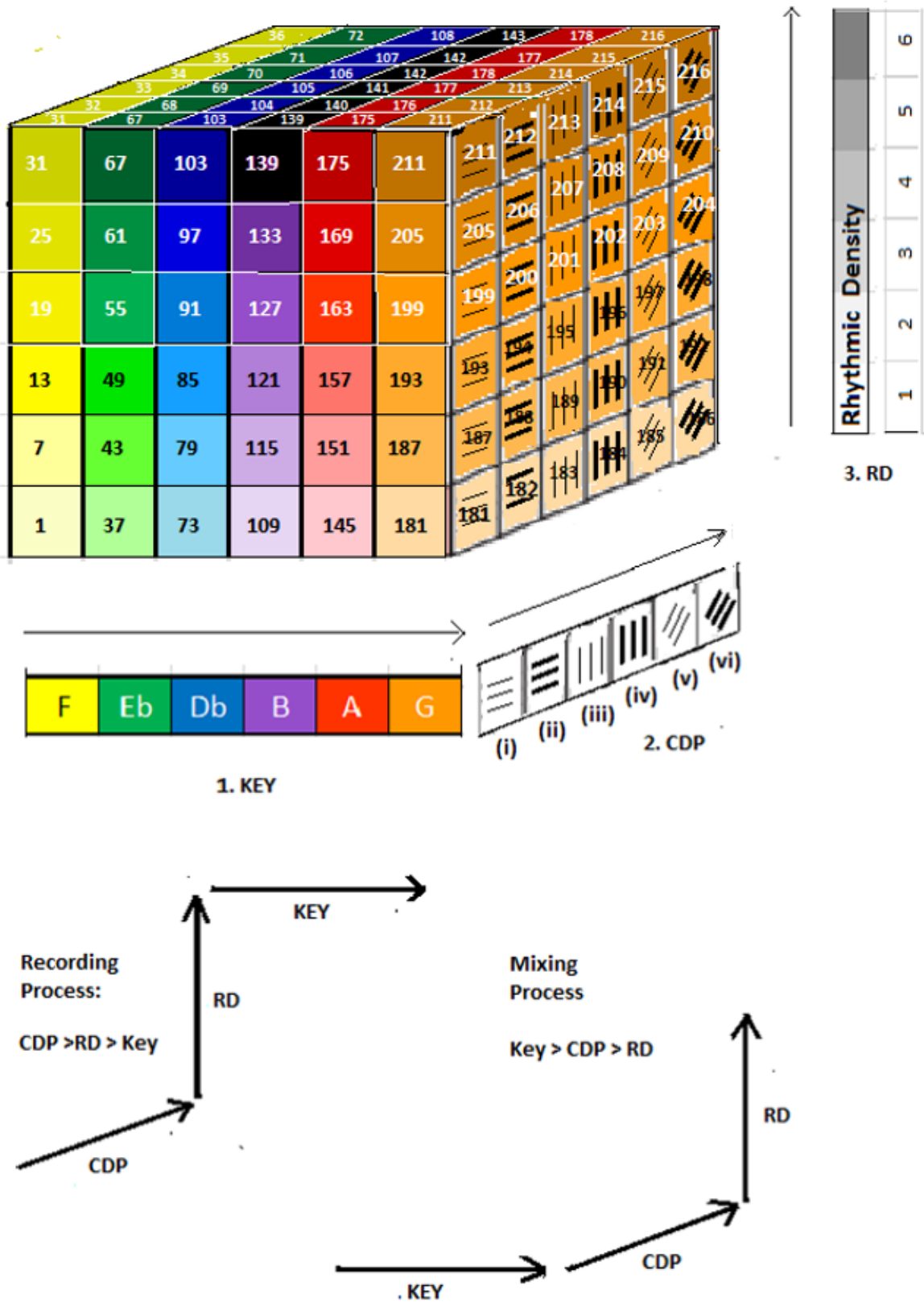


Figure 16: Combined mixing/assembly and recording template — development phase — 3D representation

Orders of parameter changes in recording and mixing/assembly of AB-sections

The recording and mixing/assembly phase of the tabla part are described in detail in section 9 below, including with explanatory diagrams. A summary of the process follows.

In the recording phase, the order of moving through the parameters is thus *CDP, then RD, then key*. This order facilitates the continuity of the same key (F) for 36 x 15-second recordings — *all in the same key* (F). At this point, a new drum tuning was established (E^b). The process then continued through all keys: F, E^b, D^b, B, A G.

The first recording sequence — all in the key of F — thus comprises blocks 1 2 3 4 5 6 7 8 9 10 11 and 12 in this order, each of these a unique 15-second recording. Continuing this systematic process, 216 x 15-second recordings of tabla improvisation, each recording being defined by a unique combination of key, CDP, and RD, were produced.

In contrast to this, in the *mixing/assembly* phase, the order of moving through the parameters is *key, then CDP, then RD*. This order of assembly facilitates the generation of equi-harmonic cycles every 12 x 15-second recording. The first mixing/assembly sequence thus comprises blocks 1 2 37 38 73 74 109 110 145 146 181 and 182, in order. This produces the first equi-harmonic cycle. During this time, the key changes every 7.5 seconds, RD remains at level 1, and CDP exhausts its first two values (levels 1 and 2 of its six levels).¹⁹

This process then repeats twice for another two equi-harmonic cycles. During these cycles, the key continues to change every 7.5 seconds, CDP cycles through levels 3 and 4, and then levels 5 and 6, producing the next two equi-harmonic cycles. At this point, nine minutes of the composition have been assembled and all RD = level 1 options have been exhausted. The assembly process repeats using RD = level 2 improvisations. Another nine minutes of composition have been assembled.

This process is further repeated for the remaining levels of RD 3, 4, 5, and 6, producing 54 minutes of music, which comprises the full *development* arc of the composition.

The order of three-minute equi-harmonic cycles is then reversed, comprising the 54 minutes of the resolution arc.

Importantly, by establishing RD as the last of the three parameters to change, the process prioritises the slow, incremental progression of RD such that RD peaks at 54 minutes and then, in mirror-image fashion, progressively and incrementally resolves.

This process is consistent with Clayton's concept of *intensification*.²⁰

¹⁹ Because the AB-section itself involves a key change — the B-section is in the subdominant key of the A-section, the assembling of six ABAB-sections in the keys of F, E^b, D^b, B, A and G is actually the assembly of six ABAB-sections in the keys of: F [A-section], B^b [B-section], E^b [A-section], A^b [B-section], D^b [A-section], F[#] [B-section], B [A-section] E [B-section], A [A-section], D [B-section], G [A-section], and C [B-section] — thus producing an equi-harmonic cycle.

Because the AB-section repeats to form a 30-second ABAB segment, the first ABA movement is a *linear* oscillation, returning to the original key.

In contrast to this the second ABA-section is an ABA' movement — a *cyclic* modulation from A to B to A' section where A' represents a new key.

The overall effect of this alternating linear and cyclic modulation is that the key changes from F to B^b to E^b in the first 30 seconds and continues this cycling process, thus traversing all 12 keys per three-minute equi-harmonic cycle.

The method of this process is presented under "Linear and cyclic movement within inter-AB sectional harmonic movement" and in Figures 33 and 34.

²⁰ Clayton, *Time in Indian Music*, 25.

8. Operationalisation of philosophical concepts to the compositional process

Oscillation 1 — overview of metaphorical representations. Though more typically applied to the domain of the social sciences, the concept of operationalisation as “turning abstract concepts into measurable observations” applies also to musical composition.²¹ Such a process is particularly appropriate in a dissertation such as this, which seeks to represent abstract concepts in a tangible form manifestable as audible music.

This section of the method thus describes the process of operationalisation by which the abstract concepts of the dissertation are made representable within the submitted creative work. In that regard, this section describes the following specific operationalisations, each of which is an abstract concept metaphorically represented within the composition by a musical device.

These tangible representations of abstract concepts as they apply to the composition are as follows:

- | | |
|--|--|
| Sound and silence as metaphorical for the concept of form and void | 1. The <i>absolute</i> representation of void and form states as <i>silence</i> and <i>sound</i> |
| | 2. The <i>relative</i> representation of void and form states as <i>harmonic home state (home key)</i> and <i>harmonic away state</i> (modulation to subdominant key) |
| Linear and cyclic harmonic modulation movements metaphorical for the concept of Western linear and Eastern cyclic time | 3. <i>Linear ABA modulation</i> , metaphorical for the Western concept of linear time (e.g., through key centres of F-B ^b -F) |
| | 4. <i>Cyclic ABA' modulation</i> metaphorical for the Eastern concept of cyclic time (e.g., through key centres of F-B ^b -E ^b) |
| | 5. <i>Equi-harmonic cyclic resolution</i> metaphorical for the Eastern concept of cyclic time (through key centres of F-B ^b -E ^b -A ^b -D ^b -F [#] -B-E-A-D-G-C-F) |
| Linear and cyclic global forms metaphorical for the concept of Western linear and Eastern cyclic time | 6. Tabla global form (regarding RD) as linear metaphorical for the Western concept of linear time. |
| | 7. Guitar global form as cyclic (regarding repetitions of equi-harmonic cycle) metaphorical for the Eastern concept of cyclic time. |

Sound and silence as metaphorical for the concept of form and void

The first two of these operationalisations — the *absolute* representation of void and form states as *silence* and *sound* and the *relative* representation of void and form states as *harmonic home state* (home key) and *harmonic away state* (modulation to subdominant key) are static representations.

The absolute representation of void and form states as silence and sound

Unlike the guitar part, which, in its role as a harmonic tanpura has effectively *no variation*, the tabla part incrementally and progressively increases from the void-variant state to the form-variant state and then incrementally and progressively returns from the form-variant state to the void-variant state.²²

²¹ An explanation of operationalization can be found here: https://www.google.com/search?q=operationalization&rlz=1C1CHBD_en-GBAU852AU852&oq=operationalization&aqs=chrome..69157j019.3321j1j15&sourceid=chrome&ie=UTF-8

²² The concept of form variant and void variant states is further addressed under “Minimalism” in Chapter 3 (Discussion).

The former occurs for the first 54 minutes of the composition, which is the *development arc* of the oscillation, and the latter occurs for the second 54 minutes of the composition, which is the *resolution arc* of the oscillation. Thus, the tabla part transitions from a void-variant state (silence) to a form-variant state (maximum RD of sound) and back to a void-variant state.

This oscillation movement is graphically represented below:

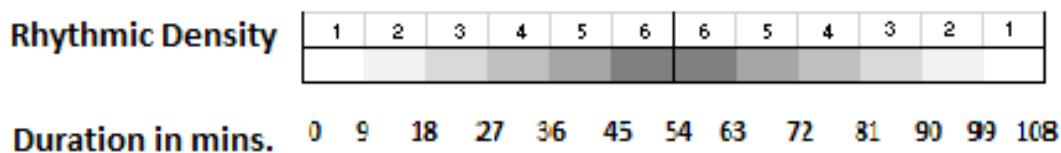


Figure 17: Increasing and decreasing RD

Referring to the concepts of absolute and relative form and void, as introduced in Chapter 1, the representation of void and form states as silence and sound is absolute because it directly refers to sound and silence as activity (form) and non-activity (void).

Thus, such a representation of form and void is not specifically related to context.

The relative representation of void and form states as home key and away key (subdominant key)

Void and form are also represented within the compositions, not as sound and silence, but metaphorically as *home* and *away* states within a changing (modulating) harmonic framework.

In this representation, void is represented not as silence but as the home key of a harmonic movement. Such a representation is a relative representation of form and void — key centres thus function as form and void relative to the harmonic context, the key centre of which changes every 7.5 seconds.

Correspondingly, form is represented not as sound but as the form of a modulation to a new key. In the case of *Oscillation 1*, this new key is the subdominant key.

The home key represents void because it is the default state. Referring again to Chapter 1, form and void in this representation are characterised not as sound and silence but as *context-specific significant change* or *context-specific salience*. In this characterisation of form, form occurs when *something unexpected happens*. If one is not expecting modulation and it occurs (a subjective and individual phenomenologically determined expectation, depending on one's familiarity with the music), then one experiences form. Such form is relative form because it depends on the context.

Not only is it context-dependent upon the listener and his/her expectations of what will occur in the music, it is also context-dependent within the harmonic framework itself. Thus, it is not the key of B^b itself that contains the musical form — rather it is the key of B^b *in the context of having previously been in the key of F*.

Linear ABA modulation, metaphorical for the Western concept of linear time, and cyclic ABA' modulation metaphorical for the Eastern concept of cyclic time.

The harmonic structure of *Oscillation 1's* equi-harmonic cycle thus comprises a repeating pattern of alternating linear and cyclic modulations between AB-sections. These *inter-AB* linear and cyclic harmonic modulation movements were graphically represented earlier in Figure 10 (the equi-harmonic cycle) where the thinner lines represent linear modulation, and the thicker lines represent cyclic modulation.

Such linear and cyclic modulation movements are not only movements between the *key centres* that precede and follow a harmonic modulation but also movements between phenomenological representation of polar states — representable as the mutually exclusive states of (in the home-away couplet) *home* and *away* or (in the form-void couplet) *void* and *form*.

Thus, in *Oscillation 1*, within each AB-section, the harmonic dispositions of the original key centre (A-section) and the modulated key centre (B-section) are musical devices functioning as metaphorical operationalisations of the phenomenological attributions of home and away (and void and form) states.

Such movement trajectories are either linear or cyclic.

As an example of this, the *linear* ABA modulation evident in the first 15 bars of the composition — represented as a movement from the key F [at Bar 1] to the key of B^b [at Bar 8] and (consistent with *linear* modulation) *back to the same home key* of F [Bar 15], phenomenologically represented, is a movement from home to away and *back to* home again.

In comparison to this, the *cyclic* ABA' modulation evident in bars 15 to 29 of the composition — represented as a movement from the key of F [Bar 1] to the key of B^b [Bar 8] and then (consistent with *cyclic* modulation) *onward to a new home key of E^b* [Bar 15 — the new A'], phenomenologically represented, is a movement from home to away and then (rather than *back to*) *onward to a new home*.

Thus, to permit continuous progressive cyclic movement within an equi-harmonic framework, harmonic centres must change function from away status to new home status. In the example above, B^b functions as such a key centre, *pivoting* from the status of away key in the linear modulation, which occurs between bars 1 and 15, to the status of new home key, as part of the cyclic ABA' modulation, which occurs between bars 15 and 29. In addition to this, the home-away-home movement is apparent at a higher hierarchical level, via the resolution of the equi-harmonic cycle back to the key from where it commenced.

In addition to the described ABA' inter-AB cyclic movement, which takes place over 14 bars (7-bar A-section plus 7-bar B-section) within *Oscillation 1*, another cyclic movement is occurring at a higher hierarchical level every 168 bars within the composition.

This cyclic movement is the equi-harmonic cycle returning to the same place from where it began 168 bars ago, having traversed the 12 major key centres with equal harmonic distribution — a process that takes three minutes to complete.

Otherwise expressed, every 168 bars, the equi-harmonic cycle returns to the point where it started.

This movement is also a movement from home to away and back again to the home state. Like all cyclic movements, it is conceptually representable as a *uni-directional, two-dimensional movement*.

In summary, the equi-harmonic cycle comprises the following home-away-home (or void-form-void) movements:

- Linear ABA movement
- Cyclic ABA' movement (where A' functions both as the old “away” key and the new “home” key)
- Cyclic movement at a second hierarchical order, resolving after 12 cyclic modulations, by returning to the “home” key from where it commenced, once every 3-minute equi-harmonic cycle.

The movements between home and away states (functioning as void and form states) within the equi-harmonic cycle are detailed in Figure 65 below. Appendix 7 also provides details about this concept.

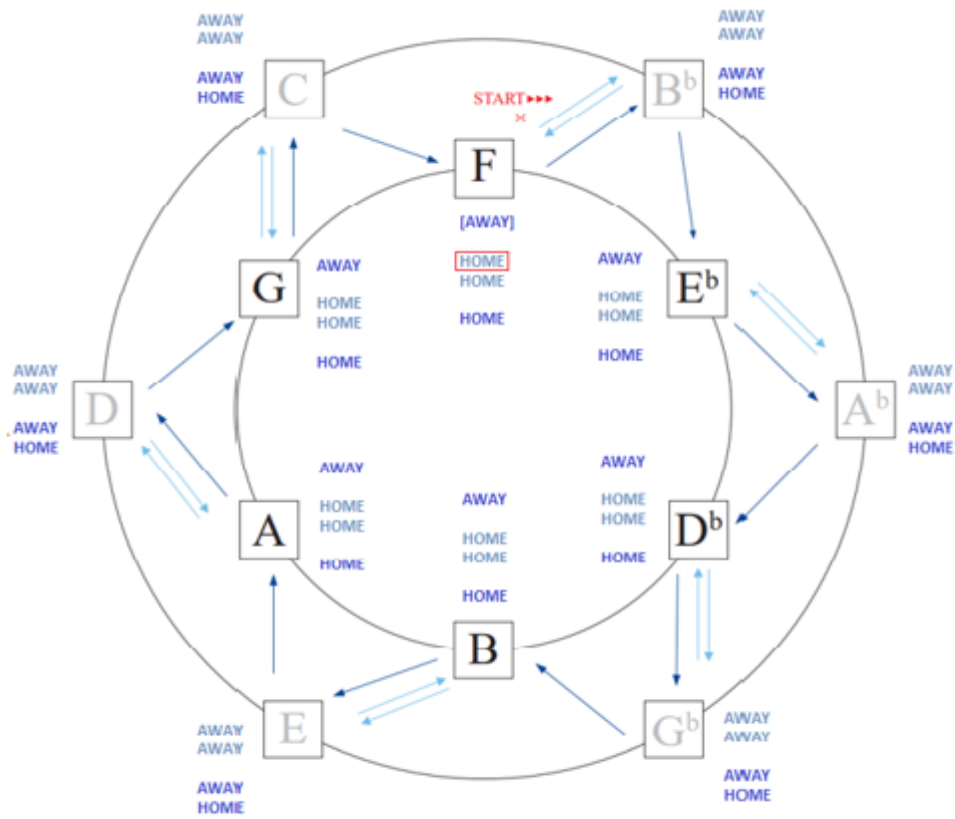


Figure 18: Home-away movement in the equi-harmonic cycle

Linear and cyclic global forms metaphorical for the concept of Western linear and Eastern cyclic time

In addition to being a metaphor for the concept of Western linear time and Eastern cyclic time, via its harmonic organisation, the composition is a metaphor for this concept in its global form — particularly in the contrasting global forms of the instrument parts.

In summary, the global form of the tabla is linear. Such a representation focuses on the progressive incremental increase and decrease in rhythmic density, which defines the overall global form of the tabla part. Thus, the tabla part comprises a single linear development and resolution.

In contrast to this, the global form of the guitar part is cyclic. Specifically, it comprises 36 cycles of the equi-harmonic cycle — the equi-harmonic cycle itself also being a cyclic structure.

The global forms of the tabla and guitar parts as primarily linear and cyclic (respectively) are graphically represented in Figure 2.

Relationship of operationalisation of concepts to exegesis research propositions

Secondary RP 2B (Exegesis) makes the following proposition:

The submitted creative work *Oscillation 1*, because of its harmonic organisation and global form, is a metaphor for the linear and cyclic representations of time in Western and Eastern paradigms.

Regarding the compositional process of *Oscillation 1* as it relates to the theoretical concepts of the dissertation, the following is a summary of the artefact's specific compositional processes as they relate to Secondary RP 2B:

- The representations of linear movement within *Oscillation 1* — in the form of linear inter-AB modulation movements within the harmonic cycle and the linear global form of the tabla part — is metaphorical for the Western concept of linear time.
- The representations of cyclic movement within *Oscillation 1* — in the form of cyclic inter-AB modulation movements within the harmonic cycle, the cyclic form of the equi-harmonic cycle's resolution, and the cyclic global form of the guitar part — are metaphorical for the Eastern concept of cyclic time.

Instrument parts

Guitar part

Background. The guitar part was introduced in section 5 above (*Overview of the composition*). The four functions of the guitar part are:

- The guitar establishes the melodic content of the composition via the repetitive playing of A (call) and B (response) melodic fragments.
- The guitar establishes the composition's implicit harmonic movement via the playing of a systematically modulating sequence of notes to outline a dynamic cycle of moving harmonic centres.
- In its repetition of the equi-harmonic cycle, the guitar functions as a *harmonic tanpura* (i.e., as a drone), repeatedly playing the 168 bars of the equi-harmonic cycle, against which the (non-repetitive) tabla solos over, during its progressive development and resolution of intensification.
- The guitar in its global form functions as the metaphorical representation of cyclicity as it relates to the Eastern concept of cyclic time.

The current section expands the description of the guitar part as it relates to the composition, especially as it relates to Secondary RP 2A, which proposes that *Oscillation 1* is a metaphor for contrasting Western and Eastern concepts of linear and cyclic time. The previous section has listed the proposed ways in which *Oscillation 1* symbolises such concepts.

At the centre of this metaphorical representation is the equi-harmonic cycle. (**Error! Reference source not found.** is a tabulated summary of the equi-harmonic cycle as an organisation of hierarchically organised, multi-parameter form-void vectors.)

An analysis of the guitar part, referenced to the compositional device of the equi-harmonic cycle, now follows.

Equi-harmonic cycle. The equi-harmonic cycle is a fundamental unit of the guitar part. The compositional method of the equi-harmonic cycle in achieving the roles of guitar is described below.

- The first step was the establishment of the *melodic content* of the composition and the role of this melodic content to create repetitive playing of A (call) and B (response) melodic fragments. This is evident in the A and B melodies described in section 5.

- The second step was the establishment of the composition's implicit *harmonic movement*, which is evident in the sections that follow — specifically, in the analysis of the harmonic movement as being either linear or cyclic.
- The third step was the role of guitar as harmonic tanpura. In *Oscillation 1*, the guitar functions as *harmonic tanpura* via the playing of a repeating-note sequence, which constitutes the equi-harmonic cycle. In this way, the guitar's repeated (36 times) playing of the equi-harmonic cycle functions as *musical void*, akin to a blank canvas or an empty frame. The guitar role is thus limited to defining the harmonic movement, providing what is effectively an empty space against which the tabla can improvise.

Typically, the musical content of the traditional tanpura is the repetition of a four-note sequence, generally a combination of Sa (first degree of the scale) and Pa (fifth degree of the scale). This four-note repeating-note sequence defines a *static tonal centre*.

In contrast to this, rather than comprising a four-note sequence, the repeating musical sequence in *Oscillation 1* is a 456-note sequence. This sequence, lasting 168 bars and three minutes, is the equi-harmonic cycle. In this way, the equi-harmonic cycle, as the guitar's primary musical content, defines a *dynamic harmonic centre* rather than a *static tonal centre*. Furthermore, the note content of the equi-harmonic cycle is such that the harmonic content of the cycle is distributed equally across all 12 keys.

Guitar part — metric, rhythmic, melodic, harmonic, modulatory and equi-harmonic structure.

In examining the metric, rhythmic, melodic, harmonic, modulatory, and equi-harmonic structure of the guitar part, several points may be made. These explicitly reference the A-section and B-section, which comprise the notes of the guitar section. An example of such an A-section and B-section is given in the figure below, being the first 14 bars of the composition.



Figure 19: First 14 bars of the composition

From the example, the following is notable:

- **Metric analysis.** A-section and B-section have the same 24-beat structure comprising 3 + 3 + 4 + 3 + 3 + 4 + 4 groupings.
- **Rhythmic analysis or rhythmic mirroring.** Sections A and B are rhythmically identical. In other words, the rhythms of the phrases of the A-section are identical to the rhythms of the phrases of the B-section. Sections A and B are thus related by a process of rhythmic mirroring.
- **Phrasing within sections A and B.** Being rhythmic mirrors of one another, sections A and B share phrasing characteristics. Based on the positioning of rests or extended (longer than a crotchet) notes, the phrasing of each section comprises three phrases.

Referencing the A-section from bars 1 to 7, the three phrases are as follows:

A-section



PHRASE 1



PHRASE 2



PHRASE 3

B-section



PHRASE 1



PHRASE 2



PHRASE 3

Figure 20: Phrases

What becomes apparent when analysing these phrases in context is that the rest lengths from phrase 1 to phrase 2 to phrase 3 increase. Specifically, the rest lengths (or final note value) increase from one to two to three beats. The effect of this lengthening of rest time is that the major rhythmic punctuation points occur at the end of the section, conceptually defining sections A and B and thus allowing the effect of call and response.

- **Melodic analysis.** *Melodically*, sections A and B, as previously noted, relate to one another in a relationship of call and response. The establishment of this call-and-response relationship is achieved through two compositional mechanisms. The first is *rhythmic mirroring*, described above. The second is *melodic and harmonic variation*. It is apparent from this example that the melodic shape of the B-section is different from that of the A-section, and such variation functions as call and response. From the first 14 bars of the composition, melodic variation occurs on the ninth note of the first phrase of the B-section. This is demonstrated in the following example, where the arrow at beat 9 indicates the change to the melodic shape of the phrase.



Figure 21: Melodic shape of the phrase

At this point, in contrast to the A-section where the shape “falls” from the F to the D, in the B-section, the shape “rises” from the B to the C. The harmonic movement that occurs in the guitar part of *Oscillation 1* is a metaphorical representation of Western linear and Eastern cyclic time. It is discussed in depth in the sections that follow.

In the context of the compositional techniques used to establish the relationship between the A-section and the B-section as one of “call and response”, it is sufficient to note that the melody in the B-section occurs within a harmonic context where the B-section is in the subdominant key to the A-section. Thus, in the first 14 bars, as referenced, the B-section is in the key of B^b while the A-section is in the key of F.

- **Harmonic movement and modulations (harmonic analysis).** In *Oscillation 1*, the harmonic movement of the guitar part is defined by two processes. The first is the *intra*-(AB) sectional harmonic movement — that is, the harmonic movement from bar to bar *within* each 14-bar AB-section.

The second is *inter*-AB movement, the harmonic movement that occurs *between* AB-sections. Effectively, this is modulation movement, comprising alternating linear and cyclic modulation. The net effect is a continuous, repeating 168-bar cycle of harmonic movement — the equi-harmonic cycle. Intra-AB and inter-AB sectional harmonic movement are described in further detail in the immediately following sections.

Intra-AB sectional harmonic movement

Intra-sectional harmonic movement takes place within the AB-section. It is the harmonic movement that occurs over a 14-bar segment, commencing at the start of an A-section and terminating at the end of each B-section.

An example of the *intra*-(AB) sectional harmonic movement, taken from the first 14 bars of the composition, as notated in the guitar lead sheet,²³ is shown in Figure 22.



²³ The main manuscript for *Oscillation 1*, because it also includes the tabla part, does not include harmonic movement notations (i.e., chords). Chords are, however, included in the guitar lead sheet.

Figure 22: Intra-(AB)-sectional harmonic movement

Harmonic modulation within the AB-section

Within the AB-section, it is notable that modulation has occurred during the 14 bars from the A-section to the B-section. Specifically, the key centre has moved from the tonic to the subdominant.

In the AB-section example above, the key centre has moved from F to B^b.

For visual clarity, the key signature in the written notation has not been altered. Instead, the modulation is evident in the altered scale tones in the fourth and sixth bar of the B-section.

Because all AB-sections are effectively transpositions of one another — in the primary keys of F, E^b, D^b, B, A and G — it appears from the key signatures that the equi-harmonic cycle is within six keys only. Within every AB-section, however, there is a modulation, as evidenced by the accidentals. Thus, the B-sections provide the harmonic content for the keys of B^b, A^b, G^b/F[#], E, D and C, and the equi-harmonic cycle systematically traverses all 12 major keys.

Harmonic nomenclatures against A-section and B-section individually versus combined

The harmonic movement from the A-section to the B-section is a modulation from a tonic key to a subdominant key. The overall harmonic movement within the 14-bar intra-(AB) section may be represented in one of two ways. The first is to reference the harmonic movement against the key centres of the A and B sections individually; the second is to reference it against the combined AB-section.

Harmonic analysis of AB-section referenced against A-section and B-section individually

In this characterisation, the harmonic movement within the A-section is referenced against the harmonic centre key of the A-section, and the harmonic movement within the B-section is referenced against the harmonic centre key of the (modulated) B-section.

This nomenclature considers the harmonic movement from the perspective that, in moving from the A-section to the B-section, the harmonic movement *has already modulated* — that modulation being from the tonic to the subdominant. In such a harmonic analysis, it is evident that the harmonic sequential movement within the A-section and B-section are, despite their melodic differences, the same.

Figure 23 shows the absolute harmonic movement, followed by the relative harmonic movement. In this representation, the harmonic movement within the B-section is described *relative to the modulated key of B^b-major*.

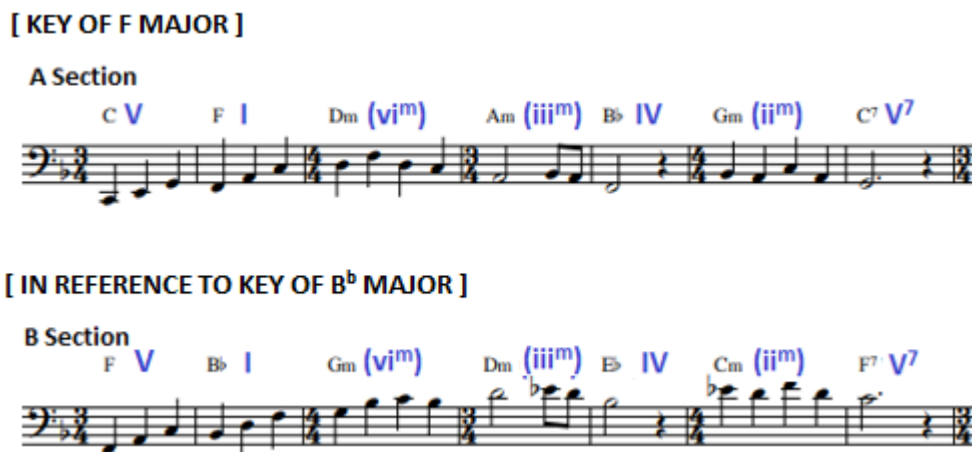


Figure 23: Harmonic movement within the B-section

In summary, a harmonic analysis of the AB-section referenced against A-section and B-section individually produces the following harmonic sequence:

$$V-I-(vi)^m-(iii)^m-IV-(ii)^m-V^7-V-I-(vi)^m-(iii)^m-IV-(ii)^m-V^7$$

Harmonic analysis of AB-section referenced against the combined AB-section

In contrast to the previous analysis, the harmonic movement within the AB-section is alternatively referenceable against *the key centre of the combined AB-section*, rather than the A-section and B-section harmonic centres separately. In this analysis, the B-section, even though the harmony has modulated to the subdominant key of the A-section by the fourth bar of the B-section, the AB unit is harmonised as a *single combined unit*.²⁴

Figure 24 shows the absolute harmonic movement, followed by the relative harmonic movement, when the entire AB-section is harmonised relative to the key centre of the A-section.



Figure 24: Entire AB-section harmonised

In summary, a harmonic analysis of AB-section referenced against the combined AB-section produces the following harmonic sequence:

$$V-I-(vi)^m-(iii)^m-IV-(ii)^m-V^7-I-IV-(ii)^m-(vi)^m-(vii^b)-V^m-I^7$$

Inter-AB sectional harmonic movement — continuous alternating linear and cyclic harmonic modulation

The second of the harmonic movements analysed is inter-AB sectional harmonic movement — the harmonic movement that occurs between the AB-section. This harmonic movement is a continuous repeating cycle of alternating linear and cyclic modulations, modulating through all 12 major harmonic key centres, to produce the equi-harmonic cycle (shown in Figure 25).

The *continuous cyclic harmonic modulation* summarised in the following graphical representations of the modulation movement that occurs within each of the 36 three-minute, 12-key equi-harmonic cycles by which the composition is harmonically defined.

²⁴ The harmonic analysis of AB-section referenced against the combined AB-section is thus a harmonic analysis of the combined AB-section in reference to the key signature of the AB-section, rather than in reference to the changed key, as indicated by the accidentals within the staff.

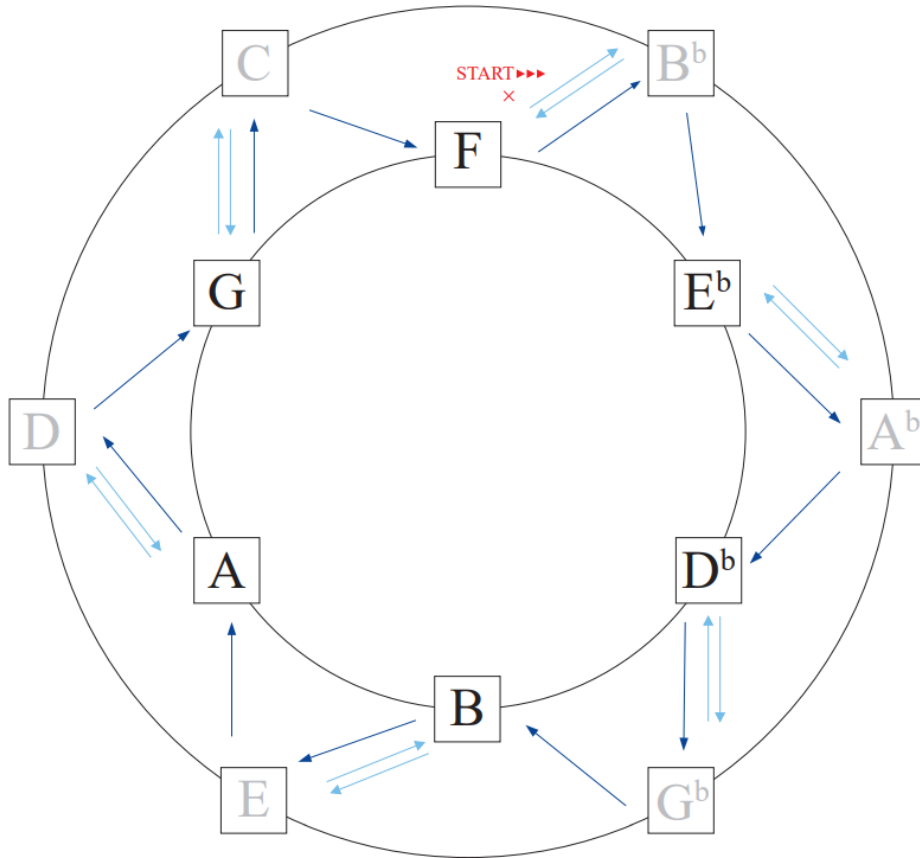


Figure 25: Continuous cyclic harmonic modulation

Linear and cyclic movement within inter-AB sectional harmonic movement

Regarding the compositional processes that operationalise the theoretical concepts of the dissertation, the equi-harmonic cycle functions in its own right as intercultural metaphor for contrasting Western linear and Eastern cyclic concepts of time.

This section describes the compositional process by which this concept is operationalised within the guitar part. The specific mechanism for this is the alternating linear and cyclic harmonic movements occurring within the equi-harmonic cycle. Notably, such harmonic movements occur within the equi-harmonic cycle at the end of every AB-section.

Inter-AB sectional harmonic movement, as modulation, thus occurs every 14 bars or every 15 seconds. Furthermore, such harmonic movements are alternatively linear or cyclic. As previously noted, the inner circle lists the keys in which the A-section is played, and the outer circle lists the keys in which the B-section is played. Furthermore, in the representation of the equi-harmonic cycle, the thinner (light) lines represent linear modulation and the thicker (dark) arrows represent cyclic modulation.

The compositional method of this alternating linear and cyclic harmonic movement of the guitar part's equi-harmonic cycle is examined in further detail, including graphic representations, below.

Inter-AB harmonic movement within the equi-harmonic cycle

The points within the equi-harmonic cycle at which modulations are determinable as either linear or cyclic are the points between a completing B-section and a commencing A-section. These points of harmonic movement are evident in the figures below.

Inter-AB movement — linear. Figure 26 represents linear modulation in more detail. Linear modulation, first occurring in the composition at bar 8, is represented in the equi-harmonic cycle as thinner (light) arrows moving *back and forth* in opposite directions.

The example demonstrates the linearity of harmonic movement in the movement from the A-section to the B-section and then *back to the A-section in the same key*.

In the example demonstrated in Figure 26, the linear harmonic movement is thus the harmonic movement from F to B^b and *back to F again*.

As previously described, such cyclic harmonic movement is akin to the *one-dimensional, bi-directional movement* of a simple pendulum appearing as a straight line, when viewed from above.

In Figure 26, this cyclic modulation movement is highlighted by the large arrows.

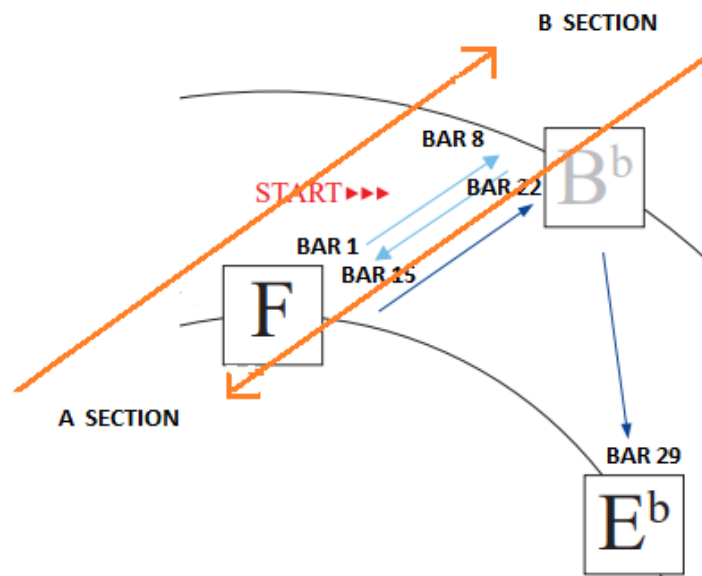


Figure 26: Linear modulation

Inter-AB movement — cyclic. Figure 27 represents cyclic modulation in more detail. Cyclic modulation, first occurring in the composition at bar 29, is represented in the equi-harmonic cycle as thicker (dark) arrows moving *around the cycle* in a continuous forward direction. In the example demonstrated, cyclic harmonic movement is thus the harmonic movement from F to B^b and then *onwards to E^b*.

As also previously described, such cyclic harmonic movement is analogous to the *two-dimensional, uni-directional movement* of a pendulum bob, moving in a circle, viewed from above. This cyclic modulation movement is highlighted in Figure 27 by the large arrows.

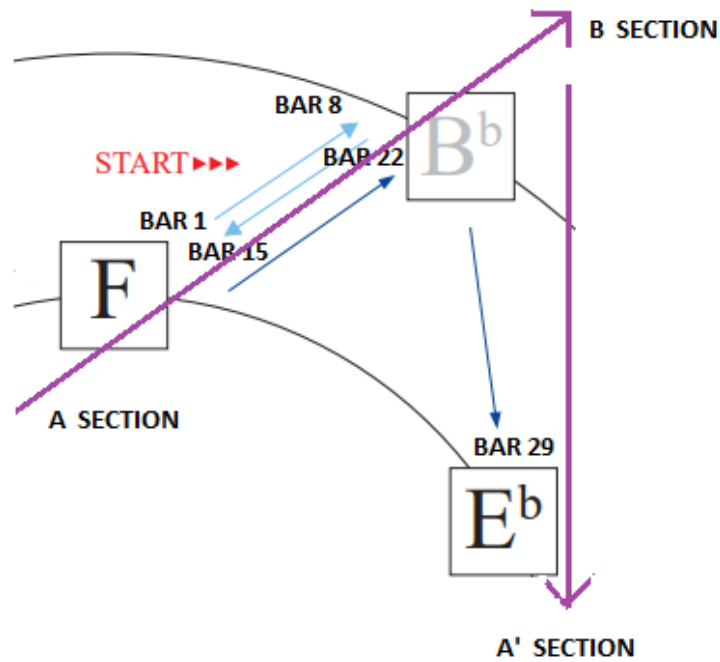


Figure 27: Cyclic modulation

Summary of linear and cyclic movement — guitar part

Thus, linear and cyclic modulation, functioning as a metaphor for Western and Eastern linear and cyclic concepts of time, occur in the *inter-AB harmonic movement* of the equi-harmonic cycle, as evident in the figures above. These figures represent linear modulation as thinner, lighter arrows and cyclic modulation as thicker, darker arrows. This concept forms the foundation of the inter-AB sectional harmonic movement of the guitar part. As described in RP 2B, the guitar part, in its alternating linear and cyclic modulation, is a metaphor for Western and Eastern linear and cyclic concepts of time.

Combined intra-sectional (AB) harmonic movement and continuous) cyclic harmonic modulation movement — harmonic movement of the equi-harmonic cycle

The overall harmonic movement of the three-minute equi-harmonic cycle is established by combining the intra-sectional (AB) harmonic movement — as demonstrated by the continuous cyclic harmonic modulation movement demonstrated earlier in Figure 10 (the equi-harmonic cycle), and in further detail in the figures above (Figure 26 and Figure 27).

Otherwise expressed, the harmonic movement of the *equi-harmonic cycle* is the *intra-(AB) sectional harmonic movement*, modulated through all 12 keys.

Figure 28 summarizes the overall harmonic movement, both *intra-AB sectional* and *inter-AB sectional*, for a single equi-harmonic cycle.

C F D^m A^m B^b G^m C⁷
 F B^b G^m D^m E^b C^m F⁷
 B^b E^b C^m G^m A^b F^m B^b7
 E^b A^b F^m C^m D^b B^b^m E^b7
 A^b D^b B^b^m F^m G^b E^b^m A^b7
 D^b G^b E^b^m B^b^m C^b A^b^m D^b7
 F[#] B G[#]^m D[#]^m E C[#]^m F[#]7
 B E C[#]^m G[#]^m A F[#]^m B7
 E A F[#]^m C[#]^m D B^m E7
 A D B^m F[#]^m G E^m A7
 D G E^m B^m C A^m D7
 G C A^m E^m F D^m G7

Figure 29: Chord chart of equi-harmonic lead sheet

Relation to the research propositions

Equi-harmonic cycle — harmonic graphic representation expressed in terms of Zuckerkandl's 2/4 metre home-away concept

Linear home-away-home movement alternative representations. In Chapter 1 of the dissertation, extensive reference is made to the theoretical work of Victor Zuckerkandl's implicit concept of home-away polarity within 2/4 metre as the foundation of the experience of musical vectoriality within metre, one of the initial concepts on which the research is based.

The equi-harmonic cycle, specifically its concept of *continuous cyclic modulation*, is also representable, referring to Zuckerkandl's same concept. In this representation, linear modulation is the movement where the second "home" (from a harmonic perspective) is the same "home" as the original. Thus, linear modulation is representable as ABA. Such linear harmonic movement is representable as *home-away-home* (or *void-form-void*) movement. The *linear modulation* in the first 15 bars of the composition (i.e., from bar 1 to bar 15, from the key of F to B^b then back to F) is an example of such linear home-away-home movement.

Cyclic home-away-home movement. In contrast to this, the *cyclic modulation* in the next 14 bars (from bars 15 to 29, from F to B^b, then *onwards* to the *new key* and *new home* of E^b) is representable as *home-away-home'* (or *void-form-void'*) movement, where *home'* represents the new home key. The equi-harmonic cycle is thus referenced against Zuckerkandl's concept of home and away as an alternating pattern of linear home-away-away movement and cyclic home-away-home' (new home) movement.

As it applies to inter-AB sectional harmonic movement, this concept is illustrated in Figure 18. Expressed in terms of movements between form and void states, it is illustrated in Figure 30.

Equi-harmonic cycle as it relates to the primary research proposition

RP 1A states:

The phenomenological experience of directional movement within a music composition is conceptually representable as a "phenomenologically determined, hierarchically organised, multi-parameter, form-void vector field".

RP 1A thus comprises five sub-propositions as below:

- (i) The experience of vectoriality in music is phenomenologically determined.
- (ii) The experience of vectoriality in music is hierarchically organised.
- (iii) The experience of vectoriality in music occurs at the level of multiple parameters (including those of metre, melody, harmony, and in more complex music, modulation and global form).
- (iv) The experience of vectoriality in music arises from the phenomenological representation of polarised couplet cells, within which the experience of form-void vectors (the directional movement between form and void states) is made possible as a phenomenological representation.
- (v) The arrangement of such form-void vectors constitutes a phenomenologically determined vector field.

The case for these five sub-positions, and thus the case for RP 1A, is discussed at the beginning of Chapter 3.

Concerning sub-proposition (iv), the equi-harmonic cycle is representable in an analogous way in Figure 30 below, though using the concept of musical composition as comprising movements between phenomenologically determined form and void states. The figure is thus a “map” of the form-void vectors that comprise the equi-harmonic cycle. In it, the “START” mark indicates the point at which the composition commences.

At this commencement point, the key of F major functions as home and thus “void”.

The first form-void vector for the equi-harmonic cycle is thus the thinner, light line directly under the x mark of the START symbol.

This vector is a void-to-form vector. (In reading Figure 30, the “void” status is represented by the word “void”, directly under the word “form”).

Continuing this demonstration of form-void vectors, the first four phenomenological void-to-form vector representations are thus:

- Linear void to form phenomenological vector [F to B^b] as represented by the thin, light arrow from F to B^b.
- Linear form to void phenomenological vector [B^b back to F] as represented by the parallel but opposite direction thin, light arrow from B^b back to F.
- Cyclic void to form phenomenological vector [F to B^b] as represented by the thicker, dark arrow moving from F to B^b.
- Cyclic void to form phenomenological vector where the previous form key [B^b] has changed its status from form to void to become part of the void to form movement [B^b to E^b] cyclically modulating the composition into the new key of E^b major. This is represented by the thicker arrow from B^b to E^b.

This process continues throughout the remaining keys of the equi-harmonic cycle. The figure is thus the representation of this progressive alternating linear and cyclic harmonic modulation movement and its associated form-void phenomenological vector movement.

Form-void vectors at the level of the composition’s other parameters — those of metre, melody, modulation, and global form — are described in Appendix 7. The demonstration of such form-void vectors corresponds with the model of musical vectoriality proposed in RP 1A. In this way, the composition exemplifies the theoretical concepts introduced in Chapter 1.

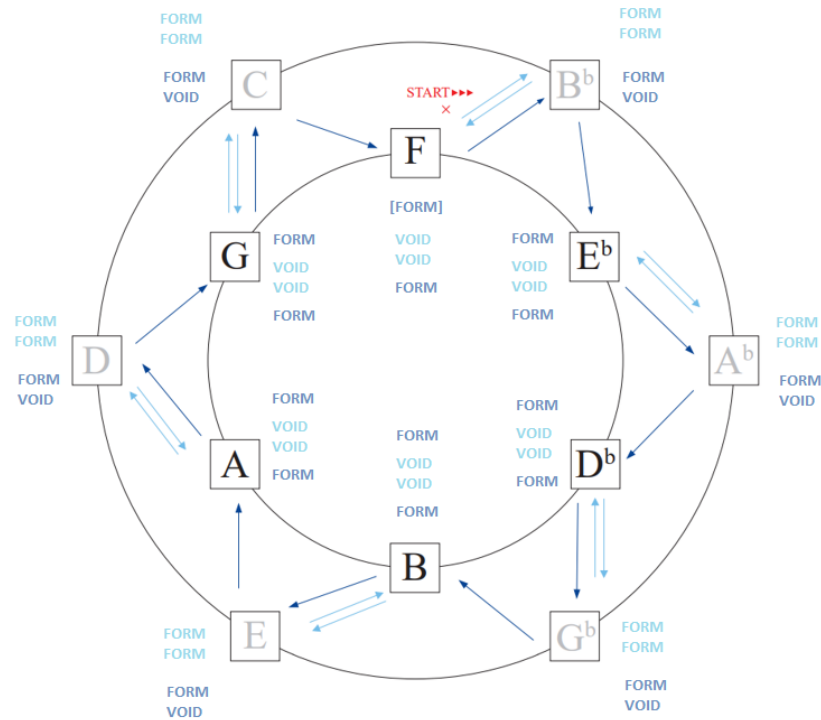


Figure 30: Void-form vectors in the equi-harmonic cycle

Equi-harmonic cycle as it relates to Secondary RP 2B (Exegesis)

Exegesis RP 2B is as follows:

The submitted creative work, *Oscillation 1*, because of its harmonic organisation and global form, is a metaphor for the linear and cyclic representations of time in Western and Eastern paradigms.

The concept of the composition’s contrasting linear and cyclic harmonic modulation movements was represented in the previous figures.

In reprising Exegesis RP 2B, the harmonic structure of the equi-harmonic cycle, as alternating linear and cyclic modulation, may reasonably be considered a metaphor for the concepts of linearity and cyclicity, especially as they relate to Western and Eastern concepts of time. Similarly, the global forms of the tabla and guitar as linear and cyclic, respectively, as demonstrated in section *Relationship between theoretical and creative work*.

The relationship of exemplification

The artefacts exemplify the concepts of the theoretical work.

Major artefact

Oscillation 1 exemplifies the concept of RP 1A — the proposition that the experience of directional motion in music is representable as a “phenomenologically determined, hierarchically organised, multi-parameter, form-void vector field”. **Error! Reference source not found.** (Appendix 7) provides a summary of the analysis of *Oscillation 1* in terms of the above proposition.

Additionally, *Oscillation 1* exemplifies the concept of RP 3A — the geometrical model of Western musical compositional form as *helix*. This is visually apparent when one examines the graphical

representation of the global form of *Oscillation 1*, as demonstrated in **Error! Reference source not found.**

Minor artefact

The minor artefact, *Beginner's Mind*, exemplifies the concept of RP 3B — the geometrical model of Eastern musical compositional form as *vortex*.

The relationship of metaphor

Oscillation 1 is also a *metaphor* for the theoretical concepts of the dissertation (Western linear and Eastern cyclic time) — specifically, in its linear and cyclic global form and harmonic structure. This concept is demonstrated graphically in **Error! Reference source not found.** Details of these compositional processes are also presented in Appendix 5.

Equi-harmonic cycle as it relates to RPs 4A and 4B

The tertiary RPs are geometrical representations of contrasting Western and Eastern musical forms, respectively, as helix and vortex, metaphorical for contrasting Western and Eastern concepts of time. They are discussed in Chapter 3 as they relate to the artefact, and then tendered as concepts for further research in Chapter 4 (Summary and Conclusion).

The next section gives a detailed presentation of the specific processes that permitted the production and recording of the tabla part.

9. Specifics of the compositional process — tabla

Background

The tabla part of *Oscillation 1* is a 54-minute development section followed by a 54-minute resolution section. The compositional process of linear development and resolution is achieved via the systematic and algorithmically determined ordering of 216 individual 15-second tabla recordings, each being uniquely defined for three parameters: key, CDP, and RD.

For each of these recordings, the tabla is thus required to play an improvised rhythmic invention that accords with one of the six levels for each of these three parameters. The duration of each unit of recorded tabla is one AB-section — that is, 14 bars, lasting (at a tempo of ♩ = 192) exactly 15 seconds per recording.

The six levels for each of these three parameters are summarised below:

Key: F, E^b, D^b/C[#], B, A and G

CDP: (i) (ii) (iii) (iv) (v) (vi) defined as follows:

- (i) Rhythmic outlining of the primary 24-beat metre as a 10-10-4 beat
- (ii) Rhythmic outlining of the secondary 24-beat metre as a 3-3-4-3-3-4-4 beat
- (iii) Rhythmic improvisation based upon the melodic phrasing of the AB-sections — simple.
- (iv) Rhythmic improvisation based upon the melodic phrasing of the AB-sections — extended.
- (v) Rhythmic soloing over 24-beat sections (A-section and B-section separately)
- (vi) Rhythmic soloing over 48-beat (combined AB-sections).

RD: 1, 2, 3, 4, 5 or 6 levels of rhythmic density.

Summary of 216 units of recorded tabla units as 6 keys x 6 CDP levels x 6 levels of RD

Using the above compositional process, it was possible to create 216 units (6 keys x 6 levels of CDP x 6 levels of RD) of 15-second tabla improvisation recordings, each recorded unit being uniquely defined in terms of the parameters of the key, CDP and RD.

Figure 31 summarises this concept.

PARAMETERS: 1. Key x 2. CDP x 3. RD						
1. KEY	F	E ^b	D ^b	B	A	G
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
2. CDP						
	1	2	3	4	5	6
3. RD	Rhythmic Density					

Figure 31: Summary of controlled graded improvisation

Controlled graded improvisation

The concept of “controlled graded improvisation” is thus fundamental to the tabla part of *Oscillation 1*. It is the deliberate and precise compositional process that makes it possible to incorporate improvisation into global control of the process of development and resolution within the composition. It is also the foundation for the concept of “intensification”, further described under “Development and resolution via non-vectorial process of intensification” below.

In the case of the tabla part for *Oscillation 1*, controlled graded improvisation applies primarily to the RD parameter. The reason is evident in the differences between the data sets associated with the CDP and RD parameters. This is briefly explained below.

The data sets of key, CDP, and RD

For practical purposes, the data set of the parameter *key* contains nominal data — that is, the six keys are related to each other in terms of differences of identity like the data set of fixed colours.²⁵ Similarly, the CDP data set, describing differences of approach to improvisation, is primarily nominal data.

In contrast to this, the RD data set contains ordinal data. The six levels of RD invited for the improvisation can thus be measured. This capacity to be ordinal permits quantitative, algorithmically determined development and resolution of the RD parameter. RD is the parameter on which the overall linear development and resolution of the tabla part are structured. The compositional method by which this is achieved is contingent on the logical “ordering” of the 216 recorded units of improvisation so that the process is one of gradual movement from low RD to high RD.

²⁵ In theory, both musical keys and colours are also considered as continuous ordinal data. The is so because, at the physical level, both musical keys and colours are frequencies. Frequencies, being numbers, are both continuous (i.e., not discrete) and ordinal (arrangeable in an order or hierarchy). The statement: *Orange is closer to yellow than blue* is thus comparable to *E^b is closer to F than B*. Certainly this is case when key centres are considered as vibrational frequencies within a spectrum. The “closeness” of key centres to one another may also be considered in other terms of closeness or relatedness. This concept of “relatedness” is evident, for example, in George Russell’s *Lydian Chromatic Concept of Tonality*. For practical purposes, however, in the context of the current dissertation, keys are considered a nominal data set. George Russell, *George Russell’s Lydian Chromatic Concept of Tonal Organization* (2001), cited at https://en.wikipedia.org/wiki/Lydian_Chromatic_Concept_of_Tonal_Organization

The compositional process for the tabla part is thus one of orderly, algorithmically determined assembly of each of the recorded units to produce an overall effect of development by intensification (gradual increase in RD), followed by intensification resolution (gradual decrease in RD).

The compositional mechanisms enabling this process, and in particular the specific order of re-assembly of the 216 x 15-second duration tabla recordings to achieve this effect, are described in the sections that follow.

Representation of recorded units

Single key x CDP x RD units

As mentioned earlier, the tabla part comprises the systematic ordering of 216 14-bar AB-sections, each having a duration of 15 seconds. Each of these 216 sections is thus representable in terms of the value (1 to 6) on each of its three parameters of key, CDP, and RD. The figure below captures this representation.

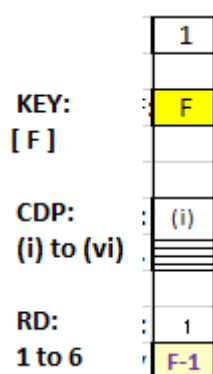


Figure 32: Fifteen-second duration AB unit — improvisation values on Key, CPD, and RD

Geometrically, this unit may be represented as a three-dimensional unit or “block” as shown here:

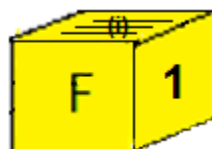


Figure 33: Three-dimensional representation of 15-second duration AB unit

Units 1 to 6: Key of F x CDP (i) to (vi) x RD = 1

Continuing with this description, the first six x 15-second duration AB improvisational units are defined in terms of:

Key: [F]

RD: 1

CDP:

- (i) Rhythmic outlining of the primary 24-beat metre as a 10-10-4 beat
- (ii) Rhythmic outlining of the secondary 24-beat metre as a 3-3-4-3-3-4-4 beat
- (iii) Rhythmic improvisation based upon the melodic phrasing of the AB-sections — simple
- (iv) Rhythmic improvisation based upon the melodic phrasing of the AB-sections — extended
- (v) Rhythmic soloing over 24-beat sections (A-section and B-section separately)
- (vi) Rhythmic soloing over 48-beat sections (combined AB-sections)

These six AB units and their improvisational direction values regarding Key, CDP and RD are representable as demonstrated below:

	1	2	3	4	5	6
KEY:	F	F	F	F	F	F
[F]						
CDP:	(i)	(ii)	(iii)	(iv)	(v)	(vi)
(i) to (vi)	Horizontal lines	Vertical lines	Diagonal lines (top-left to bottom-right)	Diagonal lines (top-right to bottom-left)	Diagonal lines (top-left to bottom-right)	Diagonal lines (top-right to bottom-left)
RD:	1	1	1	1	1	1
1 to 6	F-1	F-1	F-1	F-1	F-1	F-1

Figure 34: First six AB units — improvisation values on Key, CDP, and RD

Geometrically, in three dimensions, the improvisation directions for the first six AB units may be represented as shown below:

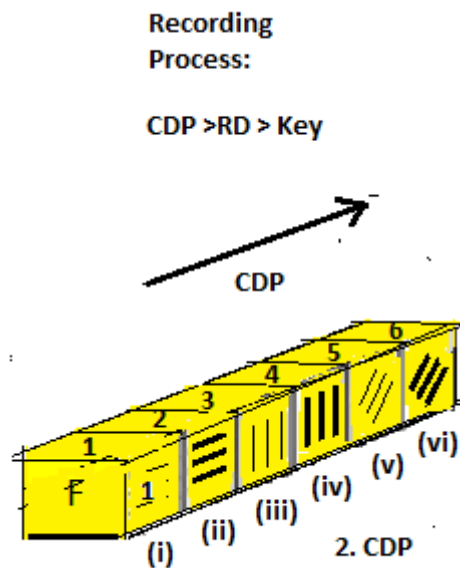


Figure 35: First six AB improvisation units in three dimensions

Units 1 to 36: Key of F x CDP (i) to (vi) x RD 1 to 6

Continuing this process, for each of these six units there are six levels of RD. Thus, the first 36 improvisational units are similarly defined in terms of:

Key: [F]

RD: 1 to 6

CDP:

- (i) Rhythmic outlining of the primary 24-beat metre as a 10-10-4 beat
- (ii) Rhythmic outlining of the secondary 24-beat metre as a 3-3-4-3-3-4-4 beat
- (iii) Rhythmic improvisation based upon the melodic phrasing of the AB-sections — simple
- (iv) Rhythmic improvisation based upon the melodic phrasing of the AB-sections — extended

(v) Rhythmic soloing over 24-beat sections (A-section and B-section separately)

(vi) Rhythmic soloing over 48-beat sections (combined AB-sections).

The first 36 units of improvised AB units are thus represented as demonstrated below:

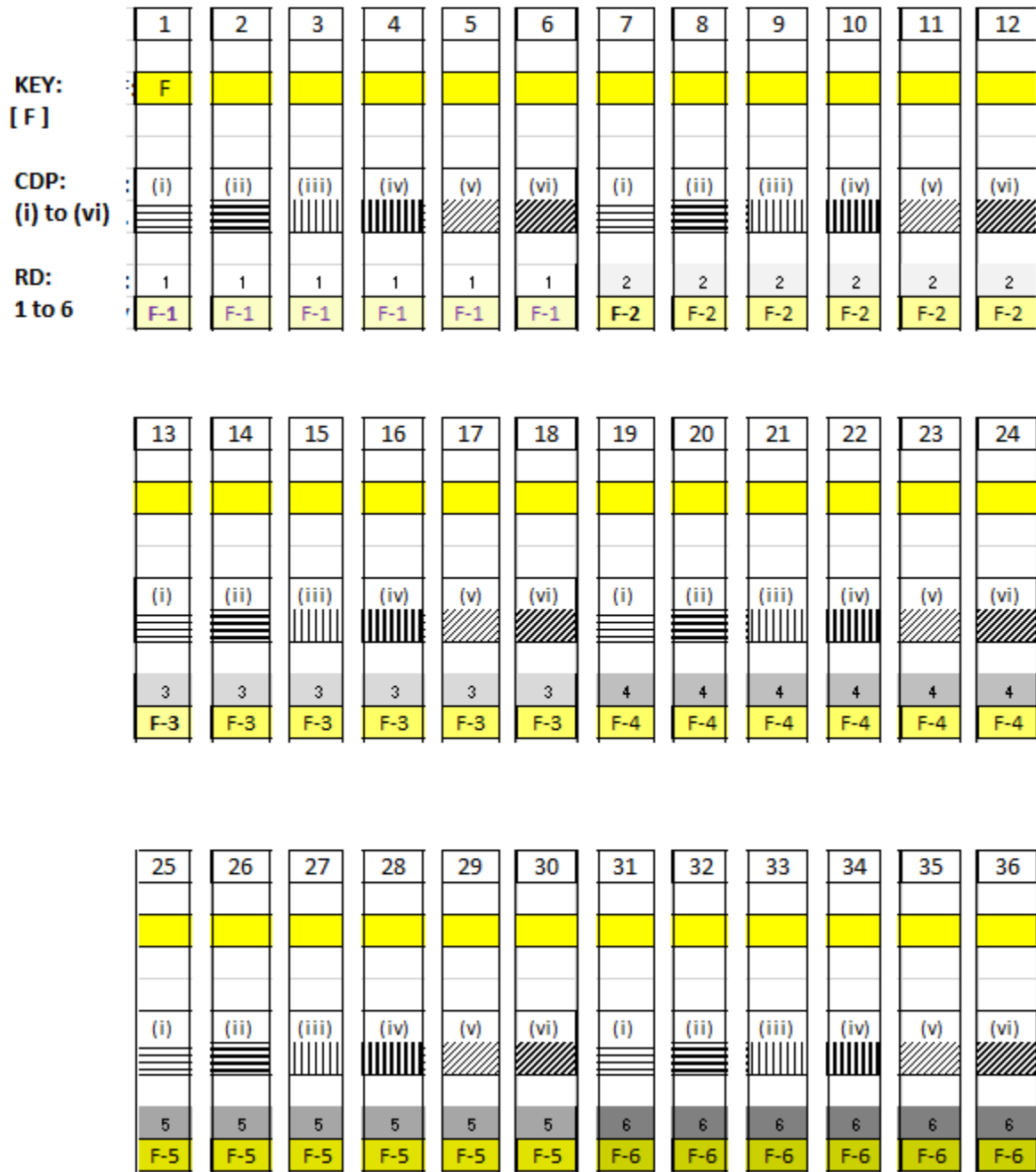


Figure 36: First 36 AB units — improvisation values on Key, CDP, and RD

Geometrically, in three dimensions, these 36 units may be represented as demonstrated below:

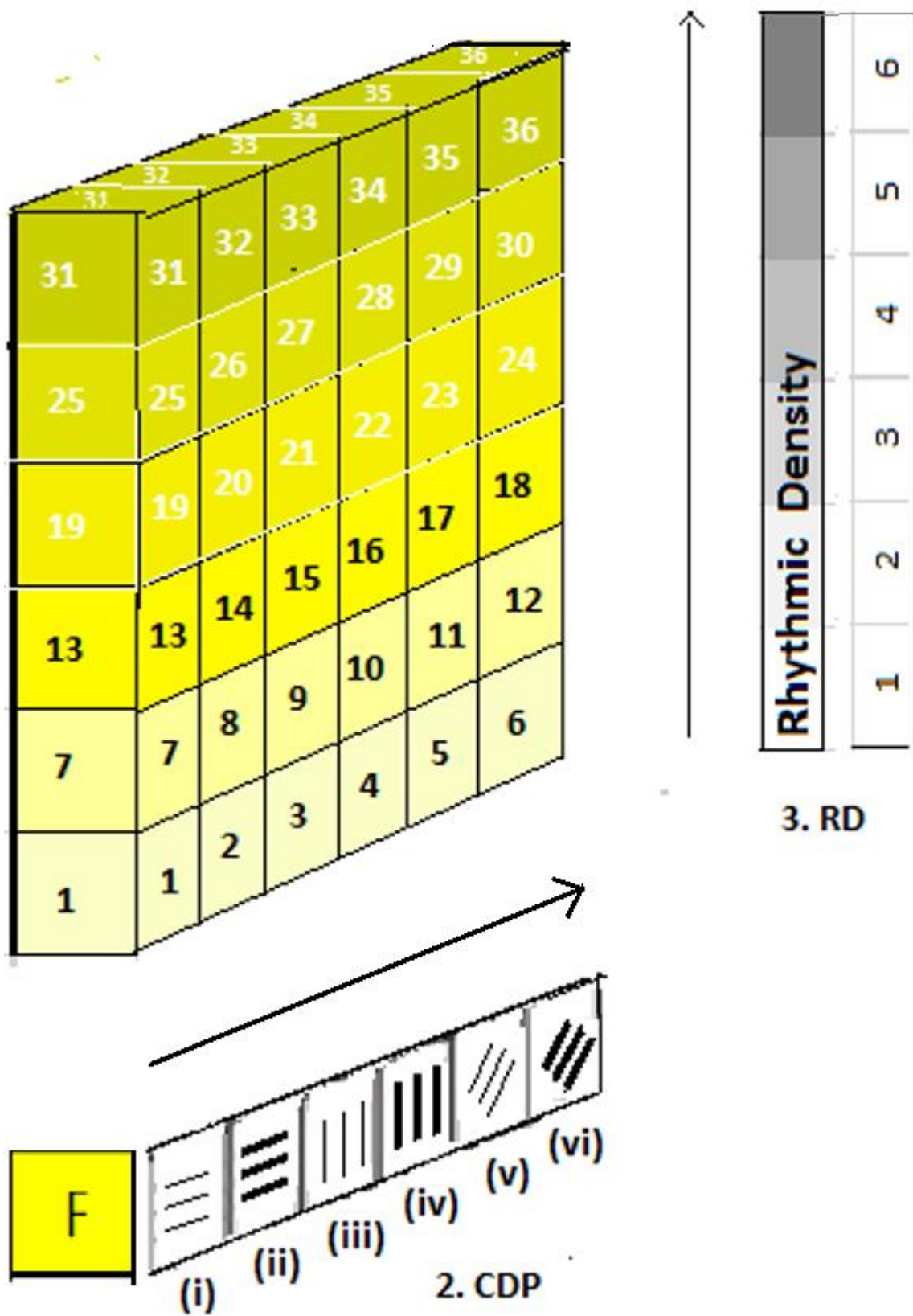


Figure 37: First 36 AB-improvisation units in three dimensions

Units 1 to 216: Keys of F, E^b, D^b/C#, B, A, G x CDP (i) to (vi) x RD 1 to 6

Continuing this process for each of these 36 units, there are six keys. Thus, the first 216 improvisational units are defined in terms of:

Key: F, E^b, D^b/C#, B, A, G

RD: 1 to 6

CDP:

- (i) Rhythmic outlining of the primary 24-beat metre as a 10-10-4 beat
- (ii) Rhythmic outlining of the secondary 24-beat metre as a 3-3-4-3-3-4-4 beat
- (iii) Rhythmic improvisation based upon the melodic phrasing of the AB-sections — simple
- (iv) Rhythmic improvisation based upon the melodic phrasing of the AB-sections — extended
- (v) Rhythmic soloing over 24-beat sections (A-section and B-section separately)
- (vi) Rhythmic soloing over 48-beat sections (combined AB-sections)

These 216 units are demonstrated below:

CDP (i) to (vi):		(i)	(ii)	(iii)	(iv)	(v)	(vi)	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Comp. Dev't. Param.																			
RD 1 to 6:		1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3
Rhythmic Density		F-1	F-1	F-1	F-1	F-1	F-1	F-2	F-2	F-2	F-2	F-2	F-2	F-3	F-3	F-3	F-3	F-3	F-3
Key 1	F	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Key 2	E^b	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Key 3	D^b	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Key 4	B	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126
Key 5	A	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162
Key 6	G	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198

CDP (i) to (vi):		(i)	(ii)	(iii)	(iv)	(v)	(vi)	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Comp. Dev't. Param.																			
RD 1 to 6:		4	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6	6
Rhythmic Density		F-4	F-4	F-4	F-4	F-4	F-4	F-5	F-5	F-5	F-5	F-5	F-5	F-6	F-6	F-6	F-6	F-6	F-6
Key 1	F	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Key 2	E^b	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
Key 3	D^b	91	92	93	94	96	96	97	98	99	100	101	102	103	104	105	106	107	108
Key 4	B	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144
Key 5	A	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Key 6	G	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216

Figure 38: 216 AB units — improvisation values on Key, CPD, and RD

Geometrically, in three dimensions, these 216 units may be represented as demonstrated below:

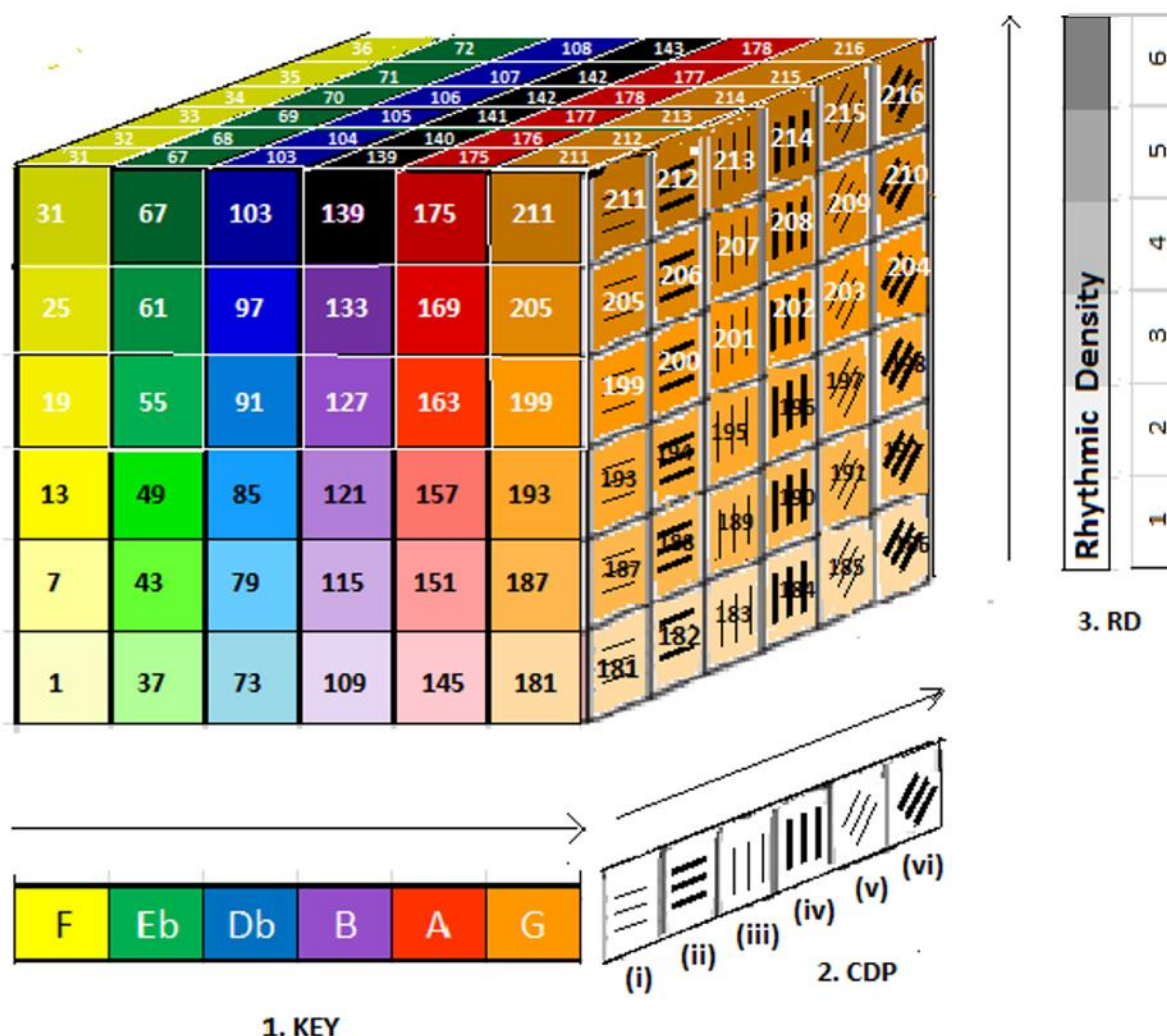


Figure 39: First 36 AB improvisation units in three dimensions

Recording and mixing templates

For the reasons previously discussed, the order of AB improvised segments needed to be different from the recording order. Essentially, this was because the composition required changing key every 15 seconds — a task that is effectively impossible in real time on the tabla.

For this reason, all AB-improvised segments were recorded in one key before moving to the next. The recording and mixing templates, which demonstrate the process by which this was achieved, are summarised in the figures below.

- Figure 40 demonstrates the order in which improvisations for the tabla AB units were recorded, in accordance with the specified values of CDP, RD, and Key.
- Figure 41 demonstrates the order in which the AB units were *reassembled* to achieve the compositional purpose of creating incremental progressive increase in RD.
- Figure 42 demonstrates the two contrasting orders for recording of AB segments, and their re-assembly, in the form of a single figure.

Graphical 3D summary of recording and mixing process

Geometrically, in three dimensions, the recording and mixing templates units may be represented as follows:

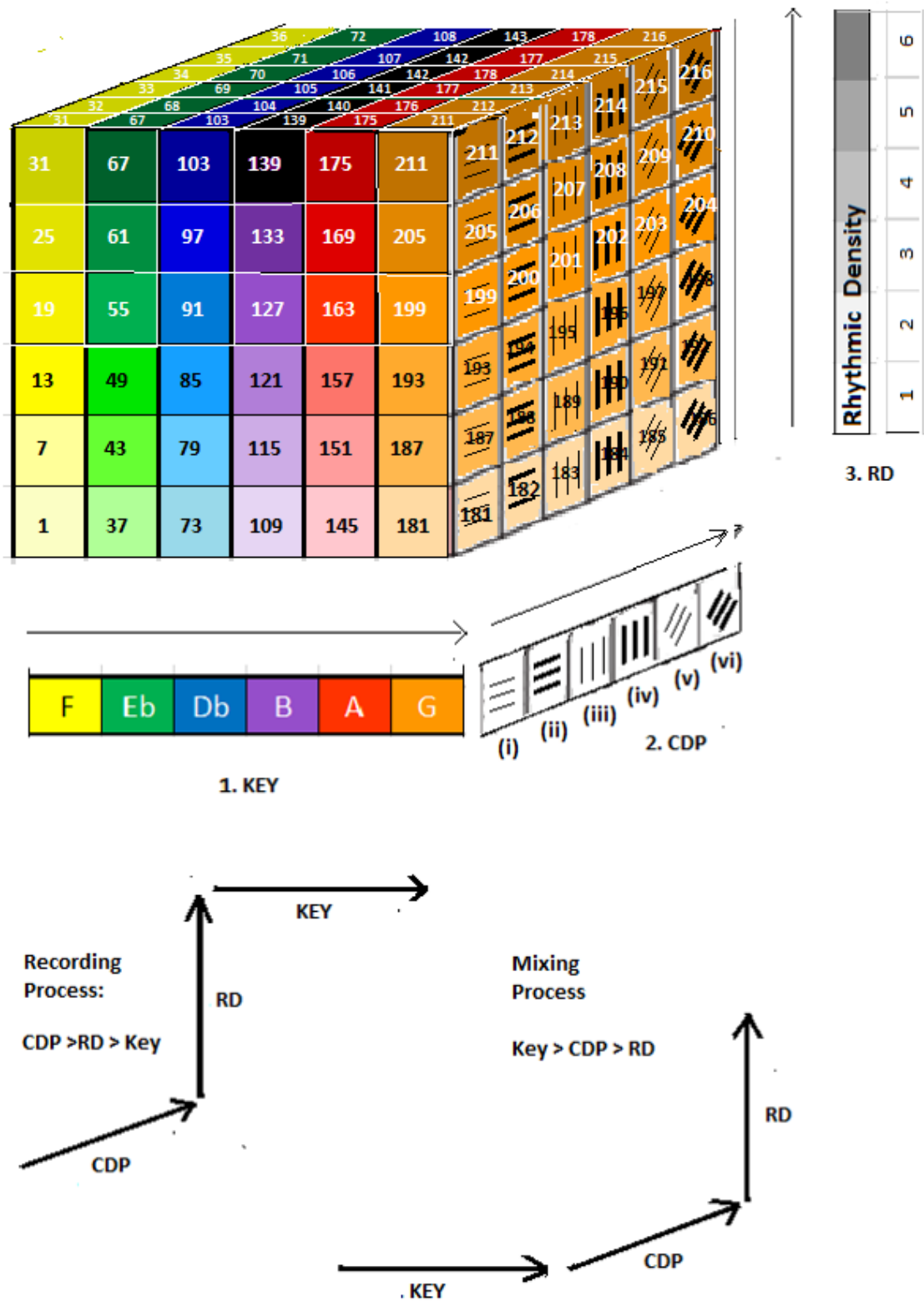


Figure 42: 3D summary of recording and mixing/assembly process — development phase

Development and resolution via non-vectorial process of intensification

Regarding the tabla part, the processes described and demonstrated in the figures elucidate the method used to create the experience of 54 minutes of tabla improvisation.

As previously mentioned, the second 54 minutes of the composition comprises the tabla parts, grouped into three-minute equ-harmonic cycles, played in reverse order.

The cyclic aspect of this process occurs via key changes. Specifically, as the tabla is playing in the same key as the guitar throughout the composition, it must, like the guitar, effectively change key every 15 seconds to progress through all 12 keys, as described in the equ-harmonic cycle.

The linear aspect is that for the duration of the composition, the tabla incrementally and progressively increases its rhythmic density.

At 54 minutes, after 216 (re-assembled) 15-second AB-sections have been played, each having a different combination of Key, CPD and RD requirements, the composition is at the peak of its rhythmic density, as provided by the tabla part.

Such a process is an emulation of the concept of *intensification*, a process that characterises Eastern (i.e., North Indian) classical music. Reiterating Clayton's characterising of this concept, intensification may be considered "large-scale process ... proceeding by a process of expansion".²⁶

Thus, the first 54 minutes of the composition (excluding the three-minute single equ-harmonic cycle introduction where the tabla does not play) constitutes the tabla's process of *development*.

As previously described, the second part of the composition is the reversal of this process, constituting the composition's process of resolution. The resolution process is achieved via playing the sequence of equ-harmonic cycles in the reverse order of the development arc.

In that regard, the tabla part of *Oscillation 1* is effectively a single *void-to-form* phenomenological vector, followed by a single, *equal but opposite* form-to-void phenomenological vector.

The composition's overall form is thus an oscillation from void to form and back to void again.

Combined concept: Intercultural consideration in the experience of music as a phenomenological machine. Briefly stated, the current dissertation proposes that the representation of Western and Eastern concepts of time as linear and cyclic, respectively, is metaphorically represented in *Oscillation 1*. This includes linear and cyclic representations at the harmonic level, in the form of alternating linear and cyclic modulation within the equ-harmonic cycle, and at the level of global form, as characterised by the linearity of the tabla part and the cyclicity of the guitar part.

Final consideration — concept of equ-harmonic composition as analogous to unrefracted light

The final concept of the method section broadens the concept of equ-harmonic composition and situates the concept within an interdisciplinary context. This concept is also relevant, in a broader sense, to the concept of the experience of music as comparable to that of a phenomenological machine. Consideration of this concept in detail is beyond the scope of the current dissertation — it is a concept, however, worthy of consideration in future research.

The final concept of the method section thus considers the concept of key centres — a sonic phenomenon as analogous with a visible phenomenon — that of light. Simply expressed, the concept equates the 12 (major) key centres of the Western musical system with the seven constituent colours

²⁶ Clayton, *Time in Indian Music*, 25.

and frequencies in the refraction of light as it travels through a prism. In such a comparison, the 12 distinct key centres are analogous to the colours of refracted light.

Equi-harmonic composition is then analogous to unrefracted white light. The figure below demonstrates this concept.

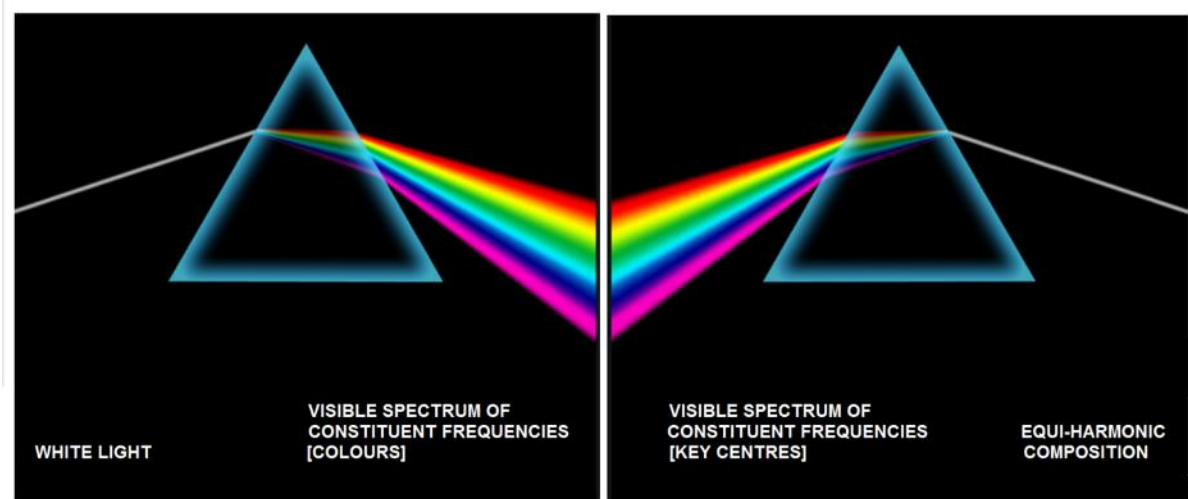


Figure 43: Equi-harmonicity of musical composition as synonymous with white, unrefracted light

Source: https://www.google.com/search?q=prism+refraction&rlz=1C1CHBD_en-GBAU852AU852&tbm=isch&source=iu&ictx=1&fir=u9aTFd2LQee1rM%252C6GkZ_mYTComcDM%252C_&vet=1&usg=AI4_-#imgrc=A1hY754__CA4qM