David Six

Matr.Nr.: 00640573

Composing Techniques based on Indian Classical Rhythmical Structures

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Anton Bruckner Privatuniversität Linz

Betreut durch: Renald Deppe und Christoph Cech

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A creative approach

Abstract

This text provides an overview of traditional composing techniques and rhythmic devices originating from Indian classical music as well as their potential application for composers of western classical contemporary music or jazz. This is achieved by an analysis of already existing works of twentieth century composers who have either clearly drawn inspiration from Indian classical rhythmic structures or whose work simply shows unintended parallels. Further, new creative concepts of how to implement or transform pure rhythmic structures via matrices into tonal material are being introduced. (Rhythm : Harmony | Rhythm : Melody)

Diese Arbeit bietet einerseits einen Überblick über verschiedene Kompositionsmethoden und Rhythmusstrukturen in der Klassisch indischen Musiktradition sowie mögliche Anwendungsmethoden derselben für Komponisten der westlichen Genres *Neue Musik* und *Jazz*. Bereits bestehende, von Komponisten des 20. Jahrhunderts aufgegriffene Techniken wie eigene kreative Ansätze (Matrizen) werden vorgestellt. (Rhythmus : Harmonie | Rhythmus : Melodie)

CONTENTS

Glossar

Angas:
Rhythmical building blocks of different length. There are three different kinds: *laghu, drutam and andrutam*.

Avartana/Avartanam:
A run-through and the completion of a rhythmic cycle called *tala*.

Chatusra:
A type of *gati;* a rhythmical subdivision into four (sometimes eight) *matras* per beat.

Damaruya yati:
A type of yati-phrase where *palas* (phrases) get gradually shorter and after the shortest *pala* will expand in length again.

Drutam:
One of the three *angas* and of the length of two beats. D is used as an abbreviation.

Gati:
Subdivision of an *akshara (beat)* into any number of equal units (*matras)*.

Gopuchayati / Gopucha Yati:
A type of reducing *yati-phrase* where phrases (*palas)* get gradually shorter.

Jathi:
The accentuation or phrasing of *gati*.

Jathi Bhedam:
A sequence or irregularly applied accents.

Khanda / Kanda:
A type of *gati;* a rhythmical subdivision into either five or ten *matras* per beat.

Konnakol:
The Art when *Solkattu* is recited.

Kriya:
Handclaps, finger counts and waves used to conduct *tala*.

Laghu:
One of the three *angas* of the length of 3,4,5,7, or 9 beats. L is used as an abbreviation.

Laya:
Speed or tempo.

Misra:
A type of *gati;* a rhythmical subdivision into either seven or fourteen *matras* per beat.

Mōrā / Mohara:
A composing technique.

Mridangam yati:
A type of yati-phrase where *palas* (phrases) get gradually longer and after the longest *pala will* shorten in length.

Peshkar:
Beginning part of a tabla-solo recital in a slow tempo.

Pala:
A rhythmical phrase and any segment of a *muktay, yati phrase* or *tirmanam*.

Sam:
The first beat of one *avartana*.

Sankirna:
A type of *gati;* a rhythmical subdivision into either nine or eighteen *matras* per beat.

Solkattu:
Vocal syllables (Sol syllable, kattu - bunch or group), a rhythmic language.

Srotovaha yati:
A type expanding of *yati-phrase* where *palas* (phrases) get gradually longer.

Tala:
Basic rhythmical framework that serves as a foundation for all rhythmical concepts and techniques explained in this text.

Tirmana / Tirmanam:
A structural device based on the expansion or reduction of *palas (*phrases) in which notes are divided by the same number of *matras*.

In the beginning there was rhythm.

(Hans von Bülow)

Introduction

My research addresses ways in which the Carnatic rhythmical system can contribute to the development of useful ideas and tools for western contemporary classical and jazz composers.
Since 2012 I have been doing research on how the Carnatic rhythmical system works by becoming a student of Manickam Yogeswaran, a true master-singer, percussionist and composer of Classical South Indian Music and later deepening my research in Hindustani Music in 2015 by becoming a student of Pandit Sri Shailendra Mishra, one of New Delhi's best known tabla virtuosos.
This present text is the result of reviewing the musical material I have learnt from my teachers and, further, I have encountered during repeated trips to India between 2015 and 2019.

One of the main ideas of this research is to give an overview of the different rhythmical techniques and the architecture that has been developed in this complex rhythmic culture and to explain how this system can be used as a source of creative ideas for (western-)composers.

Note on Orthography and employment of musical terms:

Long before starting with this text I have encountered the problem of the many orthographic variations of musical terms of Indian classical music and the question which form to choose. Unfortunately the predominant richness of variations is a known problem for many musicians. In addition to that, on a global scale but even within India many terms are also used in a different fashion as they are often assigned to different musical phenomenons, methods or techniques.
When studying Indian classical music one will quite regularly notice that many specific terms are applied in puzzling fashions: some terms seem to be interchanged, others seem to mean the opposite of what they were known for in other places.
Prominent examples: The term *laya* is sometimes used for *tempo/speed,* sometimes for *rhythm*. The terms *matra* and *akshara* often get mixed up with their meanings resulting in a semantic error. Some musicians use the term *tirmanam* to express what others call a *short mōrā* or *arudhi* and vice versa where others (including myself) use this term for a very specific and different rhythmical technique. This creates a lot of confusion amongst the community of musicians.
Obviously the semantic anarchy and the many orthographic variations are a result of the vast plurality of languages amongst India and the many translations between these languages. Moreover, the multiplicity of *garanas* (musical schools of a specific tradition), where terminology is being kept traditional and often regional do not help avoiding this confusion.

In order to cope with these problems, all musical terms that come to be used in this text are used exactly in the way, my *gurus* have taught me to use them. And since all musical lessons are usually held orally and without any writing, orthographic variations are omitted by mostly using the versions Raffael Reina introduced in his book *Applying Karnatic al Techniques to Western Music* (2015), which seems to be the most comprising text on this matter.

Hybridisation

In our western musical tradition we are used to specify between musical periods and styles, be it the Second Viennese School, Baroque music, Bluegrass or Hard bop. Mostly all musical styles have evolved within a certain cultural and philosophical context, each bringing along its distinct and characteristic qualities, be it Renaissance music or Minimal music and have constantly been changed and reinvented into what was currently needed, desired and possible: Jazz opened the doors to its roots in the music of Africa, the invention of electromagnetism changed the way we build instruments and not to forget about the effects the mechanical invention of the printing press has had to our western music.
(Musical) change does not only mean that something new evolves out of something old. It also includes that old and new ideas will be compared, mixed up and eventually get aligned and permuted. In a creative process there is no guarantee that the first ideas will also be the best ones.

Ironically, exactly during a period were western culture has been systematically and forcefully superimposed onto its colonies, western music culture also opened its ears to the music of the world and a process of hybridisation started to entirely change western music. When Claude Debussy came across a Javanese gamelan ensemble that had been invited to the 1889 Paris Universal Exhibition, he was confronted with an entirely different musical cosmos of centuries-old compositions, improvisation and exotically dynamic tempo changes. (Cooke, 1998, p. 258-260)
An infestation of exotic ideas had put down roots into his musical thinking. After all an experience, that changed not only Debussy's way of composing but through his influence also gave impulses onto the development of western music.
However, Debussy had never aimed to learn the art of playing gamelan instruments himself. Much more importantly he brought some of the ideas that breached the bubble of western music into his own work. Thus he begun to generate a whole new practice of musical thinking. Personally, I doubt that without music-historical knowledge one could spot the influence of the Javanese tradition while listening to Debussy's œvre. But on a more abstract level these experiences clearly left their marks.

Naturally the route of transfer of musical ideas and instruments was not a one-way lane. Indian classical music (Carnatic and Hindustani) also started to incorporate change even though, unlike western music, which was constantly changing due to different needs in function, it still had a much more direct connection to their earliest musical traditions coming from the Vedic periods.

Indian classical music always had a certain spiritual quality as and the ancient Indians considered the origin of music as a divine. (Vaz, 2013-14) It is said that the gods and goddesses have passed down music themselves. Yet, musicians have not hesitated to incorporate western instruments while the distinct ways of how this music works has been maintained by their traditional form. (The Carnatic Tradition, 2017) Our ears provide the evidence.

I believe that hybridisation can best be achieved, once a differentiation between a subconscious or a more abstract influence of exotic musical ideas onto the composers mind and what is also called *Fusion music*, where musical ideas get superimposed on each other much like musical terrain gets colonised by the ideas of another, is accomplished. But in order to be creatively influenced by abstract ideas of another contextual pool, one still needs to study these ideas carefully and meticulously and let the ideas do their own work.
This text is aiming to provide a collection of traditional musical ideas as well as a collection of how these ideas have made their way through the minds of different composers and have possibly transformed their work.

Publications and Existing Material

This text deals mainly, but not exclusively, with rhythmical elements of traditional South Indian music, also called Carnatic Music. Most books and literature available on Indian music are dedicated to Hindustani music, the more northern musical culture that is also much more known in the West. Hindustani music is quite different to the music of South India when it comes to the development of ragas and form but especially the structure of its rhythmical components.
In addition most literature is dedicated to raga, melody and its development and the few books that aim to explain the complex varieties of Carnatic rhythmical structures are either written for players of traditional instruments or, sometimes, for improvisers.
Although many of my colleagues from within the composing and improvising scene are working with “Indian rhythmical concepts“ like *solkattu* (verbalised rhythm) and *kanakku (calculation),* I

have not yet encountered much literature that aims to systematically collect a variety of rhythmical devices. One of the best books on this topic is called *Applying Karnatic Rhythmical Techniques to Western Music* by Rafael Reina published in 2015. It turned out to be of great use when it comes to having a multitude of Carnatic techniques explained in full detail. This book systematically presents the results of two decades of his research, containing concepts, detailed explanations, examples written in western notation and even a collection of 262 audio-tracks which he calls a „Karnatic metronome“ (Reina, 2015)
But still, there seems to be no literature in the West on how Carnatic rhythmical devices can be a useful source of inspiration for composers.

The Structure of this Text

This text is divided into two parts. The first part presents an introduction into Carnatic music and its concepts, offers a collection of different rhythmical devices and how they are built and used within their traditional framework.
The second part consists out of two sections: The first one (Stage I) provides an overview on how the Carnatic system has already been used by either western contemporary classical composers in the 20th century or within Jazz and Rock music. It also lists a few examples of specific similarities between western compositions and creative Carnatic devices. The second section (Part II) offers an insight into my own work as a composer and the creative application of the Carnatic system in it as well as a creative guide on how these elements could further be used.

The Choice of this Topic

Indian classical music has intrigued me from an early age on since being exposed to it by listening to recorded music on CD. But so has Western Classical music and composition, especially the instrument piano, which I am now studying now for more than 27 years. Both traditions come with their own canon of aesthetic ideals, sets of rules and of course quite different historic developments.

On either side traditions have also had a chance to draw ideas from each other. From during the beginning of the colonisation of India in the fifteenth century when India was introduced to Western music, when composers like Mutthuswami Dikshita (Durga, 2011/2012,31-35) in the eighteenth century or Rabindranath Tagore in the nineteenth century appeared and up to many examples of the

twentieth century of a hybrid style (which oddly peaked after Indian independence) can be found. Composers like Terry Riley or players like Ravi Shankar can be seen as main exponents.

It is quite fascinating that the arising of early Indian music happens during the same period during which the Greek musical system was established by Pythagoras in 510 BC, as Arthur Popley stated (Popley, 1971, p.9). He concludes that it seems likely that contact between the Early Greeks and Ancient India have also contributed to a number of similarities between the musical cultures. Two Early Greek scales (*Mixolydian* and *Dorian*) are for example similar to early Indian scales (Popley, 1971, p.28), a common ground on which future developments could have appeared. So why not follow the idea of hybridisation? Certainly, many other attempts to fuse at least elements of both styles have recently been made, the most prominent one being the harmonised music produced by the Hindi Film Industry. (Caldwell, 2015)

From my own experience I know that Fusion-Style-Music seems to be very popular amongst young musicians and audiences in India. However, I have not come across any literature yet that aims to point out how the richness of Indian classical rhythmic-devices has been or may be implemented into Western music. This text shall aim for exactly that.

Origins

Within Indian culture, music and arts have always played an important role and have been associated to religious rituals since ancient times. Even the very refined classical music tradition with its highly trained players and virtuosic exponents has their root in devotional music and chants. (Beck, 2000)

Similar to the music development in the West where church-music provided the foundation for classical traditions

> "the religious music of the various bhakti or devotional movements, along with the musical styles inherited from the ancient period, provided raw materials for the polished classical music heard today, both the northern Hindustani and the southern Karnataka traditions." (Beck, 2000, p.246)

Within one of the oldest bodies of religious Indian literature, the Vedic scripts, a collection of sacred texts, chants and prayers originating 1800-600 B.C. are dedicated to a multitude of gods. (Howard, 2000, p. 238)

Passed on by oral tradition and a later documentation in *Sanskrit* language, the Vedas have been successfully preserved. Music is often mentioned in these texts and some passages even contain the use of percussion instruments, some even the use of odd meters. (Young, 2010) Being rooted in the spiritual realm, Indian music of its very ancient origin can also be considered to have emanated from the universal sonic sound 'OM'. (Kumar 1987)

Spiritual music has been mainly played in aristocratic courts. Beside its clear influence on Indian classical music, the not necessarily more secular developments of folk music have also contributed to the uprising of Indian classical traditions:

> "It is generally accepted that the roots of every system of 'Classical-music' may be traced to ‚Folk-music'. It is equally true that 'Folk-music' in its turn has been greatly influenced by ‚Classical-music'. Orthodox religious faith and folk-cults inspire growth of existing arts and the flowering takes place." (Kuppuswami, 1992, p.130-131)

The long and rich history of this music must clearly be acknowledged. A sophisticated and almost scientific approach to this form of art has been kept alive for thousands of years and great advancements have been made over time.

Hindustani & Carnatic

Hindustani music is the classical music tradition in Northern India whereas Carnatic music is known as the Southern school of music. In Tamil language Carnatic means 'traditional'. It is said that both traditions originated from the same source but started to differentiate around the 12th and the 13th century when the Moguls established their empire in the North of India. Because of their connection to Arabia and Persia due to their Muslim faith, they also introduced elements of Arabian music into the prevalent system which eventually resulted in new melodic and rhythmic forms. The music in the South of India remained 'untouched' by foreign elements. (Sankaran 1994; Subramaniam 1990) As Kanthimathi Kumar puts it:

> "In ancient times one system of music prevailed throughout India. […] With the advent of freight influence through repeated invasions, the music in the north of India underwent many changes and evolved into the Hindustani system. The music of the South came to be known as Carnatic music. Because of the predominantly peaceful political and social life in the region, this system more or less retained its pristine form, although it absorbed some important features of the music of the ancient Tamils of the South" (Kumar, 1987, p.1)

One of the clear and obvious differences between Hindustani and Carnatic music is how the voice gets produced and in addition to that the whole system of *gamakas* (a complex and distinctive system of melodic ornamentations) clearly separates both systems. (Kuppuswami, 1992, p.iv)

In addition to that, Carnatic music is nowadays much more based on fixed compositions whereas improvisation is one of the strongest elements in Hindustani music.
Kuppuswami (1992) finds the comparison of both musical systems in a way similar to how languages could be compared. As he states, certain types of speech sometimes differ only in their verbalisation and others mainly in their grammatical structure. (Kuppuswami, 1992, p.iv) In a way this comparison is a well chosen one since both the musical similarities as well as the differences even vary depending on the geographical context within India.

What both systems have in common is the verbalisation of rhythm (*Konnakol*). However, the northern music is much more connected to the actual strokes (*bols)* a tabla player would perform and is not handled as freely as *solkattu,* which probably is the reason why the southern system is also more structurally complex and richer in varieties.

Gurukula System

For many centuries the tradition of Classical Indian Music has been conserved, transmitted and handed down orally from generation to generation. The traditional form of study music is the g*urukula system,* which asks the student to live with his master as part of their household. This way a student can take lessons and learn from the teacher (*guru)* on an everyday basis. It also ensures that a student can be present in the most creative moments of the teacher.

Students usually start at an early age as many instrumentalists report having started at an age between five and seven. Within the early years of study, the musical authority of the *guru* must not be questioned. Although it appears to be authoritarian this system encourages a certain way of continuity and stylistic preservation. (Nelson David Paul, 2000, p.140-151)

Systemic Advantages

One clear advantage of this musical system in general lies in the continuous repetition of the *tala* (cycle), which allows a performer to repeat phrases over the same context and display the different aspects of phrasing one can apply to any material. When learning Carnatic music, any instrument or vocals, each student is also confronted with strict and pure rhythmical practice. (Reina, 2015)

Rhythmic training is an inherent part of every musician. Usually every melody is also expressed in its pure rhythmical form by making use of *solkattu*. This guarantees that all the players in an ensemble are rhythmically competent, which furthermore also provides many more liberties to the players of percussion instruments.

Percussionists can play a much more active part and operate on a more creative level compared to how timpani or drum sets are mostly used in the West. The fact that at least one person in the ensemble is always keeping *tala* (conducting the rhythmic frame) ensures the musicians won't 'fall off the train' even when complex layers of polypulses are performed.

West and East

During the sixties and seventies of the twentieth century Indian classical music gained popularity in the West. Certainly, the Beatles' interest in Eastern music and philosophy highly contributed to that uprising by connecting their large Hippie audience to exponents of (mostly Hindustani) musicians like Ravi Shankar, Alla Rakha, Zakir Hussain or Ali Akbar Khan.

When Shankar performed for large audiences in the West, he was quickly put in line with pop and rock-superstars like the Beatles or Jefferson Airplane. On top of his performances also his explanations of how the Indian musical system works were highly appreciated. Ravi Shankar became

> "*a household name to '60s music lovers and to many, synonymous with Indian music*." (Rossi, 2013)

Many western rock groups even named Indian music as a direct influence: The Jimi Hendrix Experience, The Grateful Dead, The Doors, The Jefferson Airplane or Cream. (Rossi, 2013) Listening to the music of these groups, it becomes evident how much their style shows similarities with Indian classical music, with special regard to the long instrumental solos, expressive and mostly improvised parts.

Nowadays it is not hard to come across Indian music in the West. Most of it seems to take place at festivals for that specific purpose or, of course, in Indian restaurants, sometimes in yoga clubs or the 'world-music-section' at the local record store - if there is still is one around. But even modern streaming platforms provide Indian classical music and all its sub-genres.

Clearly, Indian classical music has its similarities to its Western equivalent, especially when it comes to the expectations of the musicians to their audience. Listeners must bring along a certain level of concentration in order to make the consumption of this form of art pleasurable. Truly listening and understanding both of these traditions is not something that can be easily achieved and certainly must be cultivated over time. But most importantly, this music must be experienced live.

Part I

An Explanation of Basic Carnatic Concepts, Techniques and Devices

Fundamentals

The Tala System

Talas are the fundamental metrical framework, similar to a blank canvas on which all rhythmical devices within both the Hindustani and Carnatic tradition are beeing painted. They can be referred to as repetitive musical meter measuring time. However, talas can be of a much more complex and elaborate nature when compared to the traditional European musical meter. Basically, they are cyclically repeating structures, starting and ending with a piece of music. Every traditional piece of music gets composed within this structure of beats. (Nelson, 2000)
The construction of a tala follows very specific rules which also have a determining effect on many musical decisions, for example where phrases or rhythmical devices within a tala would start or finish.
Talas can be as short as 3 beats or as long as 128 beats and a cycle can take up to a minute to complete when performed. (Nelson, 2000)

> "The main role of the tala is to provide regularity to all performers so that the continuous illusion of tempo and metre changes that the many techniques provide has a constant common denominator throughout a piece of music." (Reina, 2015, p. 13)

There are various forms of tala, each one is constructed following a specific set of rules. The two most important types of talas either belong to the *Suladi sapta tala system* or the system of Chapu talas:

Suladi sapta tala system

Suladi talas are made of construction blocks of different size, the so called *angas*.
The three types of *angas* are:

- *Andrutam:* Of the length of one beat. It must always be followed by a *Drutam*
- *Drutam:* Of the length of two beats. It can only be used when at least one *laghu* is part of the *tala*.

- *Laghu:* Of the length of 3, 4, 5, 7, or 9 beats. The length chosen for the *laghu* must remain the same if it is used more than once within one tala.
  - A *laghu* of the length of 3 beats is called *tisra jati*
  - A *laghu* of the length of 4 beats is called *chatusra jati*
  - A *laghu* of the length of 5 beats is called *khanda jati*
  - A *laghu* of the length of 7 beats is called *misra jati*
  - A *laghu* of the length of 9 beats is called *sankirna jati*

Example: If we would like to construct a *tala* of the length of nine beats (*aksharas*) the following types would be possible:

L^3-A-D-L^3 L4-D-A-D L^3-D-D L^7-D L^9

However, according to the rules stated above this *tala* could not be constructed the following ways:

L^7-A-A (because one *andrutam* must always be followed by a *drutam)*
L^3-D-D-D (because a *drutam* cannot be used more than twice within one *tala*)
L^3-A (because *laghu*^{8} does not exist and one *anga* must be followed by a *drutam*)

The following chart shows the 35 talas that are used nowadays in Southern India. (Reina, 2015, p. 15-16)

Chart 1: the 35 talas

	JATI	ANGA	NAME	# Beats		JATI	ANGA	NAME	# Beats
1	Tisra	L3 D L3 L3	Mani	11	19	Misra	L7 A D	Sura	10
2	Chatusra	L4 D L4 L4	Srikara	14	20	Sakirna	L9 A D	Kara	12
3	Khanda	L5 D L5 L5	Pramana	17	21	Tisra	L3 D D	Sankha	7
4	Misra	L7 D L7 L7	Purna	23	22	Chatusra	L4 D D	Adi	8
5	Sakirna	L9 D L9 L9	Burana	29	23	Khanda	L5 D D	Dulshkara	9
6	Tisra	L3 D L3	Sara	8	24	Misra	L7 D D	Lila	11
7	Chatusra	L4 D L4	Sama	10	25	Sakirna	L9 D D	Bhoga	13
8	Khanda	L5 D L5	Udaya	12	26	Tisra	L3 L3 D D	Gupta	10
9	Misra	L7 D L7	Urdina	16	27	Chatusra	L4 L4 D D	Lekha	12
10	Sakirna	L9 D L9	Rava	20	28	Khanda	L5 L5 D D	Vidala	14
11	Tisra	D L3	Chakra	5	29	Misra	L7 L7 D D	Loya	18
12	Chatusra	D L4	Patti	6	30	Sakirna	L9 L9 D D	Dhira	22
13	Khanda	D L5	Raja	7	31	Tisra	L3	Sudha	3
14	Misra	D L7	Kula	9	32	Chatusra	L4	Mana	4
15	Sakirna	D L9	Bindu	11	33	Khanda	L5	Rata	5
16	Tisra	L3 A D	Kadamba	6	34	Misra	L7	Raga	7
17	Chatusra	L4 A D	Madura	7	35	Sakirna	L9	Vasu	9
18	Khanda	L5 A D	Chana	8					

Conducting of *suladi talas*:

David P. Nelson introduces the art of conducting *suladi talas* as follows:

> "Possibly the most striking feature of a tala is that it is not written down. It is counted gesturally, by clapping, waving and touching the fingers sequentially to the other hand or thigh. […] The gestures that count talas are not chosen randomly but have been passed from teacher to student in an evolving transmission going back more than two thousand years." (Nelson, 2000, p. 138)

This is how angas are conducted:

Andrutam is conducted as a downward clap (palm face down).
Drutam is conducted as a downward clap (*tattu,* palm face down) followed by a downward clap (palm facing up - or in case *Drutam* is the last *anga* within the tala, it will be conducted as a wave (*viccu*), clearly signing the end of the cycle).
Laghu is conducted as a downward clap (palm face down) followed by finger counts adding up to the total sum of beats of the *laghu*. For example, *khanda laghu* is conducted with one clap followed by 4 counts with the fingers.

The Chapu Tala System

This collection of mostly faster talas has been derived from folk music. There are no *angas used*. The strongest point is again *tala sam*. *(*Reina, 2015*)* There are four kinds of *chapu tala:*

- *Tisra chapu* is counted: 1+2
- *Khanda chapu* is counted: 2+1+2
- *Misra chapu* is counted: 3+2+2 or 2+2+3
- *Sankirna chapu* is counted*: 2+2+3+2*

The Main Talas used:

Even though there is this great variety of *talas,* from my own experience I can say that there are only few ones that are most commonly used:

- Adi Talam (8 beats)
- *Rupaka Talam (6 or 3 beats)*
- *Kanda Chapu Talam (5 beats)*
- *Misra Chapu Talam (7 beats)*

Influence of talas on the musical development:

One of the most frequently used techniques of articulating the tala is to accentuate the downbeat of tala, called *tala sam,* or also on downbeats of any of the *angas*. Whenever polyrhythmic concepts or polypulses of any kind are applied to a *tala,* resolving points should these. (Reina, 2015)
However, there is no need to put an emphasis on every *tala sam*. This is increasingly so as certain rhythmical devices aim to create musical illusions like a *meter change* where an emphasis on *tala sam* would be merely counterproductive.

A maybe even stronger influence on the musical development lies within the fact that the *tala* is always visually present by being conducted with hand gestures called *kriyas*. (Reina, 2015) This conducting, which is often called *keeping the tala is* mostly done by at least one of the musicians or the singers on stage.
This way the *tala* as the metric container does not have to be articulated in any form of repetitive element like a melody or a riff, which allows the musicians to create up more abstract musical content and built up rhythmical architecture based on arithmetical principles.

Laya:

The concept or speed or tempo is called *laya* and it comes in three general forms:

- *Vilambit laya* - a slow tempo between 20 and 46 beats per minute
- *Madhya laya* - a medium tempo between 46 and 66 beats per minute
- *Drut laya* - a fast tempo, anything above around 66 beats per minute.

Compared to the tempi usually used in western music, a rate of 20 or even 40 beats per minute seems quite slow. However, the tempo of the *tala* does not necessarily represent the tempo of the actual music performed on top of it.

Avartana:

A basic element of Indian classical music is the cyclic repetition of the *talas*. Once a tala is completed this is called an *avartana (cycle)*. Considering the whole background of Hindu-religion and the concept of *samsara, the "cycle of aimless drifting, wandering or mundane existence"*, (Firth , 1997) it seems just obvious that the conception of rebirth and repetition also left its marks within in the territory of music.
During most concert recitals, the formal section that is usually given to a percussionist (mostly the mridangam player) in order to perform a percussion solo is also called *tani avartanam*. Although this term roughly translates to *small cycle,* this solo section usually comprises several cycles (*avartanas*) and may last a number of minutes.

Akshara

Lexically speaking, *akshara* means "without destruction". This term often relates to the number of beats within a tala. For example, in *Adi tala* there are eight beats (*aksharas*). In certain talas where not every *anga* is accentuated, the pulsating pauses between the accentuations are also considered as *aksharas*. For example the second value of 2 in *tisra chapu, which is* counted 1+2.
As stated above the term *akshara* is sometimes mixed-up with the term *matra*.

Matra

In Sanskrit *matra* stands for *dose, amount or degree*. Within music *matra* is usually referred to as the smallest unit of time measurement and is used to denote the length of a phrase or the number of syllables between two beats and therefore are of fundamental value for *kanakku* (calculation within rhythm). Depending on *laya* groups of *matras* are summarised as *gati*. A certain group of *matras* will also complete one *akshara*.

For example, if four *matras* are used to fill the space between two beats (*aksharas)* within a cycle of eight beats in total (*adi tala)* a total sum of 32 *matras* will complete one cycle (*tala*).

Gatis

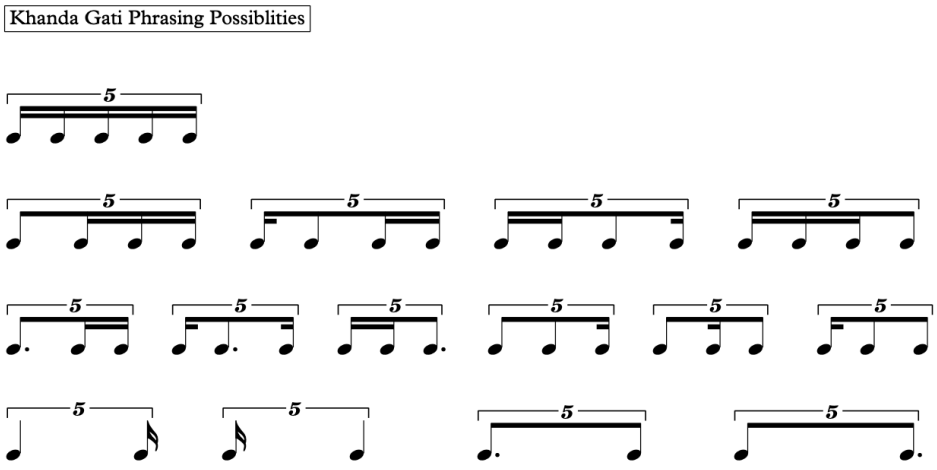
The number of equal divisions (*matras*) of one beat (*akshara)* is called *gati*. There are five basic forms of *gati:*

name of gati	number of matras	equal to
Tisra Gati	three matras	triplets
Chatusra Gati	four matras	duplets
Khanda Gati	five matras	quintuplets
Misra Gati	seven matras	septuplets
Sankirna Gati	nine matras	nontuplets

According to Reina (2015), within a *tala* a change of *gati* can only happen on tala *sam* after completing one full *avartana*.
Although from creative point of view this seems to be an antagonistic rule, the plurality of techniques that could have only been developed on top of the gati-system relativizes this restricting factor, sometimes even by simply suspending it.

However this concept is different from western music where a beat of, for example, *misra gati* (septuplets) theoretically could easily come after a beat of *tisra* (triplets) after any number of bars.

Example: Khanda gati phrases: (each line using a different number of notes)



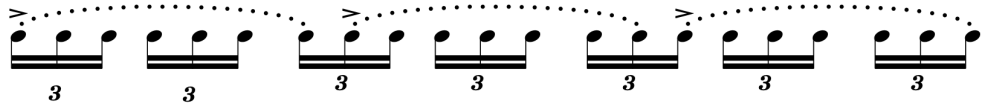
Jahtis

The term *jathi* stands for how a phrase is actually accentuated and whenever a systematic accent (or stress) is applied to a *gati*. It is one of the most fundamental concepts in Carnatic music, hence all students are asked to excessively practice all possible combinations of *jathi* and *gati*. (cf. Reina, 2015)

The concept of j*athi* is similar to the basic system used in western music to create polymeters like 3:5. In this particular case there will be an accent on every third note within a *khanda gati,* a subdivision of five. Needless to say that the amount of *matras* within a *jathi* must always be different from the amount of *matras* of the *gati* it is applied to and therefore must always result in an accentuation crossing the beat (*akshara)*. For every *gati* there is the possibility of three *jathis*. A *jathi* can cover the amount of three, four, five and seven *matras*.

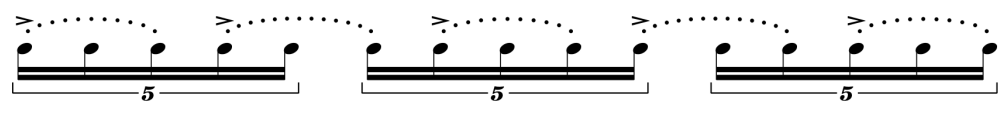
For the following examples we are going to write *tisra jathi7* for a *jathi* that covers 7 *matras over a tisra gati* (3 *matras)* and so on.

Tisra Jathi 7



Looking at the example below, *Khanda gati* allows to apply either *jathi3, jathi4 or jathi7* to it. One possible result can be *Khanda Jathi3:*

Khanda Jathi 3



It is important to mention that the nomenclature system used (like „*Khanda jathi3*“) is not the traditional way Carnatic musicians would communicate their ideas. This system has been invented

by Rafael Reina (2015) in order to illustrate the idea of *jathis* being superimposed on *gatis*. A traditional musician would rather say '*khanda in tisra',* referring to the musical idea mentioned above. (cf. Reina, 2015, p. 45)

Jathi Bhedam

In Sanskrit language *Bhedam* means something like 'change by destruction', a concept which is again deeply rooted in the spiritual system of Hindu-culture. When this concept is used it results in a succession of spontaneous (non regular) application of accents over a *gati* and aims for the illusion of a permanent change of meter. (Reina, 2015)
Therefore, the idea of *jathi bhedam* is to make the listener think that a certain section of the piece is in a different rhythm or even a different meter than it actually is.
When a jathi *bhedam* sequence is calculated, it will usually be done within the framework of the length one or two talas, which also clearly differentiates this concept from the frequently used western term *amalgamation*, that allows to carry on the illusion of a meter change for much longer times. (cf. Reina, 2015, p. 4)

A *jathi bhedam* can either be played by all players collectively as this is usually the case within the concept of *amalgamation* (although there are exceptions like in some works of Charles Ives, as Raffael Reina pointed out) or be executed by one player only whereas the other musicians stay in a different meter. In any case the *tala* does provide a solid rhythmical reference. (cf. Reina, 2015, p. 69)

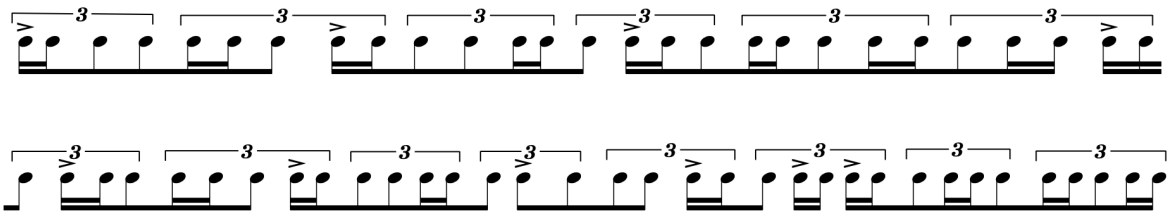
In order to construct a sequence of *jathi bhedam* we again need to do some *kannaku:*

> Let's decide upon a *tala* of seven beats, in this case *misra chapu,* a number of two cycles (*avartanas*) and a subdivision of three *matras* per beat (*tisra*), which results in a total of 42 matras.
>
> Now we have to choose sequences of a length that, when its parts are added together, will result in the total length of our 42 *matras*:
> for example:
>
> *2 times 7* *3 times 5* *2 time 4* *2 times 2* *1 time 1*

Now let's find an order in which the phrases above appear. According to Carnatic aesthetics it is now important that none of the phrases synchronise with the *akshara*, which would somewhat destroy the concept of destruction itself. Further, two consecutive beats should be omitted (therefore we must avoid the number 3 since in *tisra gati* a sequence this would result in the accentuation of the same beat). A sequence of the same phrase more often than three times and an accentuation of *tala sam* in the middle of one *avartana* (if one then more cycles have been chosen) should also be avoided.

After considering all regularities above our arrangement could for example look like this:
5 5 7 2 4 5 4 2 1 7

Example 1 Jathi Bhedam

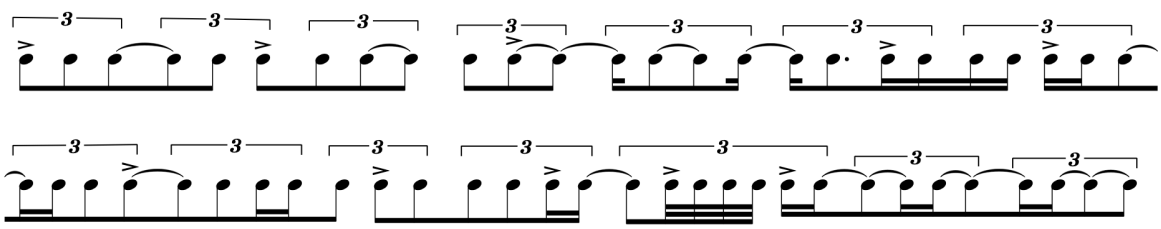


According to Raffael Reina (2015), the general phrasing within a *jathi bhedam* can be constructed in two ways:

- it can be free: in this case the phrasing needs to be created around the accents of the *jathi bhedam* (like the example above)
- or it can be built in a systematic way: A specific number of notes can be played within each cell: 1, 2, 3, 4, 5 or more.

The example below is created with four notes per cell:

Example 2 Jathi Bhedam (four notes per phrase)



Solkattu

Every phrase, *gati* and *jathi* comes along with a specific set of syllables used to internalise and express their structure, called *solkattu*. In Tamil language the word *solkattu* roughly translated means "words bound together". (Nelson, 2008, p.1) Basically, most of these 'words' are percussive sounding syllables beginning with consonants that can be joined to phrases (for example: *ta ki te*), which again can be combined and used as construction devices for larger phrases or even rhythmic sentences.
Every pattern and structure in Indian classical music can be expressed in *solkattu*. Rhythmic phrases that ought to be sung, played, danced or drummed and that make use of the *tala* system can - along with the *kriya* gestures - be spoken with these syllables.

For instrumentalists *Solkattu* can turn into an own kind of '*instrument'* and a very powerful tool for precision especially since the hands can be taken off the instruments and used for simultaneously keeping *tala* while speaking the syllables. Herein lies the big advantage of *solkattu* and *tala*:

> "By reciting the patterns vocally […], students walk a razor's edge: too much concentration on the phrases causes the tala to falter; too much concentration on the tala and the syllables break up. In either case, the student is quickly aware of the error and knows there is more work to do to master the pattern." (Nelson, 1999, p.151)

Musicians have complete freedom to use any combination of *solkattu* syllables for any phrase of any length as long as the combination is reasonable from the perspective of pronunciation and accentuation. The basic four *solkattu* syllables are:

Tha Dhi Tom Nam

The following collection of syllables that are also used in *konnakol* represent a verbalisation of the basic strokes on the *mridangam,* the main instrument in Carnatic rhythm:

Ta	*Ki*	*Ta*
Na	*To*	*Ka*
Mi	*Di*	*Ghi*
Jha	*Ku*	*Nam*
Ri	*Gu*	*Laan*
Ga	*Nu*	*Ku*

The most common phrases used to express sets of different length are:

one syllable:	*ta, di, ki, tam, jem*	
two syllables:	*ta ka*	*di mi*
	jo nu	*ti ku*
three syllables:	*ta ki ta*	*ta ki te*
	ta.an gu	
four syllables:	t*a ka di mi*	*ki ta ta ka*
	ta ka jo nu	*ti ku ta ri*
five syllables:	*da din gi na tom*	*ta ka ta ki ta*
	ta di ki ta tom	*ta ki ta ta ka*
six syllables:	*ta ki ta ta ki ta*	*ta ka di mi ta ka*
	ta din . gi na tom	
seven syllables:	*ta . din . gi na tom*	*ta ka ta di ki ta tom*
	ta ka ta din gi na tom	
eight syllables:	*ta . din . gi . na tom*	*ta ka di mi ta ka ju nu*
	ti ku ta ri ki ta ta ka	
nine syllables:	*ta . di . gi . na . tom*	*ta ka di mi ta ka ta ki ta*
	ta ka ti ku ta di ki ta tom	

Phrases longer than nine *matras* will usually include rests.

Solkattu Notation

Bearing in mind that the tradition of Carnatic music has been orally transmuted over centuries, (Lewis, 1999) attempts to notate rhythm and the way of how it can be done have always been of an individual preference. However, a few notational compromises seem to have been intermingled amongst the diaspora of musicians over the last decades. But due to the fact that *solkattu* spellings already vary to quite some extent within the different schools, regions and languages within India, one nowadays might come across an even greater diversification of syllables and phrases translated into global languages and systems.

Within English, variances of *solkattu* following spellings are accepted for the same phrase:

tha te ke ta tom *ta te ke ta tom* *ta din gi na tom* *tha thin ke na thom*

Note: When played on the *mridamgam* the use of the letter '*h'* (like in '*Thom*') usually indicates that in addition to the right hand '*Ta'*-sound also the left hand is used to simultaneously play the open '*Tom'* sound. A similar system is used in the Hindustani system when for example '*Dhin*' is played on the tabla it also indicates to play an open '*Ghe*'- sound on the *bayan* (left hand drum).

In addition, there are several ways of writing the rhythmic value of syllables. Accepted compromises seem to be that one syllable equals the value of one *matra*. Once this value needs to be extended, either a dot, a semi-colon or a raised numeral can indicate the length:

Thin . or	*Thin ;* or	*Thin*^{2}	each equal two matras
Thin . . or	*Thin ; :* or	*Thin*^{3}	each equal three matras

Underlined phrases indicate the double speed of a phrase:

ketataka	this phrase built with four syllables now equals two matras

Abbreviations used:

kttk	equals the phrase *ketataka* and is again two matras long
tdgnt	equals the phrase *ta di ge na tom* and is of the length of five matras

In order to notate the placing of the pulse, the following ways are accepted:

Chatusram:

- ***Ti** ku ta re ke ta ta ka **Tha** . . .*
- *TI ku ta re ke ta ta ka THA . . .*
- **Ti ku ta re ke ta ta ka *Tha*

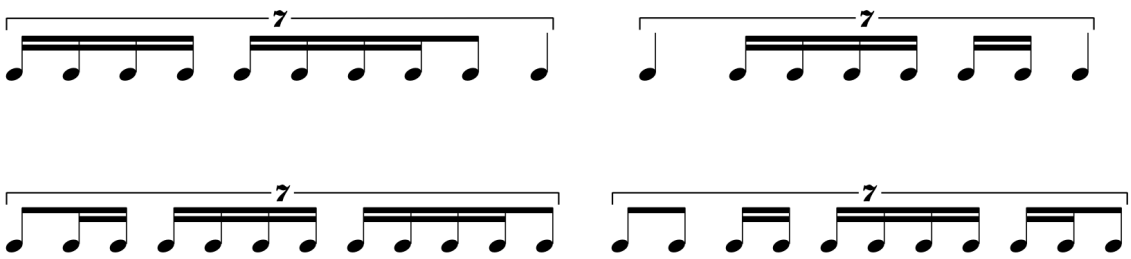
Once a consistent system is used it becomes quite easy to read. Here is an example in the traditional Indian way and western notation:

Misram:

kt tk tr kt tm tet . tam . tr kt tk tet .

tam kt dg tr kt tk dn ta dn kt dg tk tr kt

Misram:



Techniques, Structures and Devices

In this chapter I would like to introduce a selection of basic traditional creative concepts and ideas that draw from the principles introduced in the chapter *Foundations*:

Mōrā

The *mōrā* is a fundamental cadential structure in Indian classical music, mostly used to end longer and/or shorter sections within a song or an improvisation. Similar to what is called *tihai* in Hindustani music, it comes in countless forms and varieties but all being strung together by their inner grammatical structure:

(statement) [gap] (statement) [gap] (statement)

Any phrase a musician wants to introduce can potentially be used as a statement. However, it must comprise at least one *matra*. Statements either are identical or must follow a symmetric shape (see chapter *yati phrases)*. A [gap] may be of the value of zero (0) and therefore exist only as potential or of any higher value covering several *matras*. The two [gaps] can either be played or remain silent and must be identical in length.
Within all the possibilities of how a *mōrā* can be constructed, there will be always the ones in favour that displace the second and third *pala* in relation to the beat so that maximum rhythmic tension gets provoked.

Often, when Carnatic drummers play a series of *mōrās*, they would expand or reduce the length of the (statements) or the [gap] each time as the example below demonstrates:

Srotovaha yati:

(statement)	*[gap(0)]*	*(statement)*	*[gap(0)]*	*(statement)*
(statement)	*[gap(1)]*	*(statement)*	*[gap(1)]*	*(statement)*
(statement)	*[gap(2)]*	*(statement)*	*[gap(2)]*	*(statement)*

Variations can be made following geometric shapes even within one line of the *mōrā*:

(statement 3) [gap] (statement 5) [gap] (statement 3)

Here the *mōrā* follows the geometric barrel-shape of a mridangam, the main South Indian percussion instrument. Wile *mōrās* can follow certain geometric shapes the same geometric structures are often also used even without the construction of a *mōrā* (see chapter *yati phrases*).

Other forms of variation could be based on the principles below:

AAA [gap] BBB [gap] CCC

or

666 [gap] 777 [gap] 888

or

333 [gap] 555 [gap] 777

or

999 [gap] 666 [gap] 333

Construction of a Mōrā

If it has not been chosen already, the *gati* needs to be fixed. In addition to that the number of beats the *mōrā* will cover need to be chosen. As an example we are going to construct a *mōrā* of a special kind: It will cover a whole *avartana* and is therefore called *sama muktai*. However, a *mōrā* could also be of a shorter or longer kind. Usually, very short *mōrās* are then called *arudhi*.

Our chosen *tala* has a length of five beats (*khanda chapu)* and *gati* will be *khanda*. This results in a total sum of 25 *matras*.
Because our *mōrā* will consist of three *palas* we now must divide the number of *matras* by 3. The result of course is 8,333… or in other words we can have three *palas* of the length of 8 *matras* and one *matra* left for the [gaps].

8 + [1/2] + 8 + [1/2] + 8

Nonetheless, a division of that one remaining *matra* by two, which would result in the length of 1/2 *matra* per [gap] is usually avoided. Therefore we must subtract at least one *matra* from each one of the three *palas* and add the remaining *matras* to the two [gaps]. The result is a *mōrā* that will work and look like this:

7 + [2] + 7 + [2] + 7

In case we would now like to reduce the length of our *palas* even more, we could subtract one *matra* from each of them and the result will be *palas* of the length of 6 *matras and* seven remaining *palas* for the [gaps]. Here again we would like to avoid this fractional number of *matras* in the [gaps]. Therefore we are going to round up the fractional number in every [gap] to a whole number move and the last *matra* of the third *pala* to the right, resolving on *tala sam*.

~~6 + [3,5] + 6 + [3,5] + 6~~ | *tala sam* (would equal 25 *matras)*

6 + [4] + 6 + [4] + 6 | 1

In this case we must make sure that the last syllable of every *pala* is also accentuated. Otherwise *tala sam* would not be expressed accurately.

More possible variations for our *mōrā* (*sama mukthai):*

8 + [1/2] + 8 + [1/2] + 8

7 + [2] + 7 + [2] + 7

6 + [4] + 6 + [4] + 6 | 1

5 + [5] + 5 + [5] + 5

4 + [7] + 4 + [7] + 3 | 1

3 + [8] + 3 + [8] + 3

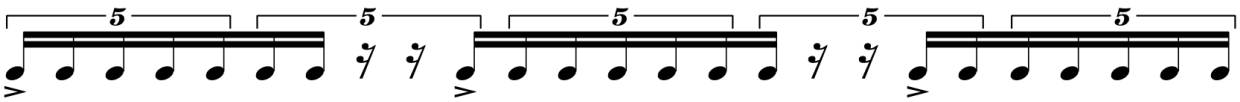
2 + [10] + 2 + [10] + 1 | 1

1 + [11] + 1 + [11] + 1

Out of these options the first one will be dismissed due to its fractional number of *matras in the* [*gaps*]. The third and fourth option will be dismissed due the fact that to each of the *palas* would start at the same place in relation to the beat. We choose option number two: 7 + [2] + 7 + [2] + 7

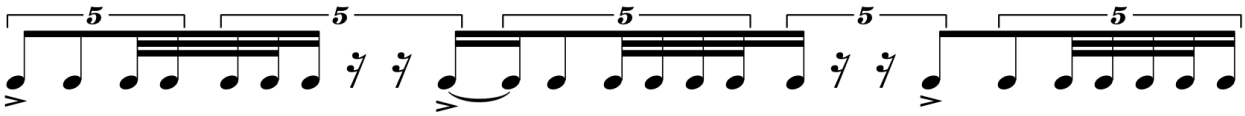
Here is the example in western notation:

mora example 1



But of course not all of the *matras* in each *pala* need to be accentuated and we can now form a *jathi: Ta . Din . Kt tk Tom*

mora example 2



Mōrā example 3 stretches over two *avartanas* (50 *matras* long) using much longer *palas* and also an accentuation on the [gaps] of the length of 4 *matras* using the syllable *[tam]* :

14 + [4] + 14 + [4] + 14

Tam . ke ta Ti ku ta re ke ta ta ka Dn. Ta . Tam . ke ta Ti ku ta re ke ta ta ka

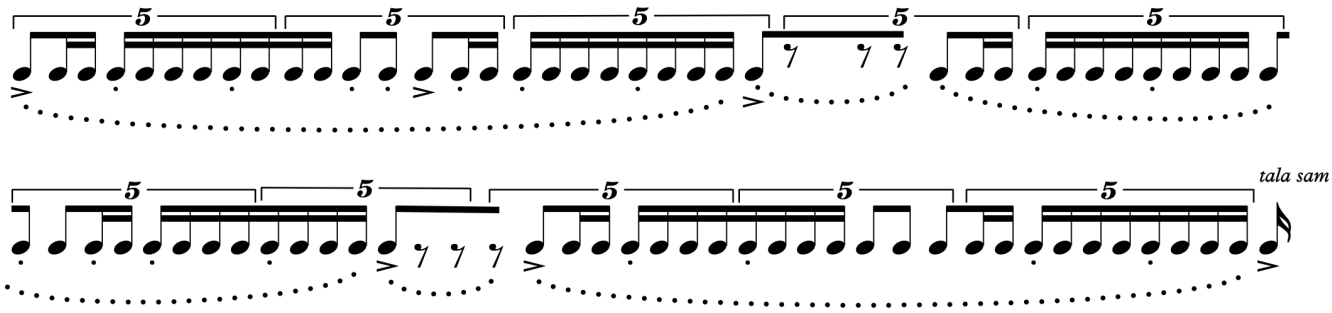
[tam4]

Tam . ke ta ti ku ta re ke ta ta ka Dn. Ta . Tam . ke ta Ti ku ta re ke ta ta ka

[tam4]

Tam . ke ta Ti ku ta re ke ta ta ka Dn. Ta . Tam . ke ta ti ku ta re ke ta ta ka

mora example 3



Anuloma-Pratiloma / Change of Speeds

One of the more complex systems within Carnatic music is called *anuloma - pratiloma* or as it is often called *change of speeds*. This commonly used technique is basically a form of *metric modulation*, a special form of *gati/jathi-combination*. The idea implies a change of *gati* based on ratios of whole numbers whereas the *jathi* or the actually played phrase stays the same. *Anuloma* means that the number of *matras* between two *aksharas* gets multiplied, *pratiloma* refers to a division of *matras*.

Because mostly three different speeds are being used in concerts, this concept is also often simply called *three speeds*. However, up to nine regular *metric modulations* are being taught. The speed used to neutrally introduce a phrase without/before any modulation is called *1st speed*.

When *anuloma* is applied the number of *matras* increase and phrases become slower in tempo.

Gati / number of matras	1st speed	2nd speed	3rd speed	4th speed
Tisra	3	6	9	12
Chatusra	4	8	12	16
Khanda	5	10	15	20
Misra	7	14	21	28

When *pratiloma* is applied the number of *matras* decrease and phrases become faster in tempo.

Gati / number of matras	2nd speed	3rd speed	4th speed	5th speed	6th speed	7th speed
Tisra	3:2	-	3:4	3:5	xx	3:7
Chatusra	4:2	4:3	-	4:5	4:6	4:7
Khanda	5:2	5:3	5:4	-	5:6	5:7
Misra	7:2	7:3	7:4	7:5	7:6	-

A composition by the mridangam-artist *Rohan Krishnamurthy* illustrates this basic idea. The following composition (*jathi) is being played in three speeds:*

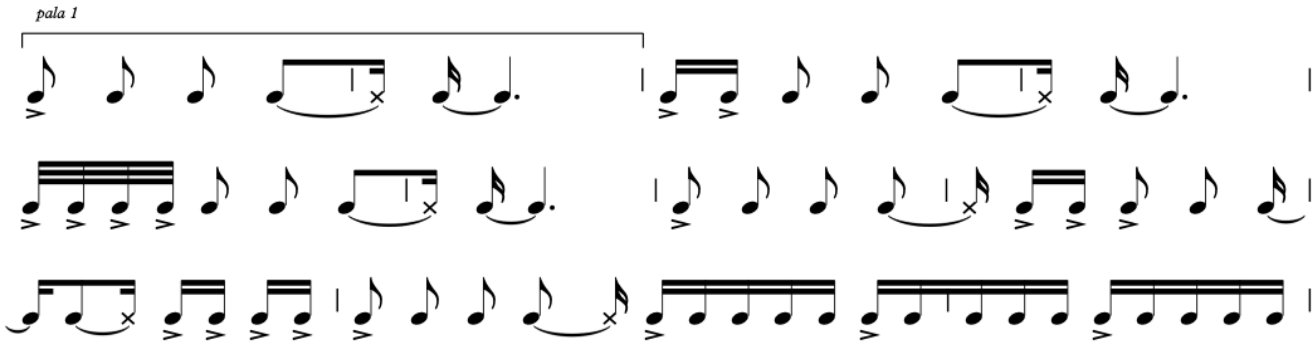
Adi Tala Chatusram:

Ta , Te , Tet , Tan , gu Tom , , , , , , // (pala1)
Ta ka Te , Tet , Tan , gu. Tom , , , , , , //
Tr kt Te , Tet , Tan , gu. Tom , , , , , , //
Ta , Te , Tet , Tan , gu. //
Ta ka Ta , Te , Tet , Tan , gu. //
Ta ka Ta ka Ta ka Ta , Te , Tet , Tan , gu. //
Ta di ge na tom //
Ta di ge na tom //
Ta di ge na tom //

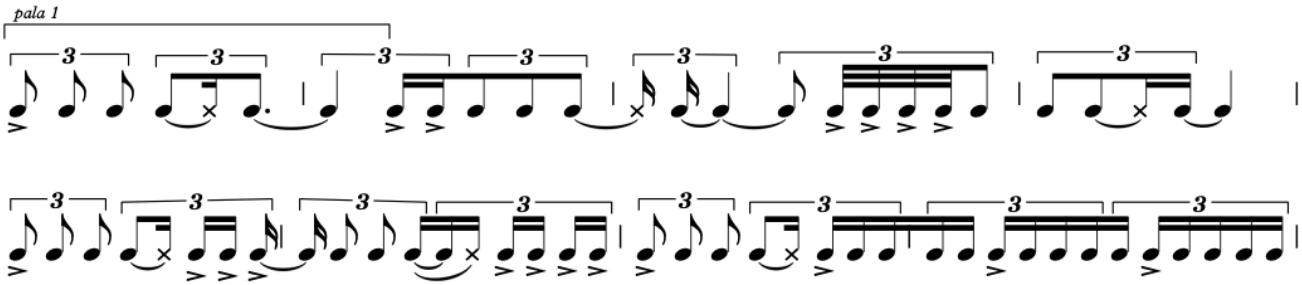
The western form of notation on the next page illustrates this idea quite clearly:

Rohan Krishnamurthy Pratiloma Example

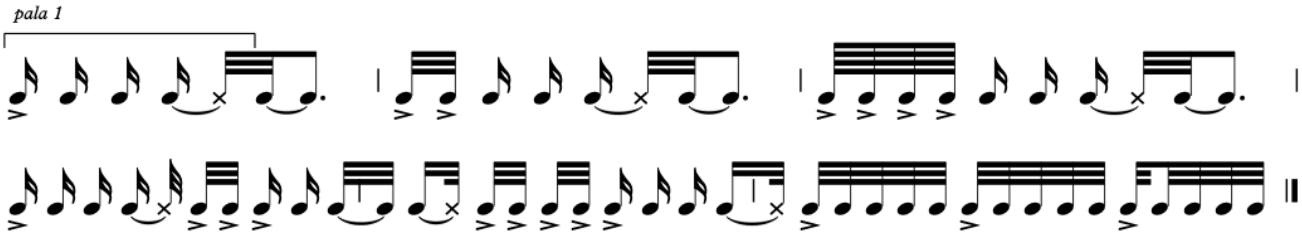
speed 1 - chatusram



speed 2 - tisra 3:2



speed 3 - chatusram 4:2



Tirmanam

A *Tirmanam is a* structural device based on the expansion or reduction of phrases in which notes are divided by the same number of *matras*. *(Example: Ta… Ka… Di… Na…)*

Tirmanams usually begin and end on *tala sam*. *Gati* stays the same whereas the *jathi* gets more and more compressed.

In order to construct a *tirmanam* the type of *tala* and the number of *avartanas,* hence the number of *matras* the complete structure shall cover must again be known and also number of notes for each phrase needs to be chosen.

In the example below the number of notes (the length of our first *jathi)* is going to be five (Ta di ge na tom), the *tala* will be *chakra tala* (five *aksharas)* and the *gati* will be *tisra (three matras per akshara)*. * This results in a total sum of 75 matras.

Ta . . . . . Di . . . . . Ge . . . . . Na . . . . . Tom . . . . .

Ta . . . . Di . . . . Ge . . . . Na . . . . Tom . . . .

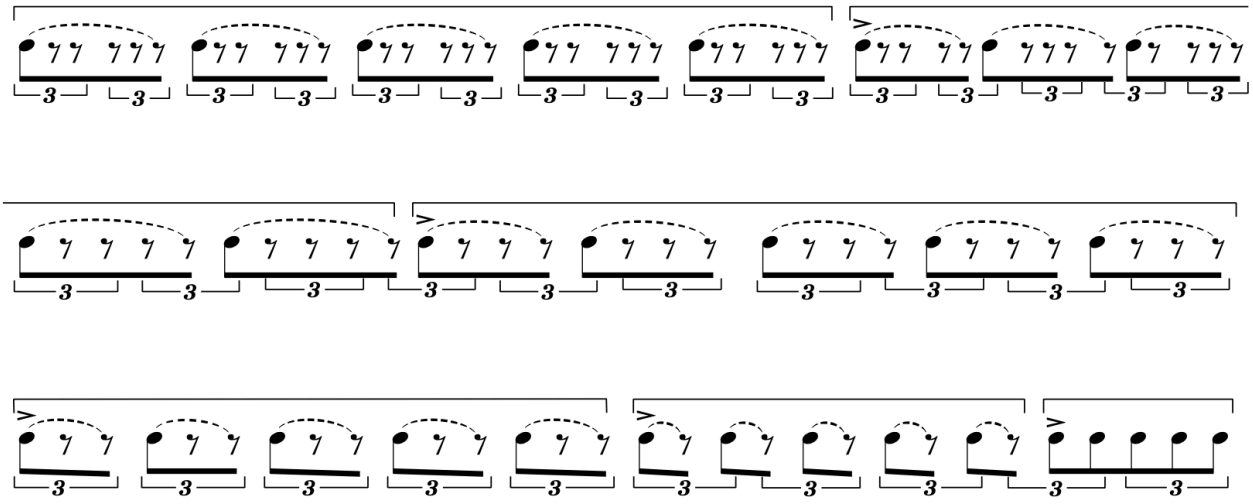
Ta . . . Di . . . Ge . . . Na . . . Tom . . .

Ta . . Di . . Ge . . Na . . Tom . .

Ta . Di . Ge . Na . Tom .

Ta Di Ge Na Tom

Tirmanam



Again, all kinds of variation are possible: For example, a *tirmanam* can be based on an expansion of *matras* (and not in length of *pala*) or *palas* can be increased or decreased by any systematic multiplication of *matras,* not necessarily by single steps of one. The number of *matras* in the very first *pala* could for example also be 13 and the last *pala* of a length of 4 *matras* (13,10,7,4).

* According to Rafael Reina, Tirmanas are being exclusively constructed in *chatusra*. (Reina, 2015, p. 123) However, for the idea of this text, the example given is constructed in *tisra*.

Peshkar

Peshkar is a musical form in Hindustani, the northern type of Indian classical music and is mostly common in solo tabla recitals. Literally speaking, *peshkar* means "presentation of a pattern“ and usually stands at the beginning of a concert. (Gottlieb, 1993, p. 62) Typically played in a slow tempo (*vilambit*) this section comprises all the different strokes and sounds that can be played on the instrument (mainly tablas). Most of the time *peshkar* patterns are composed in a simple form that allows to be slowly developed and taken into other forms of *gati*. According to Pandit Shalendra Misra *peshkar* is the only section within Hindustani music where *laya* can also be of a loose nature and patterns play with the space between the *matras*.
Peshkar is usually also - and so is the complete tabla solo recital - played over a melodic pattern called *lehra, which is* commonly played on a single instrument, either a *sarangi, esraj, sitar, sarod or others*. Based on the system of *tala* this pattern functions as a rhythmic framework, providing reliable points of rhythmic reference for the performer.

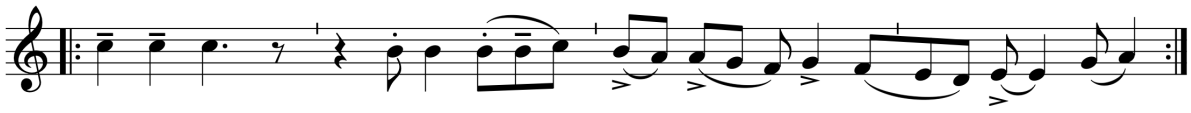
A *peshkar* composition can look like this. Variations that will be made on the main theme (called *paltas)* will gradually introduce other strokes (sounds) that have not been used in the theme yet.

Traditional peshkar:

Dhin. . Kre Dhin. Na.	Te. Dha. Dhin. Na.	Dha . Ti . Dha . . Kre Dha . Dha . Dhin . Na .
Te . . Kre . Ti Dha.	Dhin. Na. Dha. Ti.	Dha . . Kre Dha. Dhi. Dha . Dha . Dhin . Na .
Tin . . Kre Tin. Na.	Te . Ta . Tin . Na .	Ta . Ti . Ta . . Kre Ta . Ta . Tin . Na .
Te . . Kre . Ti Dha.	Dhin. Na. Dha. Ti.	Dha . . Kre Dha. Dhi. Dha . Dha . Dhin . Na .

The *peshkar* composition above could be performed based on the following *lehra:*

lehra pattern example



Yati Phrases

Yati phrases are a collection of phrases whose developments are based on geometric shapes. There are (theoretically) six different forms of *yati phrases (Trichy, 1994, p. 29-32),* each coming with their own set of rules. But all of them have in common that their development is constructed on variations of the first *pala* introduced. In this text I will only talk about the first five types of Yati-phrases since the sixth one is almost never used.

1. Samayati

A phrase (*pala*) repeated at least three times or more and generally resolves on *tala sam*. *Samayatis* can start anywhere in the tala and must not necessarily make use of [gaps] between the *palas*.

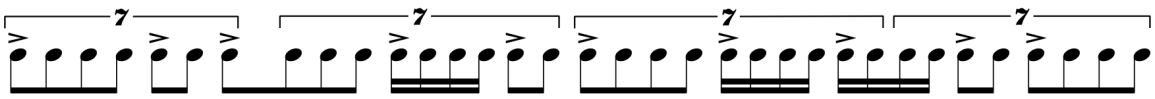
2. Srotovahayati

This sequence of *palas* starts with the shortest pala which gradually keep expanding (increasing in length). Every successive pala is based on the prior sequence and must contain the same. If the length of the 2nd *pala* is increased by 3 *matras*, the following *pala* must again be increased by 3 *matras*. The *matras* that cause the expansion of the pala can either be added in the beginning of the preceding pala or in the middle or the end of it. However, once one of these three options has been chosen the complete *yati phrase* must be constructed in the same manner.

Here is an example in *misra gati:*

Ta ka di mi
Ta ka Ta ka di mi
Tr kt Ta ka Ta ka di mi
Kt tk Tr kt Ta ka Ta ka di mi

Srotovahayati



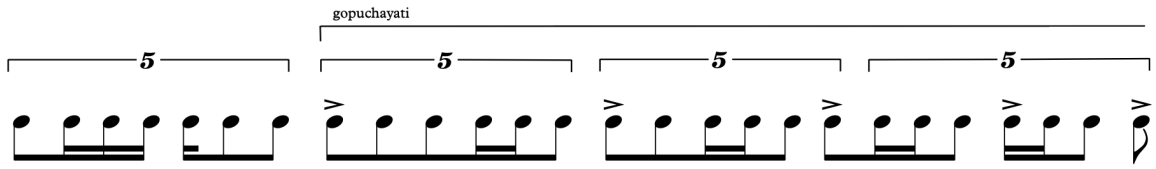
3. *Gopuchayati*

The exact opposite of a srotovahayati is the *gopuchayati,* which is often also referred to as the cow-tail yati due to its decreasing shape: A gopuchayati starts with a longer pala and gradually narrows the width of its phrases.

here is an example in *kanda gati:*

Ta Di Ge Nk Tom
Di Ge Nk Tom
Ge Nk tom
Nk Tom
Tom

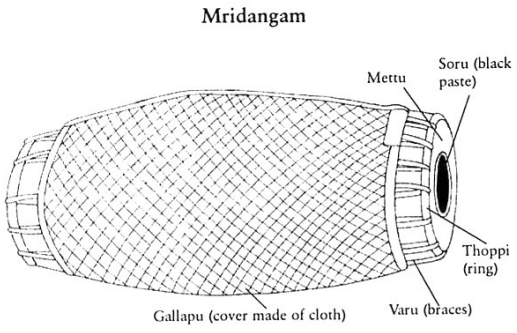
Gopuchayati



4. Mridangamyati

This yati phrase follows the geometric shape of the mridangam, the double-headed main percussion instrument in South India

(Figure 1: Mridangam)



There are many ways to create a mridangamyati. The main idea is to create a sequence of a *srotovahayati* and a *gopuchayati*. However, often there is also a *samayati* placed in between.

The construction of the increasing part and the decreasing part must not necessarily follow the same rules. For example, the place where *matras* will be added or will be removed could be in the beginning of every *pala* in the *srotovahayati* and at the end of every pala in the *gopuchayati*. Also, the choice whether or not [gaps] are used can change from part to part and so could be the choice of *gati*. The sum of choices makes a *mridangamyati* a highly complex device. A straight forward example of how it can be constructed can be found in chapter Tonal Matrix - Harmonic Transposition on page 59.

5. *Damaruyati:*

This yati phrase consequently must be the opposite of the *mridangamyati starting with a gopuchayati* (in this case in *kanda gati*) and ending with a srotovahayati (in *tisra gati*). In the example below the number of *matras* in each half is 126. Therefore it is playable in *misra gati* (18 *aksharas*) and (double-) *tisra gati* (21 bars).

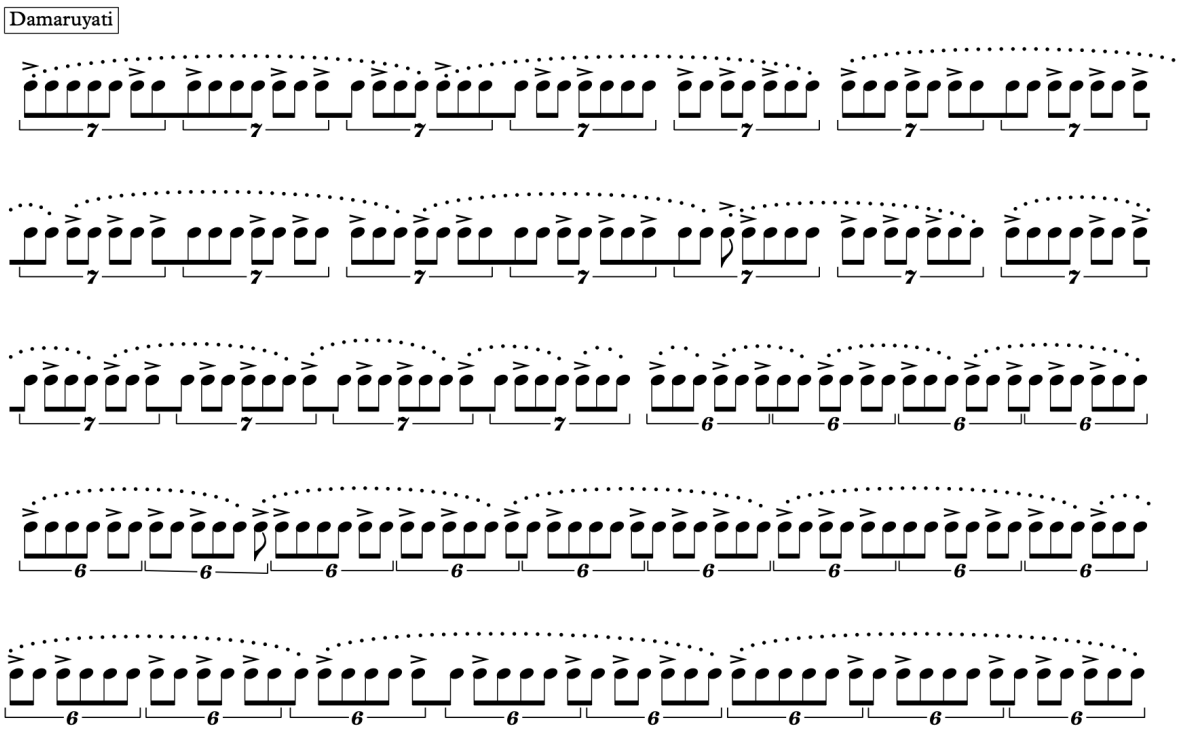
1st half of Damaruyati
numeric values

5	2	4	2	2	3
4	2	4	2	2	3
3	2	4	2	2	3
2	2	4	2	2	3
	2	4	2	2	3
	1	4	2	2	3
		4	2	2	3
		2	2	2	3
			2	2	3
sum				2	3
126					3

This is the structure of the *Damaruyati* expressed in *solkattu*-syllables:

Ta ke ta Tom . Ta ke Ju no Ju no Tom . Ta . Tam . .
ke ta Tom . Ta ke Ju nu Ju no Tom . Ta . Tam . .
ta Tom . Ta ke Ju nu Ju no Tom . Ta . Tam . .
Tom. Ta ke Ju nu Ju no Tom . Ta . Tam . .
Ta ke Ju nu Ju no Tom . Ta . Tam . .
ke Ju nu Ju no Tom . Ta . Tam . .
Ju nu Ju no Tom . Ta . Tam . .
Ju no Tom . Ta . Tam . .
Tom . Ta . Tam . .
Ta .Tam . .
Tam . .
Tam . .
Ta .Tam . .
Tom . Ta . Tam . .
Ju no Tom . Ta . Tam . .
Ju nu Jo no Tom . Ta . Tam . .
ke Ju nu Ju no Tom . Ta . Tam . .
Ta ke Ju nu Ju no Tom . Ta . Tam . .
Tom. Ta ke Ju nu Ju no Tom . Ta . Tam . .
ta Tom . Ta ke Ju nu Ju no Tom . Ta . Tam . .
ke ta Tom . Ta ke Ju nu Ju no Tom . Ta . Tam . .
Ta ke ta Tom . Ta ke Ju no Ju jo Tom . Ta . Tam . .

Here the same *Damaruyati (*first half *misra gati*, second half *double-tisra gati)* in a western notation:



Conclusion of Part I

As I could hopefully show in the preceding chapter, Indian classical music and especially its rhythmical components are quite comprehensive when it comes to a multitude of creative and conceptual ideas. However, due to the actual intention of this text only a superficial proportion of existing rhythmical devices has been referenced so far. This is especially true since most techniques could be much more developed and also be combined with each other in order to create an even more elaborated system of how complex rhythm can be arranged and performed. Nevertheless, since most further techniques are based on derivations from the fundamental techniques and structures, the present collection provides a sufficient overview.

In the following chapter the basic ideas and structures mentioned above will now be applied and transformed into creative tools for rhythmical and also tonal composition.

Part II

Creative Applications of Carnatic Compositional Devices

Stage I

In this chapter I will analyse already existing works of composers coming from the genres of western classical, contemporary music and jazz who either have explicitly applied Carnatic rhythmical concepts to rhythmically shape their music, or where unintended analogies have appeared even though composers most likely have not had knowledge of the Carnatic musical system.

Nevertheless, I think that also the analysis of a composition that shows nothing more but a certain compositional resemblance with a Carnatic rhythmical device and that has been created without the intention of applying a Carnatic technique, can only be beneficial for composers and performers.

Contemporary Music:

The music of the twentieth century is almost infinitely rich when it comes to variety of directions composers could choose from: The works of the renaissance up to classical forms and techniques, Romantic music including the works of patriotic composers who started to interweave their native folk-music or the new exotic techniques that have been developed in Paris at the *Fin de Siècle* or, a bit later in Vienna.

Since most known composers generated their own styles which through individual metamorphoses often transformed, the sum of stylistic varieties is Western Classical Music appears to be nearly endless. However, what often appears to be a common denominator is the research for new aspects on music, be it form, structure, material or expression that seem to cover western composers' interests.

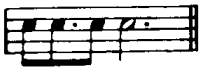
Claude Debussy's impressionistic introduction of new harmonic elements (pentatonic scales and modal techniques he had discovered in eastern cultures) into western music, started to open the possibilities even wider. It is then probably Olivier Messiaen, standing in the same line as the French musical tradition of that time, who can be seen as a first link between the music of the West and the idea of successfully incorporating elements from Indian classical music. He combined traditional western ideas of form, rhythm, notation and harmony with Indian concepts of raga and tala although he had never been to India himself. Only through studying the encyclopaedia *Lavignac's Encyclopédie de la Musique* (1913-1931) he came in contact with the 120 *deçî-tâlas*'

that had been summarised in the thirteenth century by the Indian theorist Cârngadeva and after being in contact with a “Hindu friend”. (Samuel, 1986)

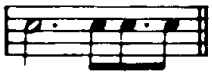
In his book *Technique de mon langage musical* (1944) he explains how one of the rhythms *(*râgavardhana) taken from the collection of 120 *deçî-tâlas* became of great importance for him and how he started to invert the original rhythm and transform it. (Messiaen, 1944)

(Figure 2: Messiaen Deçî-tâlas)

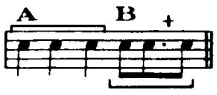
original:



inversion:

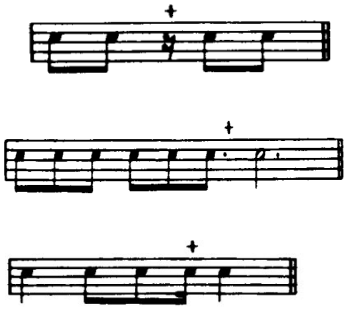


transformation:



To even widen and strengthen his concept of rhythmical irregularity, Messiaen introduced his theoretic concept of *valour ajouté* (additive rhythm), which works by individually lengthening or shortening certain notes by interpolating notes, pauses or small rhythms into otherwise regular structures:

(Figure 3: valour ajouté)



He even started combining the rhythms taken from the collection of 120 *deçî-tâlas* with harmonic sequences and by also considering many of the possible permutations these rhythms provided he reached a seemingly endless set of variations.

Olivier Messiaen - Quatuor pour la fin du temps & Cinq Rechants

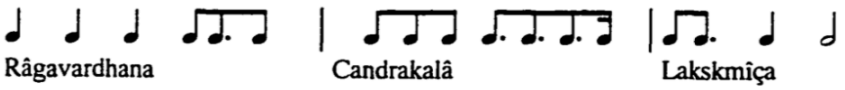
The influence of this concept can for example be found in his works *Quatuor pour la fin du temps* or *Cinq Rechants*, for which he himself provided an analysis in his work *Traité de Rhythme, de Couleur, et d'Ornithologie, Volume One, Appendix B:*

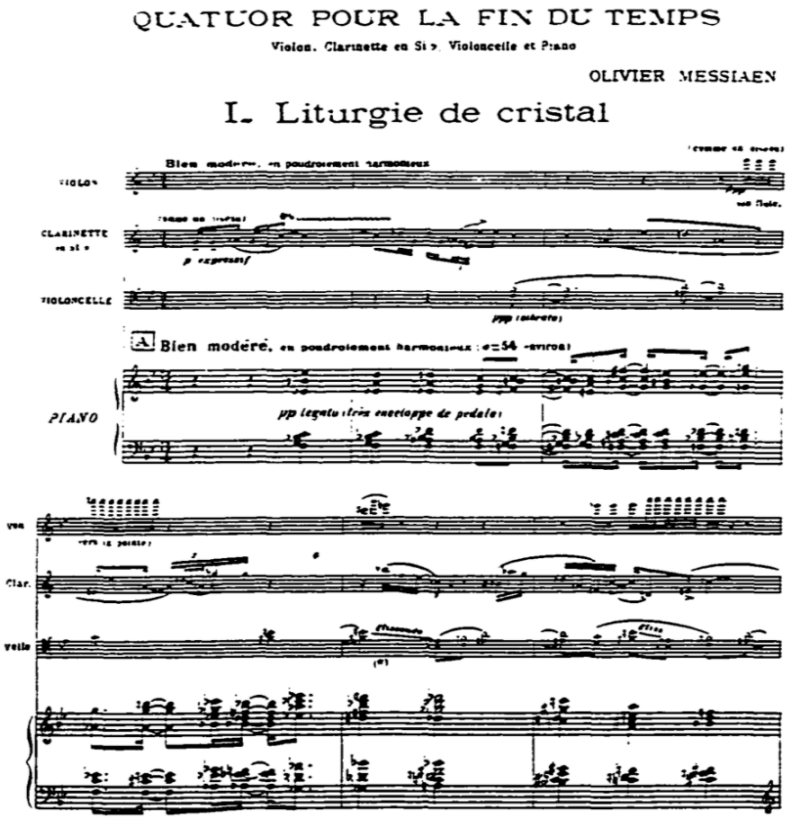
(Figure 4: Analysis by Messiaen)

1) ***Quatuor pour la fin du Temps***

for violin, piano, clarinet, and cello – (1940-41)

The piano plays these rhythms in the first movement: "Liturgie de cristal"

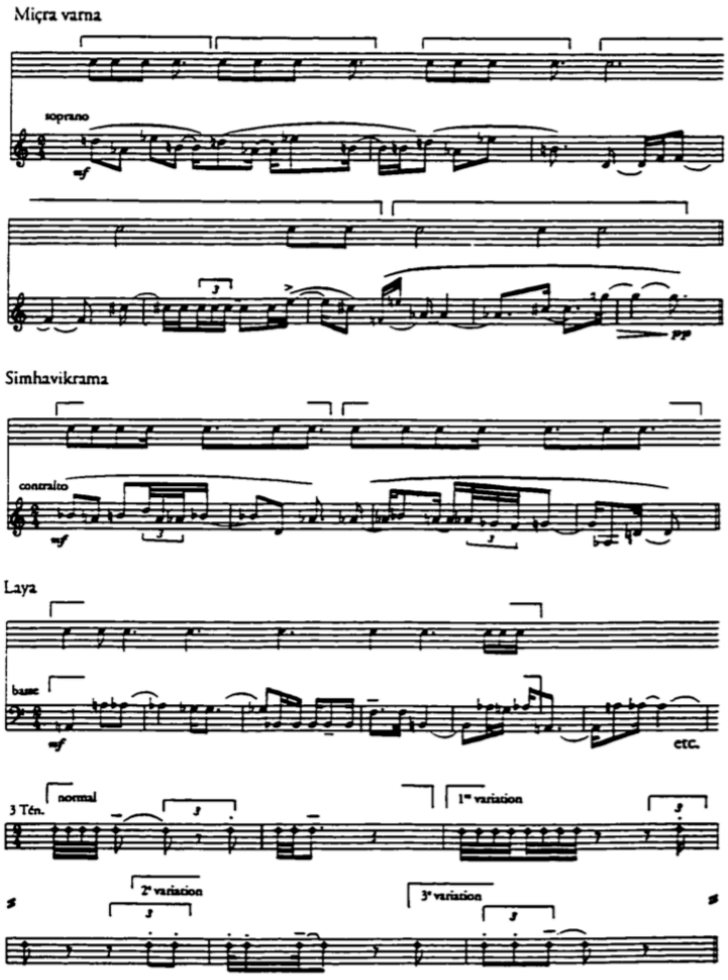




The rhythms he mentions above (*Râgavardhana, Candrakalâ* and *Laksmiça*) and below in his analysis of *Cinq Rechants* (miçravarna, simhavikrama & laya) originally derive from the collection of *deçî-tâlas*. He uses the original rhythms and their permutations to create the structure of the piece. From a Carnatic point of view this technique would also be similar to the concept of *Jathi bhedam:*

> "On page five of the first Rechant, the miçravarna is sung by the sopranos, then simhavikrama by the contraltos, the laya by the three basses, (and the parlé-percuté with variations, for three tenors)" (Messiaen, 1945-1992)

(Figure 5: Analysis by Messiaen)

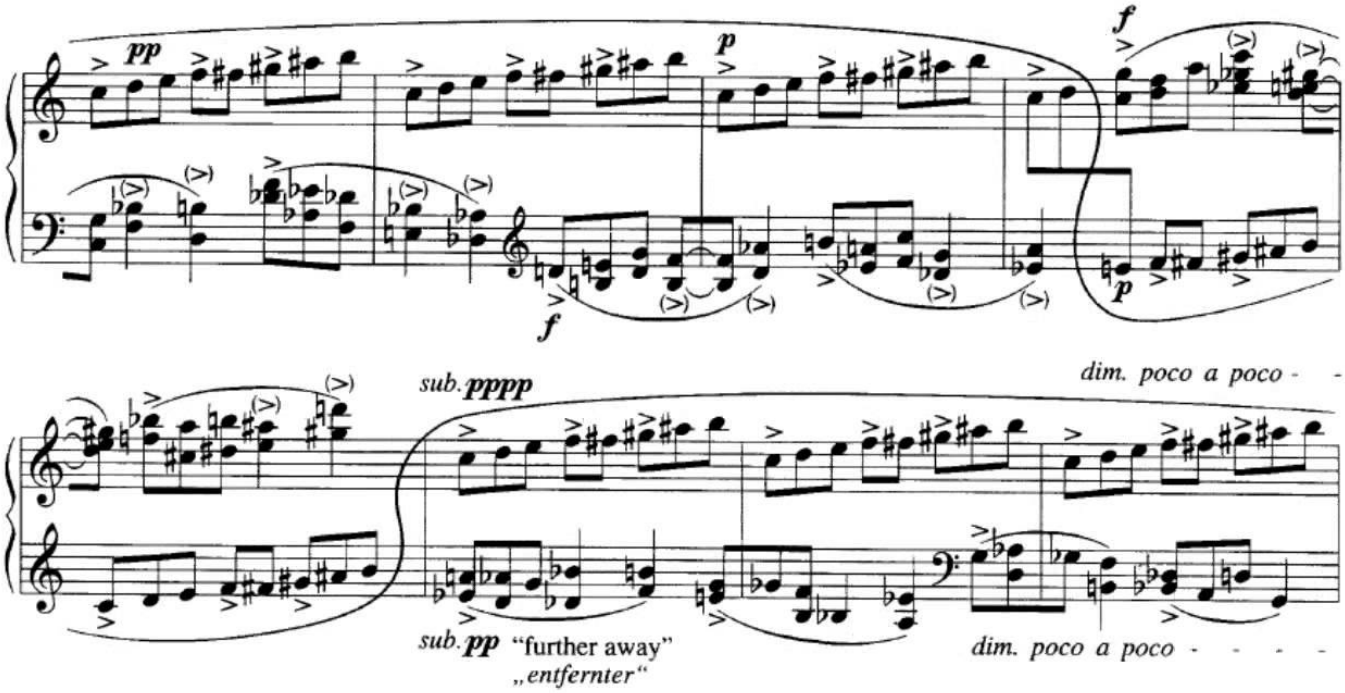


György Ligeti - Études pour Piano

Some of Ligeti's *Études pour Piano* from the *premier livre* can be seen as another great example for the use of *jathi bhedam* and interestingly even a similarity to the concept of *lehra* can be found.
The fourth étude *Fanfares (vivacissimo, molto ritmico, con alegria e slancio*), based on the rhythmical grid of *chatusra gati*, presents a *lehra* throughout the whole piece by an ascending line that is played alternately with the pianists's right or left hand in several octaves. Meanwhile the structure of the accentuated melody is broken up into segments of two, three and four: *jathi bhedam* par excellence.

The sequence of numbers in the fragment below is:
(1)2 2 3 | 2 2 3 2 2 3 2 | 2 3 2 2 3 2 2 | 3 2 2 3 2 2 3 2 3 2

(Figure 6: Ligeti - Fanfares, excerpt)

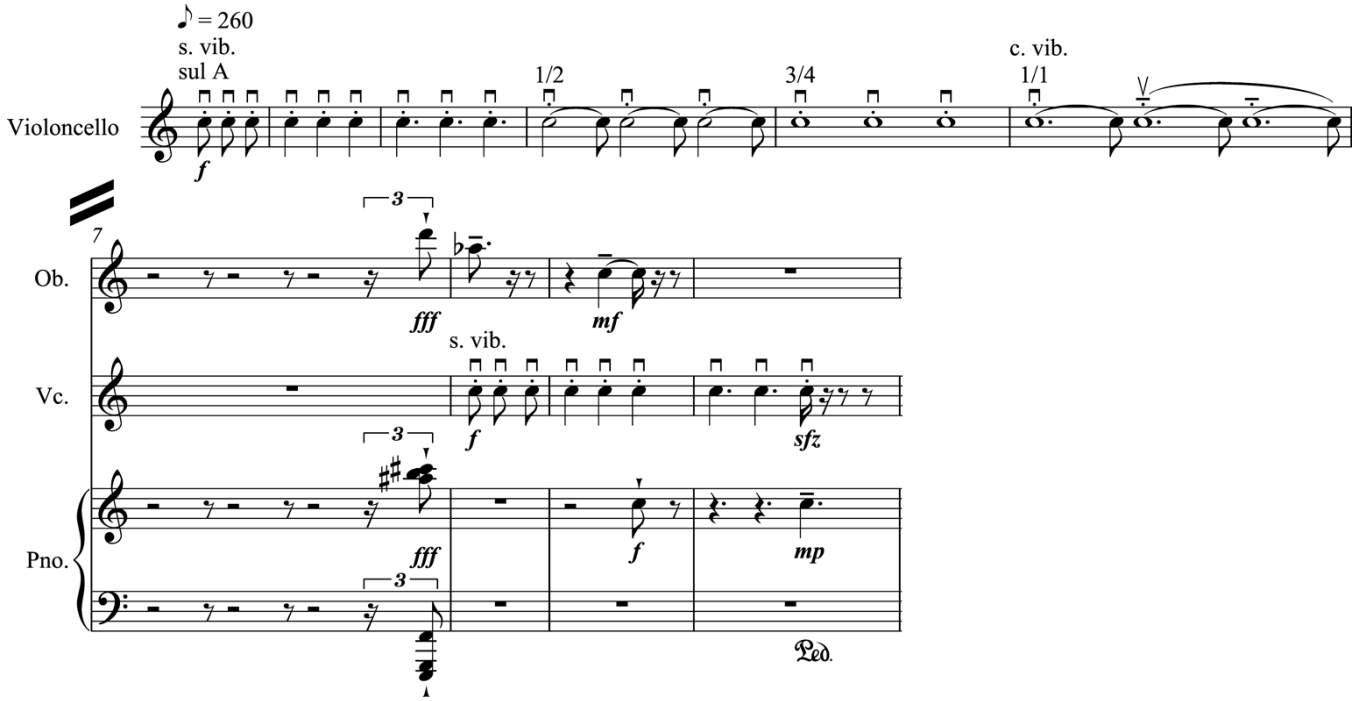


Nicolaus A. Huber - Demijour

German composer Nicolaus A. Huber (*1939) put the element of rhythm in the foreground of his works quite often and even coined the term ‘conceptual rhythm-composition’ so the chances were high to find analogies to Carnatic concepts in his œvre.

For example, the rhythmic structure in the first six bars of Hubers composition *Demijour für Oboe, Violoncello und Klavier* (1985–86) can clearly be seen as an idea analogue to the Carnatic concept of *tirmanam*. A single note (it could also be a different one) repeated three times before its rhythmic value expands before the next repetition and so forth.

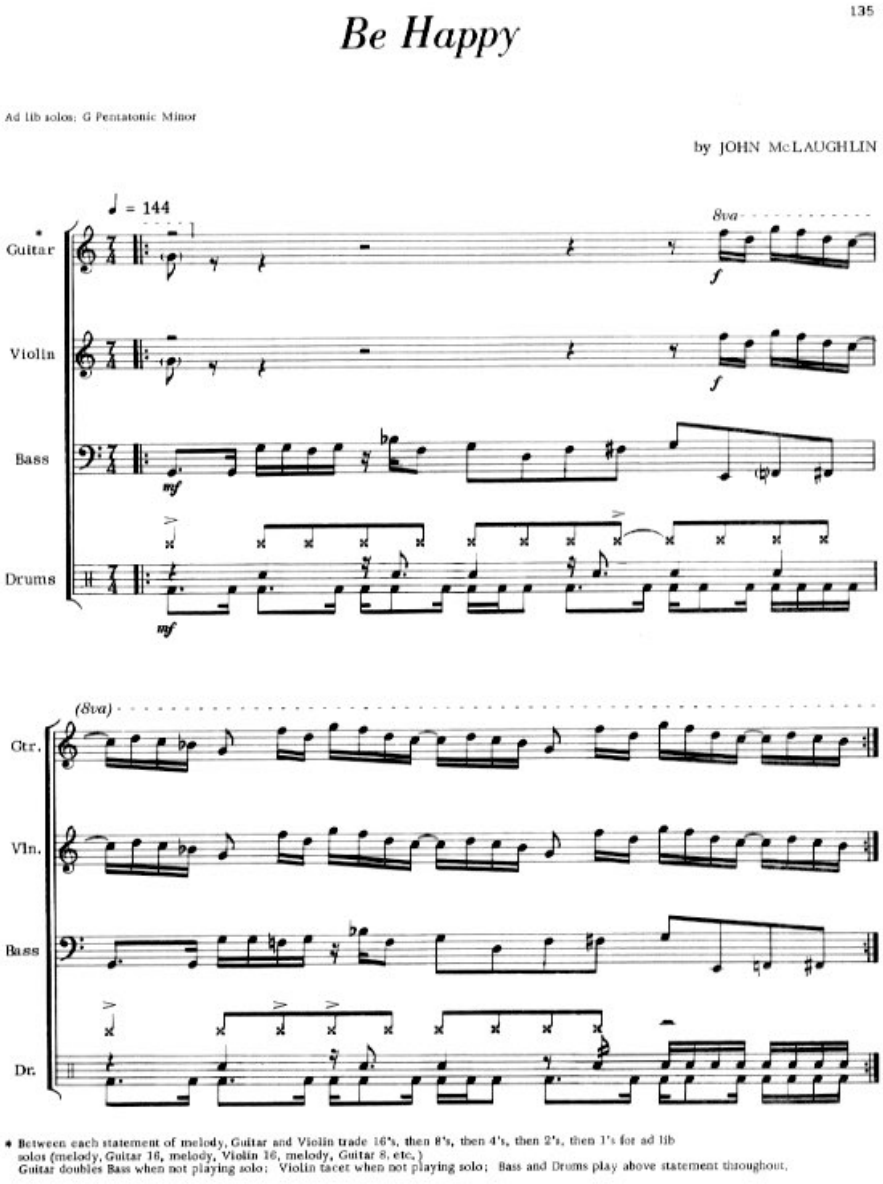
(Figure 7: Nicolaus A. Huber - Demijour excerpt)



Jazz & Rock:

Mahavishnu Orchestra / John Mc Laughlin - Be Happy

John Mc Laughlin's famous composition for Mahavishnu Orchestra *Be Happy* is a good example of how a *mōrā* can be implemented into western music (in this case a style of jazz).
Within a general meter of 7/4 (Carnatic tala: raga, *gati: chatusra)* Mc Laughlin composed a *mōrā* with a pala length of ten and a [gap] of two *matras,* therefore in total a length of thirty-four *matras*. In this case one matra equals sixteenth-notes and the overall *mōrā* therefore has a length of eight and a half beats. It must overlap the barline and start on the second half beat (*akshara*) six:



(Figure 8: John Mc Laughlin - Be Happy)

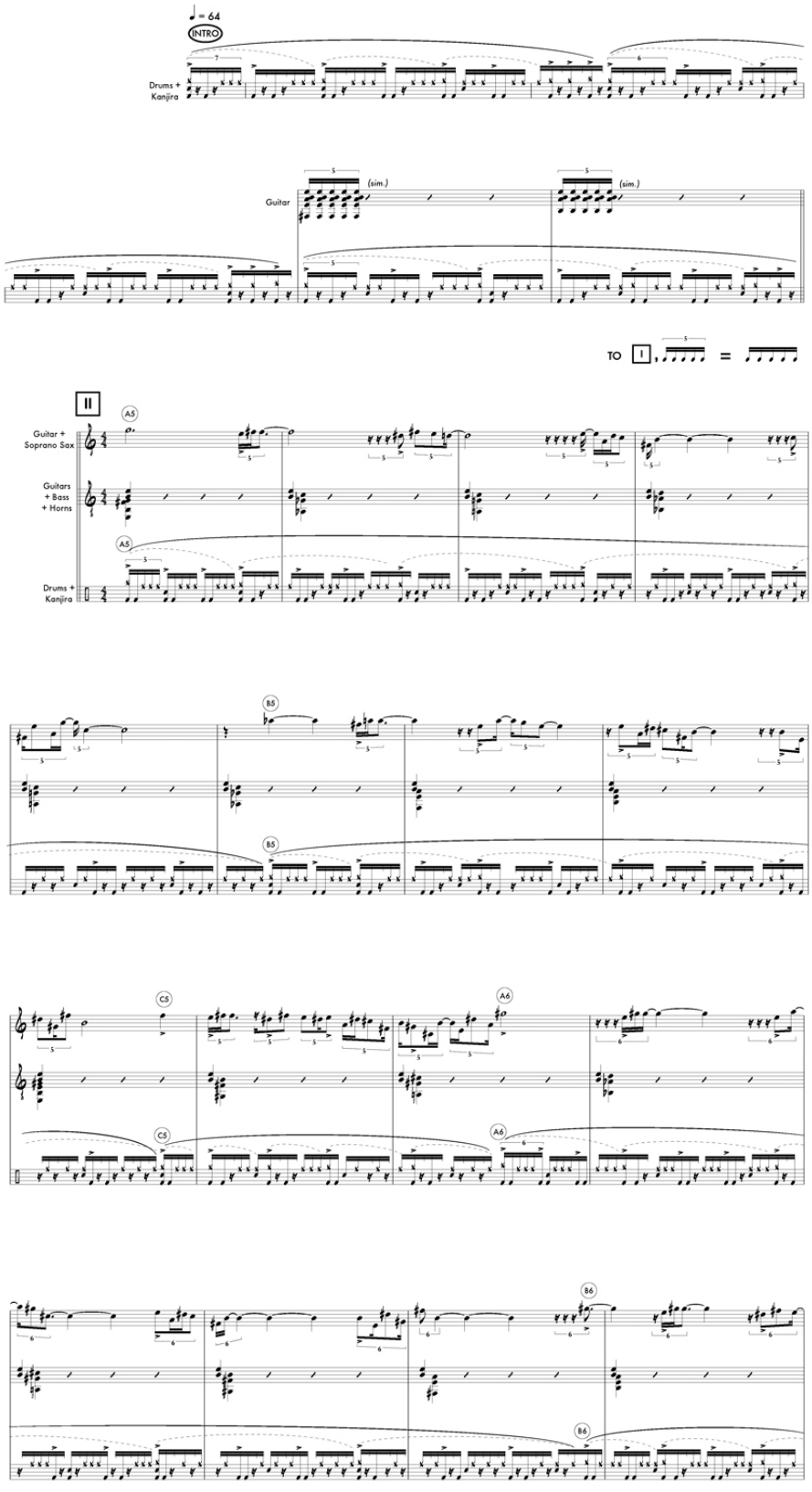
Miles Okazaki - Spiral

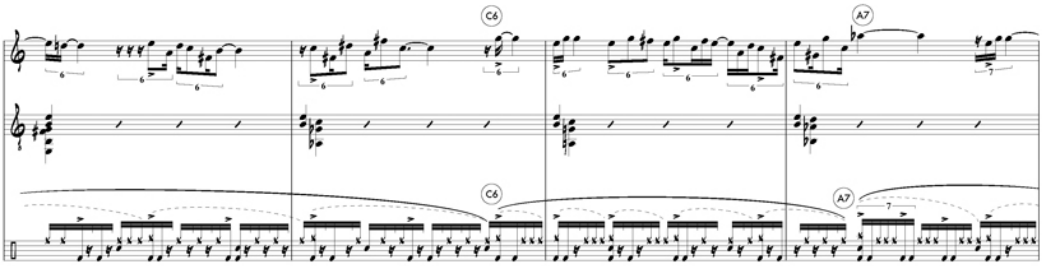
The composition *Spiral* by guitarist and composer Miles Okazaki includes a collection of elements that have clearly been borrowed from Carnatic music. As he explained the structure of this piece in the liner notes of his record in full detail, the basic rhythmic theme is composed with five strokes and played in the drums and the percussion. It keeps expanding and contracting by going through proximate divisions of *gati* (*anuloma-pratiloma*) creating a seamless but also very controlled effect of *accelerando* and *rallentando*. The form of expansion he uses is also clearly connected to Carnatic music and *solkattu* where the phrase *Ta di ge na tom* can be expanded ad libitum by adding space between the syllables: (*Ta di . ge na tom*) equals six (*Ta . di . ge na tom*) equals seven (*Ta . di . ge . na tom*) equals eight and (*Ta . di . ge . na . tom*) equals nine matras.

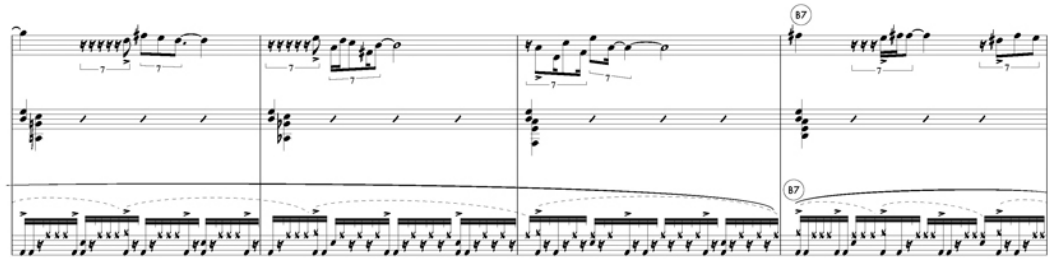
> *„The structure in the first section outlines the basic expansion of 5 strokes into 6,7,8 and 9 units, with three of each type followed by an ending (5,4,5,4,5). The structure on the bridge is inspired by a type of rhythmic composition found in South Indian music called "Korvai," where an identical rhythmic composition is played in several speeds and is calculated to finish at the end of the rhythmic cycle, in this case 32 cycles of 4 beats. Here the rhythmic composition is 210 units long, which divides into 5,6, and 7 subdivisions per beat. The triple repetition of 5,6,7,8,9 is continued, and reduced to double, and then single before moving on to the next speed. It is followed by a short three-part ending. The structure of the ending is (7,7,6,6,5,5,2,2,2) in three descending speeds. The last speed serves as a rhythmic modulation, returning to the top of the form, slightly faster. The melody, played by soprano saxophone and guitar, outlines the basic structure of the rhythmic composition with five different types of phrases, corresponding to the five rhythmic expansions. The phrases get closer together and eventually join into a continuous line.*
>
> *The beginning of each phrase is accented by the crash cymbal. The constant underlying pulse in 4/4 can be heard in the backbeat played by the snare drum and electric guitar.*
>
> *The entire form could be endlessly repeated, accelerating each time through rhythmic modulation, as there is no real beginning or end."* (Okazaki,2006)

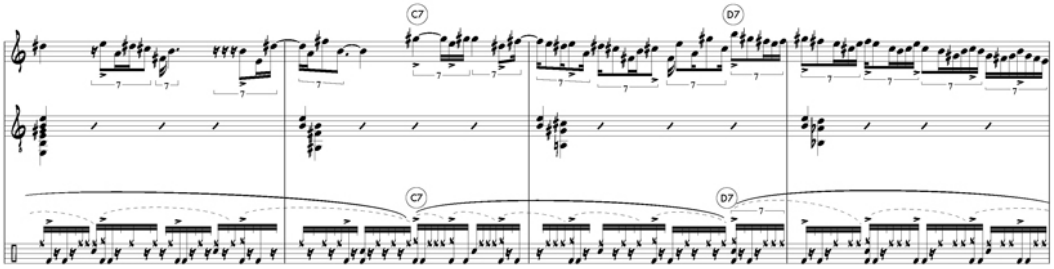
Please note that Okazaki uses the term *kōrvai* to express the concept of *anuloma/pratiloma*. The short three-part ending he mentions is based on the idea of *mōrā* or *arudhi*.

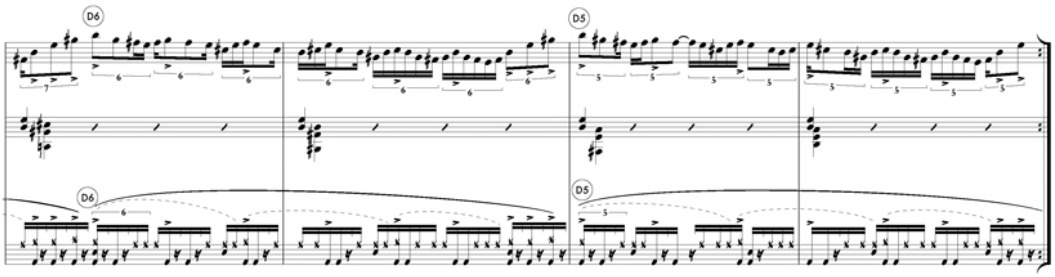
(Figure 9: Miles Okazaki - Spiral)











REPEAT TO I , 5 = 5

FADE OUT ON II

Stage II

Further Examples and Creative Concepts

In this chapter I'd like to present a collection of my own works that incorporated rhythmical devices borrowed from traditional Indian Music (Hindustani and Carnatic) and further demonstrate possible creative approaches to the implementation of Carnatic devices into a tonal or harmonic system.

Application of yati phrases

All types of *yati phrases* can be used within western music in multiple forms. The easiest and most obvious way is to simply incorporate the rhythmical structure of a *yati* into a composition. The example below will demonstrate this form of arrangement. A more elaborate way of using a *yati phrase* will be discussed in chapter *Tonal Matrix*.

In the following composition, *Methana suite op. 61 (part five)* for string trio and percussion a *Gopucha Yati* has been used to determine the rhythmical structure of a section. The first phrase introduced is the longest within the structure, covering 12 sixteenth notes (or *matras)*. Every successive phrase is then a shortened version of the first statement. Notes (syllables) from the beginning get gradually omitted resolving into a short *mōrā (tihai)* with a number of 5 *matras* per *pala*. A very non-typical element within this *yati phrase* tough are the accents on each of the last *matras* within the *mōrā*.

This is the original (traditional) composition:

Ta . Te . Tom . Ta di ge na tom

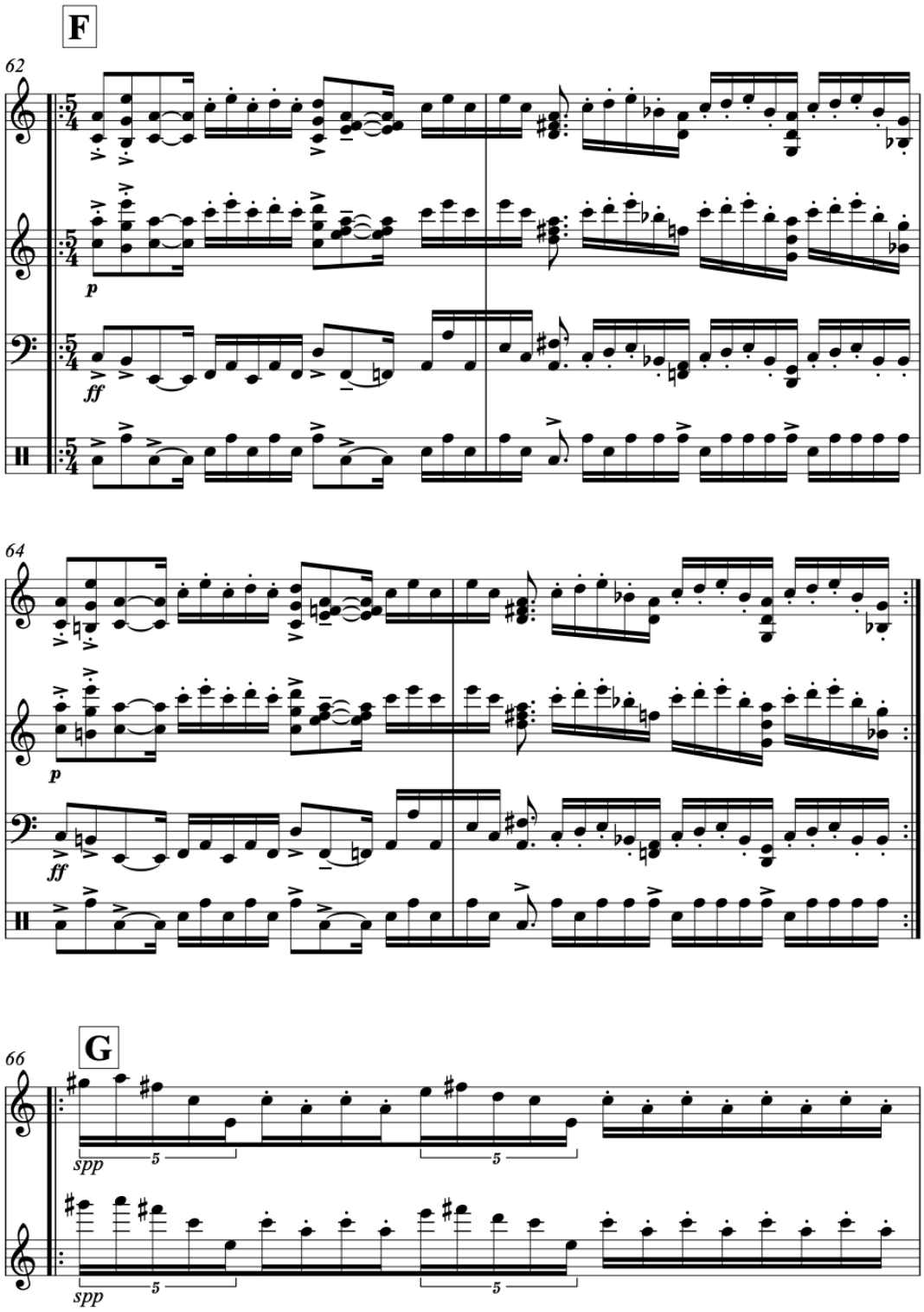
Te . Tom . Ta di ge na tom

Tom . Ta di ge na tom

Ta di ge na tom

Ta di ge na tom

The example below shows an extract from Methana suite op.61 (part five):



Application of Peshkar & Lehera

In my composition for piano *Kama Vilambit (op. 81)* I have used both the elements *peshkar* and *lehera* as a basic foundation for the whole piece. A figure in the meter of 9/4 is played in the left hand throughout the whole composition and functions the same way as a *lehera* does in Hindustani music by providing the rhythmical structure. This allows the right hand to be rhythmically free. The liberty of creating tension by exposing that freedom against the strict rhythmical structure is fully utilised. However, during the main theme of the piece the structure of the *lehera* is broken up, which results in moments of accumulated tension.

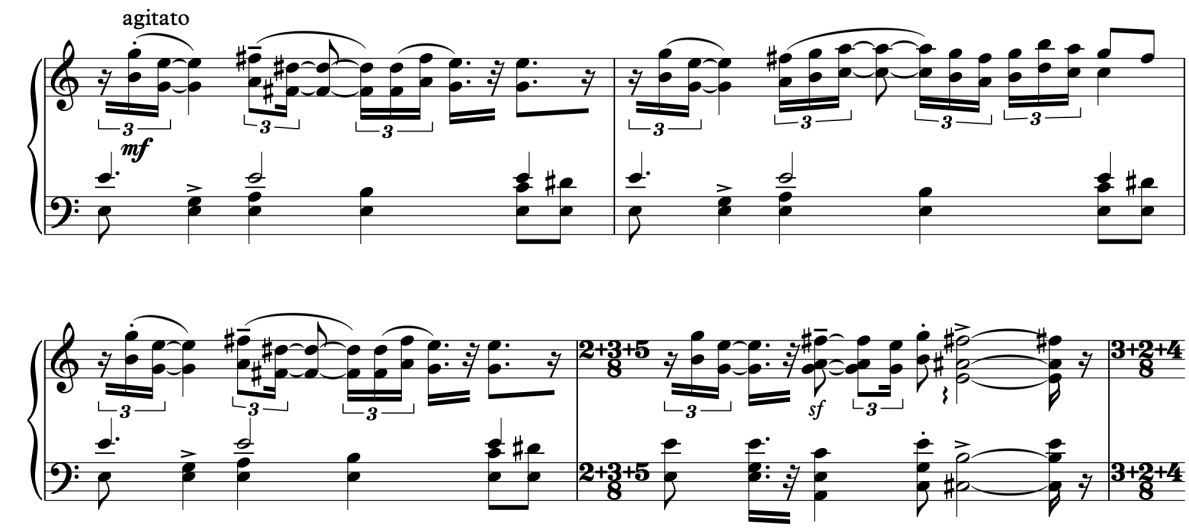
Both, the structure of a traditional *peshkar* and its successive development is then percussively played with the tip of a fingernail on one of the strings inside the piano using a technique similar to traditional tabla-playing. The time cycle is based on *matta taal (L4+D2+L3, tisra, 27 matras)* and then modified and reversed (L3 +D2 + L4).

The structure of the peshkar used:

Ke te na ge Dhin . . na //
Ke te na ge Dhi na Ghe na Tu na //
Ghe te na ge Te re ke te //
Ta te kt tk Dhi na Ghe na Tu na //
Te te Te te Te te Ga lan . na Ta . Dhi. na. //
Ga lan . na Ta . Dhi. na. //
Ga lan . na Ta . Dhi. na. //

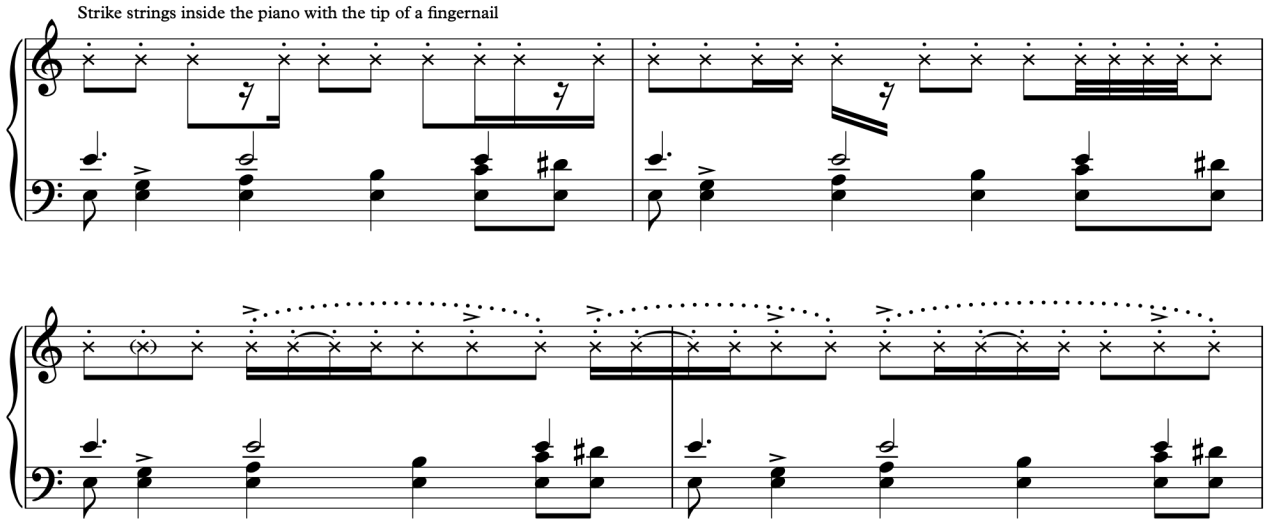
The example below shows the use of *lehera* within a *tisra* section the piece:

Kama Vilambit op. 81 excpert 1



The following example shows the use of the *peshkar-composition within* a *chatusra* section of the piece:

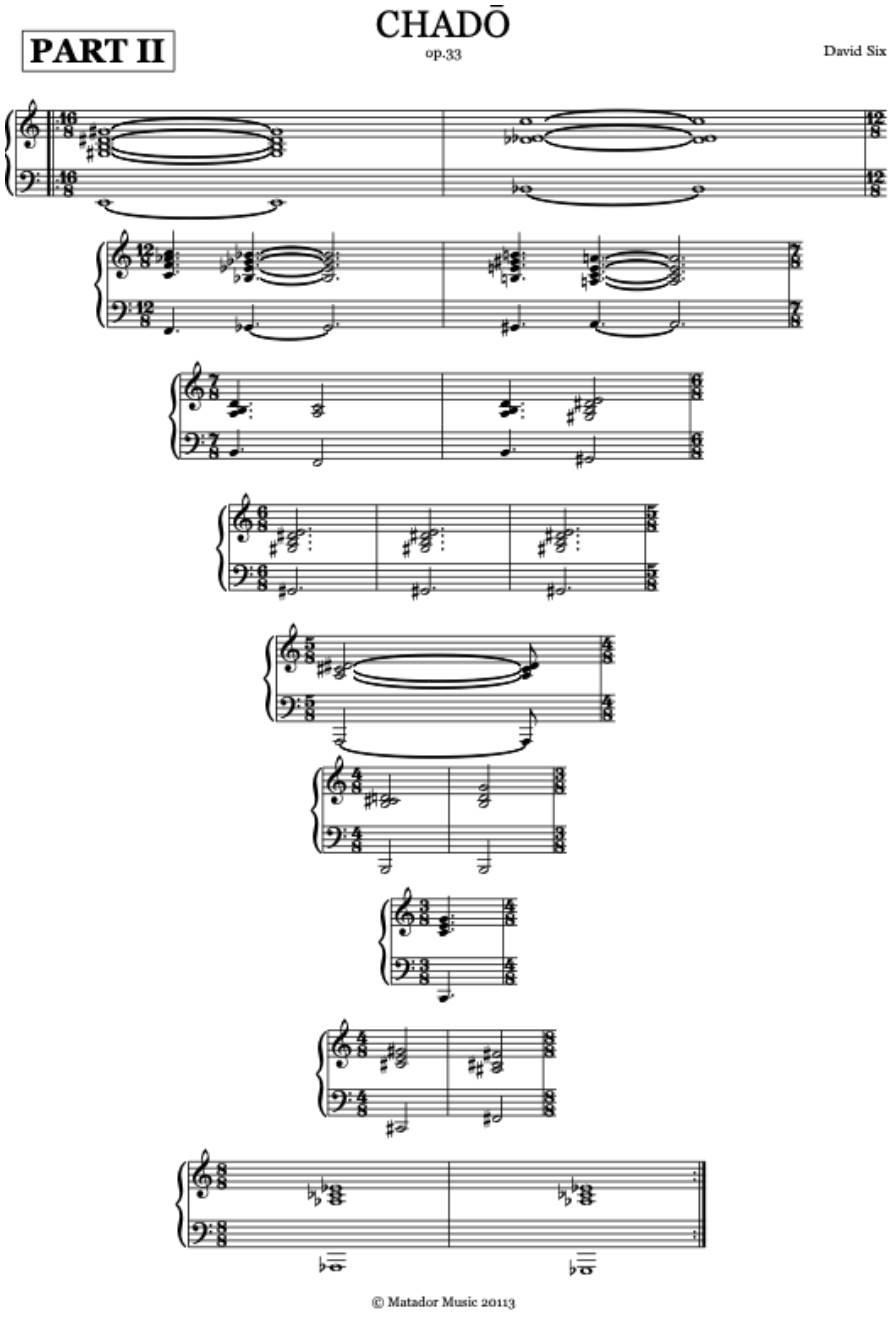
Kama Vilambit op. 81 excerpt 2



In a later section of this piece the principle of *anuloma - pratiloma* is expressed through a constant switch between sections in *tisra* and sections in *chatusra* while certain *jathi-phrases* are maintained. Because this section is usually improvised and therefore not notated, I must refer to the recording on the CD: David Six - Karkosh (2019, col legno records, Vienna)

Geometric Shape of Harmonic Rhythm

Geometric shapes as they are present in the six y*ati phrases* or as they also occur in certain types of *mōrā* can also be used in a different fashion by mapping the structure onto the flow of harmonic rhythm. In the example below (*Chadō, op. 33 - Part II, 2013*) I have used the Carnatic principle of *reduction* in a sense that the geometric form of a *gopuchayati is* projected onto the structure of harmonic rhythm while actually the entire section follows a strict sixteen bar structure of a 4/4 meter. This particular example does not rigorously follow the rules of a *gopuchayati* as the steps of reduction from *pala* to *pala* would need to be of the same length. Also, due to aesthetic reasons this composition does not follow the rules of exact symmetry. However, the basic idea of *reduction* has been applied successively and provided as an inspirational basis for the composition.



Tonal Matrix

In this chapter I'd like to demonstrate how traditional rhythmical structures can be transposed into either melodic or harmonic sequences. Since the possibilities of transposition are countless, we are going to focus on a basic structure of *korvais* without any forms of permutation.

Melodic Transposition

In the examples given below the following *kōrvai* has been used in order to define a possible melodic outcome:

Ta . Ke . Te . Tom . . Ta Di Ge Na Tom
Ke . Te . Tom . . Ta Di Ge Na Tom
Te . Tom . . Ta Di Ge Na Tom
Ta Di Ge Na Tom
Ta Di Ge Na Tom

Note that any other *korvai*, *muktayam*, chakrardar or *tihai* could be used as a starting point.

Example 1:
Syllables *Ta, Ke* and *Te* are carrying the numeric value 2 since they are all based on 2 *matras*; *Tom* the numeric value 3 (because of the length of 3 *matras*) and the phrase *Ta Di Ge Na Tom* has been divided into 5 single steps (one for each *matra*). For the purpose of a first demonstration these values get directly assigned to the amount of semitones that will produce the intervallic outcome.

ex. 1: melodic transposition

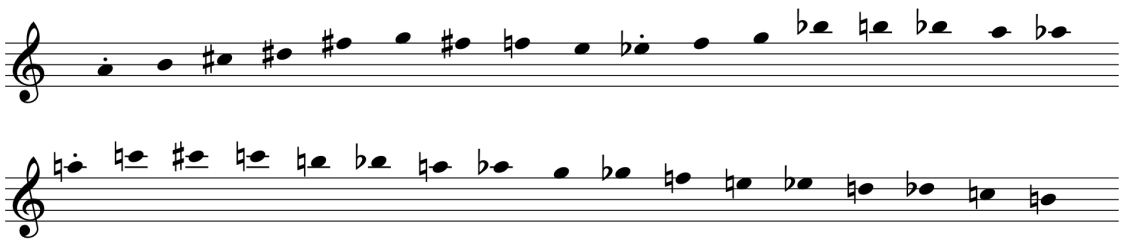
SOLKATTU SYLLABLES	NUMERIC VALUE	INTERVALLIC OUTCOME
Ta	2	wholetone
Ke	2	wholetone
Te	2	wholetone
Tom	3	minor third
Ta	1	semitone
Di	1	semitone
Ge	1	semitone
Na	1	semitone
Tom	1	semitone
Ke	2	wholetone
Te	2	wholetone

ex. 1: melodic transposition

Tom	3	minor third
Ta	1	semitone
Di	1	semitone
Ge	1	semitone
Na	1	semitone
Tom	1	semitone
Te	2	wholetone
Tom	3	minor third
Ta	1	semitone
Di	1	semitone
Ge	1	semitone
Na	1	semitone
Tom	1	semitone
Ta	1	semitone
Di	1	semitone
Ge	1	semitone
Na	1	semitone
Tom	1	semitone
Ta	1	semitone
Di	1	semitone
Ge	1	semitone
Na	1	semitone
Tom	1	semitone

In order to use this sequence of intervals for a composition, a random note must be chosen representing a starting tone. In example 1 below the starting tone is an A. However, any other note could be chosen instead.

example 1



Example 2:

Based on the same *korvai* again the syllables *Ta, Ke* and *Te* are carrying the numeric value 2 ; *Tom* the value 3 again but the complete phrase *Ta Di Ge Na Tom* has now been assigned to the value 5.

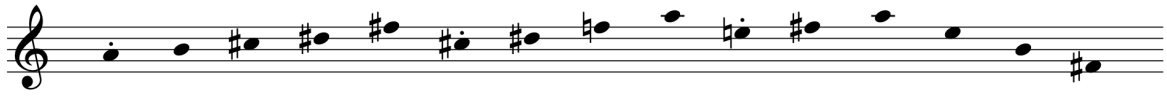
A simple transposition into semitones defines the outcome:

ex. 2: melodic transposition

SOLKATTU SYLLABLES	NUMERIC VALUE	INTERVALLIC OUTCOME
Ta	2	wholetone
Ke	2	wholetone
Te	2	wholetone
Tom	3	minor third
Ta Di Ge Na Tom	5	fourth
Ke	2	wholetone
Te	2	wholetone
Tom	3	minor third
Ta Di Ge Na Tom	5	fourth
Te	2	wholetone
Tom	3	minor third
Ta Di Ge Na Tom	5	fourth
Ta Di Ge Na Tom	5	fourth
Ta Di Ge Na Tom	5	fourth

The choice whether an interval must go up or down has been made based on personal aesthetics. Of course, one could determine all intervals of the first sequence in the *korvai* go upwards, the second sequence to move downwards, the third upwards etcetera, or vice versa.

example 2



Example 3

The same korvai with the same numeric values can also be used to transpose not directly into semitones but into whole tones. This way two whole tones form the interval of a major third, three whole tones form a diminished fifth and five whole tones add up to a minor seventh:

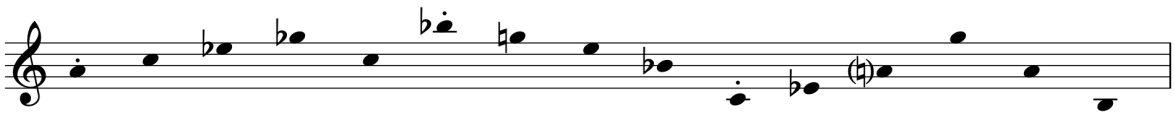
ex. 3: melodic transposition

SOLKATTU SYLLABLES	NUMERIC VALUE	INTERVALLIC OUTCOME
Ta	2	major third
Ke	2	major third
Te	2	major third
Tom	3	diminished fifth
Ta Di Ge Na Tom	5	minor seventh
Ke	2	major third

ex. 3: melodic transposition

Te	2	major third
Tom	3	diminished fifth
Ta Di Ge Na Tom	5	minor seventh
Te	2	major third
Tom	3	diminished fifth
Ta Di Ge Na Tom	5	minor seventh
Ta Di Ge Na Tom	5	minor seventh
Ta Di Ge Na Tom	5	minor seventh

example 3



Example 4

The original rhythmic structure of a *korvai* can then be combined with its melodic transposition. In the example below one *matra* of the *korvai* equals the value of an eight note. Since our randomly chosen starting point (note A) has so far not been involved into the actual structure of the *korvai*, it will now be used as the target for the first rhythmic value the korvai originally provided. We are going to use this structure in *tisram*, making a numeric value of 2 equal to two sixteenth-note triplets.

ex. 4: melodic transposition

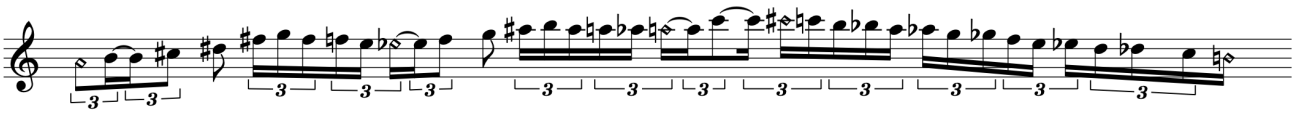
SOLKATTU	NUMERIC	INTERVALLIC	RHYTHMIC VALUE
Ta	2	wholetone	
Ke	2	wholetone	
Te	2	wholetone	
Tom	3	minor third	
Ta	1	semitone	
Di	1	semitone	
Ge	1	semitone	
Na	1	semitone	
Tom	1	semitone	
Ke	2	wholetone	
Te	2	wholetone	
Tom	3	minor third	
Ta	1	semitone	

ex. 4: melodic transposition

Di	1	semitone	𝅘𝅥𝅯
Ge	1	semitone	𝅘𝅥𝅯
Na	1	semitone	𝅘𝅥𝅯
Tom	1	semitone	𝅘𝅥𝅯
Te	2	wholetone	𝅗𝅥
Tom	3	minor third	♪
Ta	1	semitone	𝅘𝅥𝅯
Di	1	semitone	𝅘𝅥𝅯
Ge	1	semitone	𝅘𝅥𝅯
Na	1	semitone	𝅘𝅥𝅯
Tom	1	semitone	𝅘𝅥𝅯
Ta	1	semitone	𝅘𝅥𝅯
Di	1	semitone	𝅘𝅥𝅯
Ge	1	semitone	𝅘𝅥𝅯
Na	1	semitone	𝅘𝅥𝅯
Tom	1	semitone	𝅘𝅥𝅯
Ta	1	semitone	𝅘𝅥𝅯
Di	1	semitone	𝅘𝅥𝅯
Ge	1	semitone	𝅘𝅥𝅯
Na	1	semitone	𝅘𝅥𝅯
Tom	1	semitone	𝅘𝅥𝅯

Once this system of transposition has been established, the composer can continue with either using a series of permutations of the basic *korvai* as a starting point or use the same *korvai* as an operator to define other values such as accentuation, dynamics, timbre or instrumentation.

Example 4



Harmonic Transposition

For the following technique we are going to use a *compound mōrā* as our basic structure, usually performed in *ādi tāla* and *chatusra* (128 *matras* in total). It follows the structure of a *mridangamyati*.

Our basic phrase will be: (*ta kt tr kt tom ta)* and is six *matras* long. We are going to repeat that phrase three times. This repetitions will be divided by [gaps] of the length of three *matras* that we are going to notate as [tam_3] to get our first *mōrā*:

(ta kt tr kt tom ta) [tam_3] (ta kt tr kt tom ta) [tam_3] (ta kt tr kt tom ta)

In order to construct a compound *mōrā* we are going to repeat that (basic) *mōrā* three times, which leaves us with a total sum of 72 *matras:*

Basic structure:

(ta kt tr kt tom ta) [tam_3] (ta kt tr kt tom ta) [tam_3] (ta kt tr kt tom ta)
(ta kt tr kt tom ta) [tam_3] (ta kt tr kt tom ta) [tam_3] (ta kt tr kt tom ta)
(ta kt tr kt tom ta) [tam_3] (ta kt tr kt tom ta) [tam_3] (ta kt tr kt tom ta)

To end up on tala *sam* this *compound mōrā* would therefore always need to start on beat seven within *ādi tāla* and *chatusra*.

The third line of our small composition will now be reduced, producing a *gopuchayati*. Since our reduction will produce five *phrases* we are going to reduce the gap by one *matra* turning it into [tam_2]. This way we will achieve a total sum of 31 *matras* for this whole section.

Variation1: (gopuchayati)

(ta kt tr kt tom ta) [tam_2]
(kt tr kt tom ta) [tam_2]
(tr kt tom ta) [tam_2]
(kt tom ta) [tam_2]
(tom ta) [tam_2]
(ta)

Variation 2 (*srotovahayati*) simply reverses the order of the phrases and develops these in an expanding fashion:

(ta) [tam$_2$]
(tom ta) [tam$_2$]
(kt tom ta) [tam$_2$]
(tr kt tom ta) [tam$_2$]
(kt tr kt tom ta) [tam$_2$]
(ta kt tr kt tom ta)

Finally we can compose the *compound mōrā,* beginning with variation 2, then adding the original *mōrā* and finishing the structure it with variation 1. The result will then be the structure of a *mridangamyati,* being based on 88 *matras* in total (22 bars in *chatusra, starting on beat 3 in ādi tāla cycle).*

Mridangamyati:

(ta) [tam$_2$]
(tom ta) [tam$_2$]
(kt tom ta) [tam$_2$]
(tr kt tom ta) [tam$_2$]
(kt tr kt tom ta) [tam$_2$]
(ta kt tr kt tom ta)
(ta kt tr kt tom ta) [tam$_3$]
(ta kt tr kt tom ta) [tam$_3$]
(ta kt tr kt tom ta)
(ta kt tr kt tom ta) [tam$_2$]
(kt tr kt tom ta) [tam$_2$]
(tr kt tom ta) [tam$_2$]
(kt tom ta) [tam$_2$]
(tom ta) [tam$_2$]
(ta)

Here the table with the numeric values:

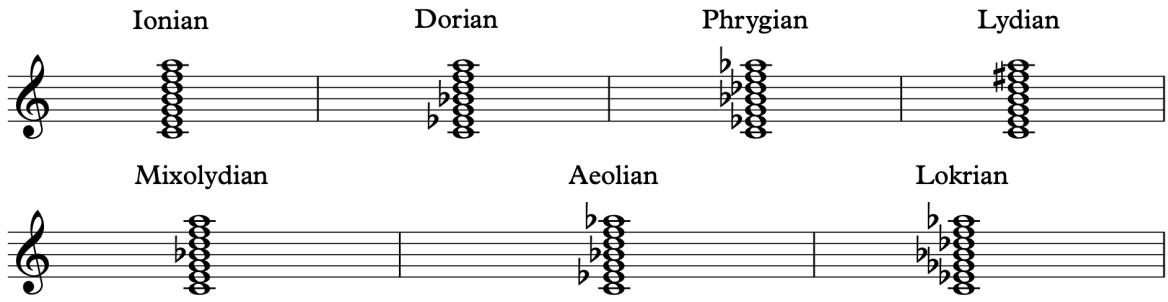
ex. 4: mridangamyati and numeric values

SOLKATTU SYLLABLES PHRASE	NUMERIC VALUE	SOLKATTU SYLLABES GAP	NUMERIC VALUE
ta	1	[tam_2]	2
tom ta	2	[tam_2]	2
kt tom ta	2	[tam_2]	2
tr kt tom ta	4	[tam_2]	2
kt tr kt tom ta	5	[tam_2]	-
ta kt tr kt tom ta	6	-	-
ta kt tr kt tom ta	2	[tam_3]	3
ta kt tr kt tom ta	3	[tam_3]	3
ta kt tr kt tom ta	5	-	-
ta kt tr kt tom ta	2	[tam_2]	2
kt tr kt tom ta	3	[tam_2]	2
tr kt tom ta	5	[tam_2]	2
kt tom ta	5	[tam_2]	2
tom ta	5	[tam_2]	2
ta	1	-	-

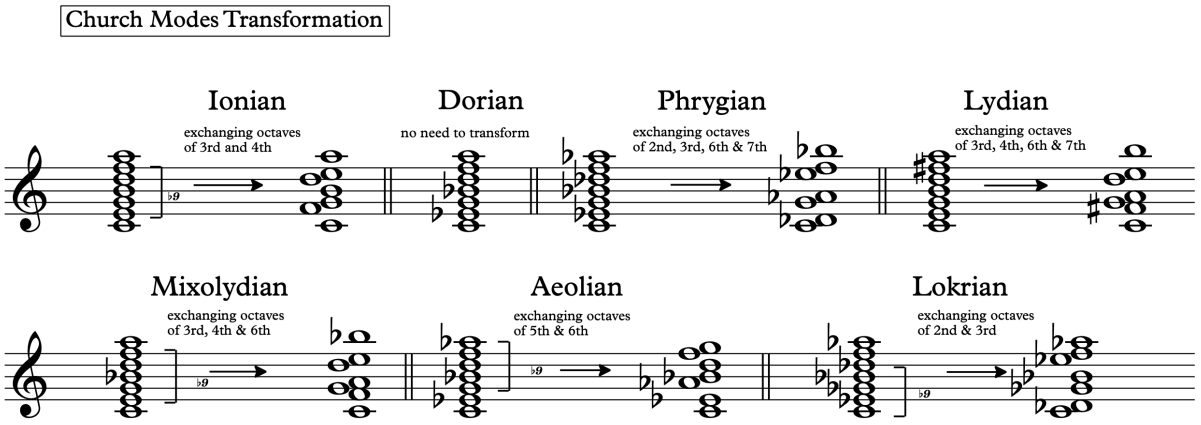
The next step will lead us into the territory of harmony. Therefore, we need to establish a system that allows us to map the structure of our numeric values to specific kinds of harmonic expression.

A system I find quite satisfying works with the seven harmonic modes derived from the the *ionian scale* also known as the common church modes: *ionian, dorian, phrygian, lydian, mixolydian, aeolian and lokrian*.

Since for our purpose these modes need to clearly conveyed, we can use them in a pandiatonic manner by stacking intervals of thirds until the seventh degree above the harmonic root. This way each harmony is fully expressed by all its components while the architecture of the chords remains tertian. The seventh, ninth, or thirteenth of the chords are being treated as consonances functionally equivalent to the fundamental triad. (Slonimsky, 1938, p. xxii)



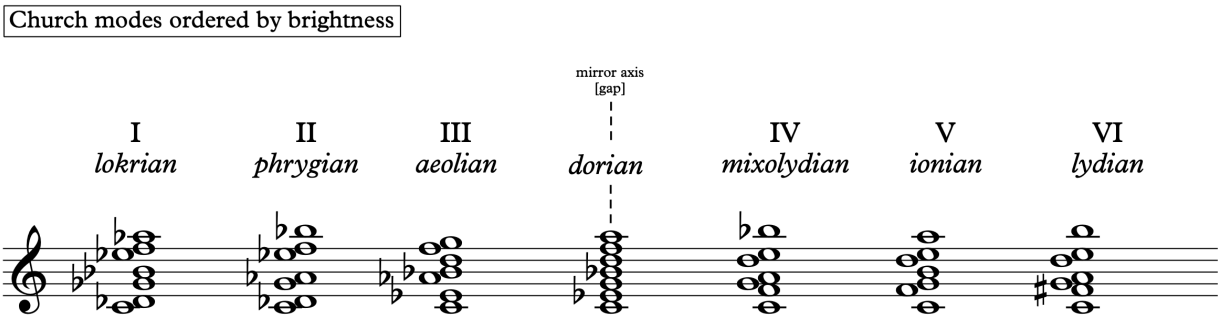
For the pure sake of aesthetics, we are now going to internally arrange this chords into other forms of voicing, especially since due to their natural condition most of this tertian chords contain the (relatively harsh) interval flat nine (b9) which makes them sound a bit cumbersome. By reversing the notes that were originally building a flat nine interval by their octave, the result will be more pleasant to the ear:



Transposition Into Harmonic Opacity

In the next step we will assign these modes to our numeric values. One of the many ways that will work is to put the modes into a specific arrangement first by ordering them by opacity, starting with the most opaque, the “darkest“ harmony and gradually aligning the modes ending with the most transparent, the “lightest“ of the seven modes.
Thus, the result will be:

lokrian - phrygian - aeolian - dorian - mixolydian - ionian - lydian



The *dorian* mode in the middle of this sequence has been omitted because of two reasons:

1) we can either use this (seventh) mode as a filler for our [gaps]:
2) or we use this mode as a mirror axis

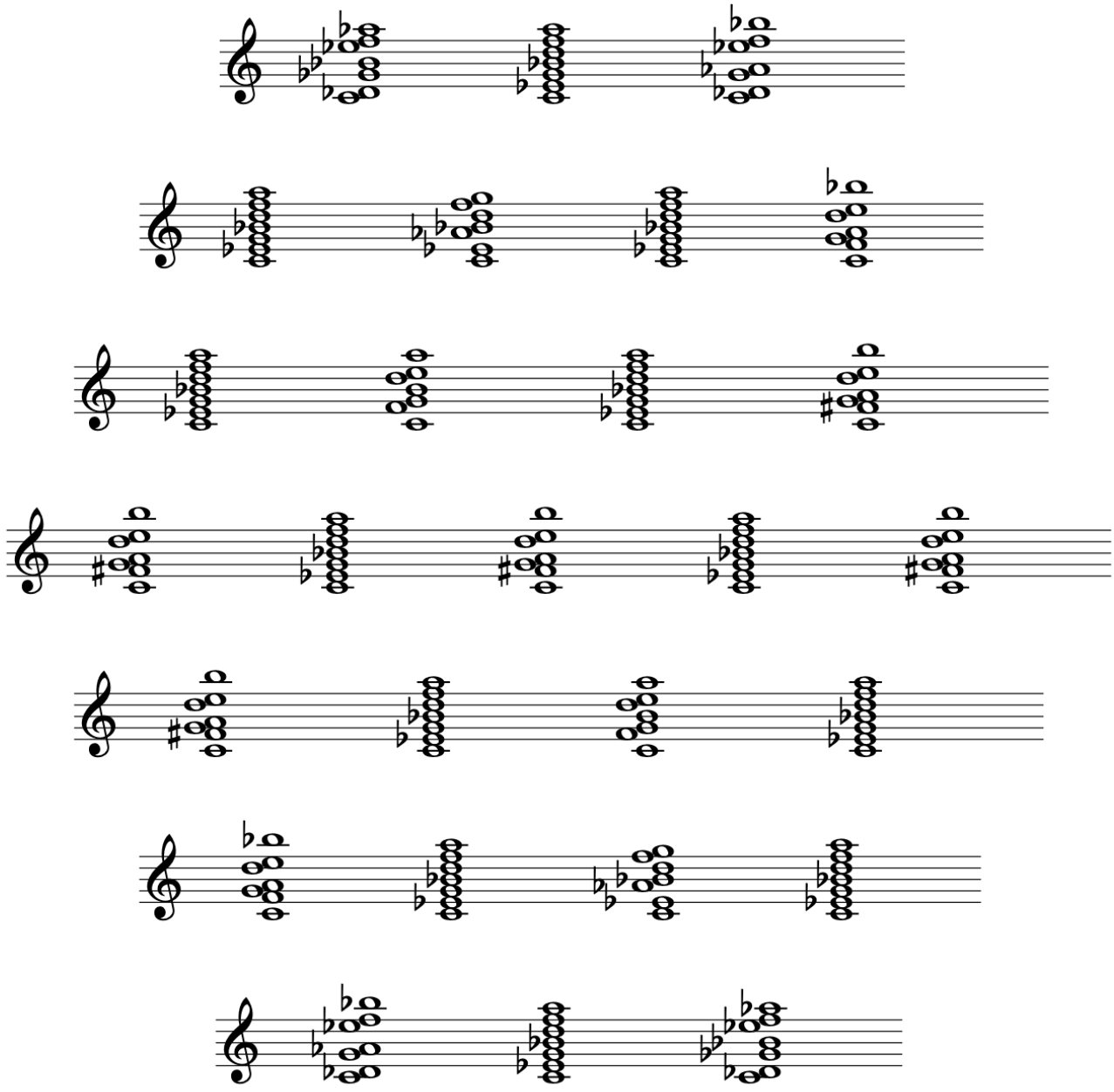
Taking into consideration the idea of using the *dorian* mode as a filler for the [gaps], we can now assign harmonic modes to the numeric values of the yati:

ex. 5: mridangamyati, numeric values and harmonic modes

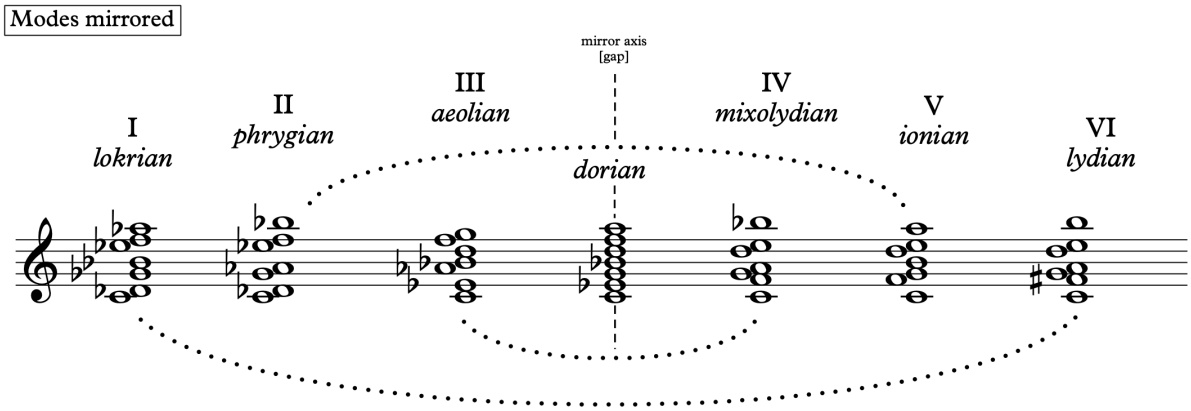
SOLKATTU SYLLABLES PHRASE	NUMERIC VALUE	HARMONIC MODE	SOLKATTU SYLLABES [GAP]	NUMERIC VALUE	SUCCEEDING HARMONIC MODE
ta	1	lokrian	[tam$_2$]	2	dorian
tom ta	2	phrygian	[tam$_2$]	2	dorian
kt tom ta	2	aeolian	[tam$_2$]	2	dorian
tr kt tom ta	4	mixolydian	[tam$_2$]	2	dorian
kt tr kt tom ta	5	ionian	[tam$_2$]	2	dorian
ta kt tr kt tom ta	6	lydian	-	-	
ta kt tr kt tom ta	6	lydian	[tam$_4$]	4	dorian
ta kt tr kt tom ta	6	lydian	[tam$_4$]	4	dorian
ta kt tr kt tom ta	6	lydian	-	-	
ta kt tr kt tom ta	6	lydian	[tam$_2$]	2	dorian
kt tr kt tom ta	5	ionian	[tam$_2$]	2	dorian
tr kt tom ta	4	mixolydian	[tam$_2$]	2	dorian
kt tom ta	3	aeolian	[tam$_2$]	2	dorian
tom ta	2	phrygian	[tam$_2$]	2	dorian
ta	1	lokrian	-	-	

Now we can create a harmonisation of the *mridangamyati*. The version shown below is based on the idea of using the same root note for all syllables. Naturally, this could again be changed and done in any other fashion:

Mridangamyati harmonized



So far, the *dorian* mode has been used as a filler for the [gaps] between our (phrases). Going a step further and considering the second idea above, we can make use of the *mirror axis* the *dorian* mode can provide: mirroring the ultimate most opaque mode with the ultimate transparent (*lokrian - lydian*), the middle „darkest“ with the middle „brightest“ (*phrygian - ionian)* and last also the two modes next to the *mirror axis* (*aeolian - mixolydian*).

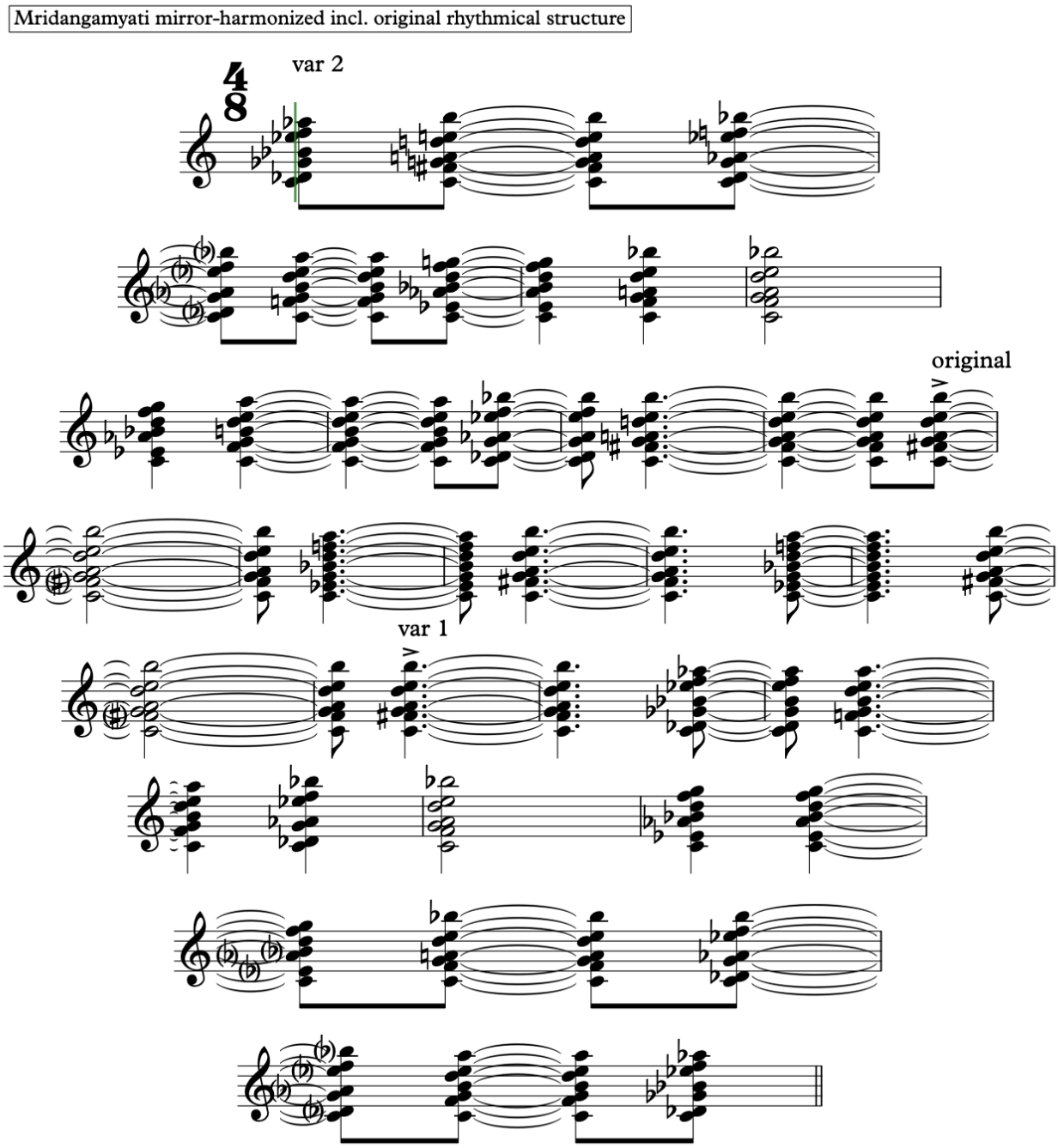


Now, instead of filling the [gaps] of our variations one and two with the *dorian* mode, we could fill them each with the mirrored opposite of the preceding harmony. However, the original *mōrā* in the middle of the *mridangamyati*-structure will use the *dorian* mode as a filler in the [gaps].

ex. 6: mridangamyati harmonic modes and modes mirrored

SOLKATTU SYLLABLES PHRASE	NUMERIC VALUE	HARMONIC MODE	SOLKATTU SYLLABES [GAP]	NUMERIC VALUE	SUCCEEDING HARMONIC MODE
ta	1	lokrian	[tam$_2$]	2	lydian
tom ta	2	phrygian	[tam$_2$]	2	ionian
kt tom ta	3	aeolian	[tam$_2$]	2	mixolydian
tr kt tom ta	4	mixolydian	[tam$_2$]	2	aeolian
kt tr kt tom ta	5	ionian	[tam$_2$]	2	phrygian
ta kt tr kt tom ta	6	lydian	-	-	
ta kt tr kt tom ta	6	lydian	[tam$_4$]	4	dorian
ta kt tr kt tom ta	6	lydian	[tam$_4$]	4	dorian
ta kt tr kt tom ta	6	lydian	-	-	
ta kt tr kt tom ta	6	lydian	[tam$_2$]	2	lokrian
kt tr kt tom ta	5	ionian	[tam$_2$]	2	phrygian
tr kt tom ta	4	mixolydian	[tam$_2$]	2	aeolian
kt tom ta	3	aeolian	[tam$_2$]	2	mixolydian
tom ta	2	phrygian	[tam$_2$]	2	ionian
ta	1	lokrian	-	-	

Adding the rhythmic values of the original *mridangamyati* and setting up a time signature of 4/8 by taking into consideration our total sum of 88 *matras* that will add up to 22 bars in *chatusra*, the result could be:



Explanatory note:

Naturally, the same system will also work with the modes of the harmonic minor scale (*aeolian maj^{7}- locrian$^{\#6}$ - ionian$^{\#5}$ - dorian$^{\#4}$ - phrygian dominant - lydian$^{\#2}$ - superlocrian*), all hexatonic or pentatonic modes or a combination of these.

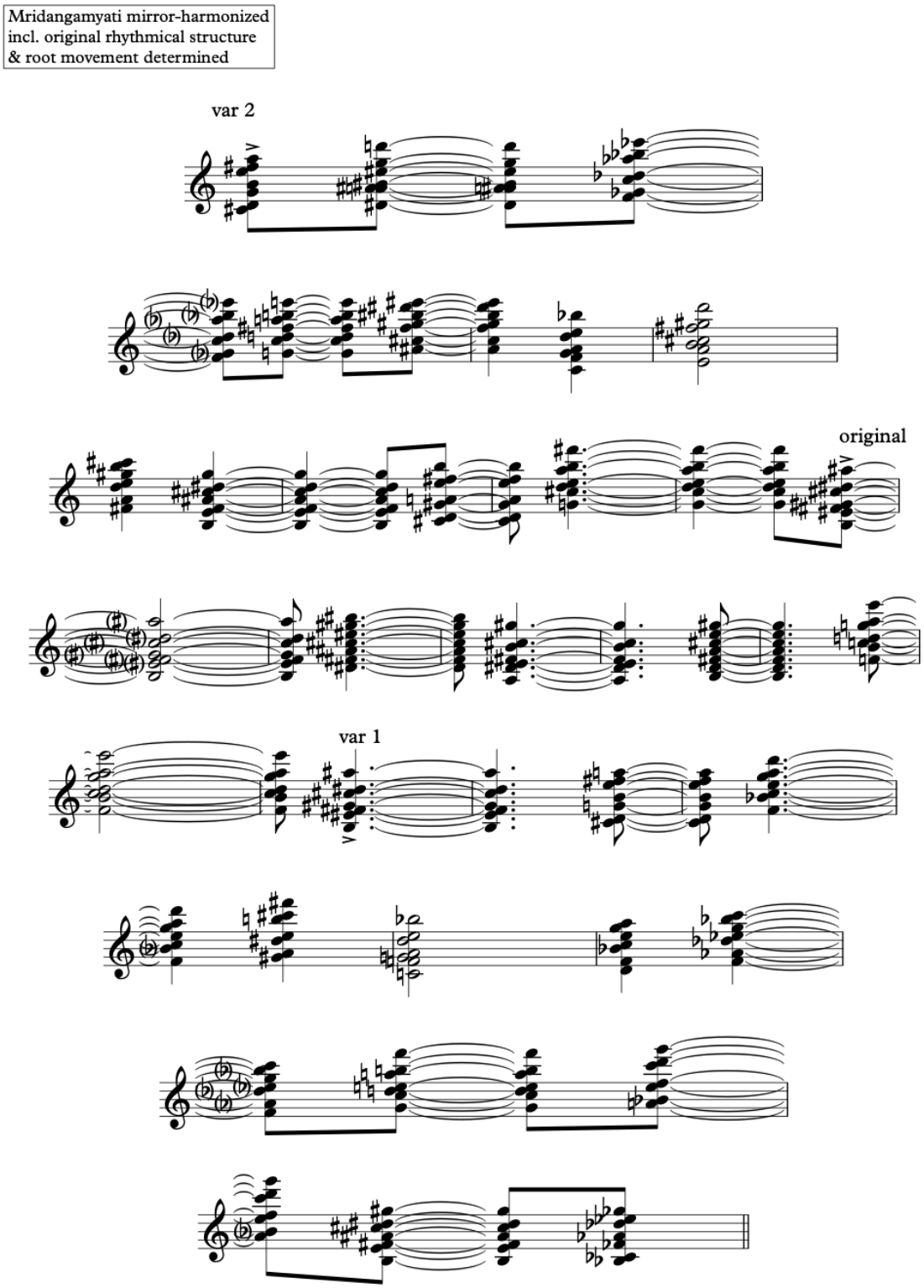
Transposition into Harmonic Roots

The method above can simultaneously also be used to define a sequence of harmonic root notes. Applying the idea of transforming the numeric values into (ascending) intervals, making one matra equal to the interval of a semi-tone and after defining the note c-sharp as a random root to start with, the outcome would look like this:

ex. 7: mridangamyati harmonic modes, modes mirrored & harmonic root (ascending, matra equals semi-tone)

SOLKATTU SYLLABLES PHRASE	NUMERIC VALUE	HARMONIC MODE	SOLKATTU SYLLABES [GAP]	NUMERIC VALUE	SUCCEEDING HARMONIC MODE
ta	1	C# lokrian	[tam$_2$]	2	D#-lydian
tom ta	2	F-phrygian	[tam$_2$]	2	G-ionian
kt tom ta	3	A#-aeolian	[tam$_2$]	2	C-mixolydian
tr kt tom ta	4	E-mixolydian	[tam$_2$]	2	F#-aeolian
kt tr kt tom ta	5	B-ionian	[tam$_2$]	2	C#-phrygian
ta kt tr kt tom ta	6	G-lydian	-	-	
ta kt tr kt tom ta	6	B-lydian	[tam$_4$]	4	D#-dorian
ta kt tr kt tom ta	6	A-lydian	[tam$_4$]	4	B-dorian
ta kt tr kt tom ta	6	F-lydian	-	-	
ta kt tr kt tom ta	6	B-lydian	[tam$_2$]	2	C#-lokrian
kt tr kt tom ta	5	F#-ionian	[tam$_2$]	2	G#-phrygian
tr kt tom ta	4	C-mixolydian	[tam$_2$]	2	D-aeolian
kt tom ta	3	F-aeolian	[tam$_2$]	2	G-mixolydian
tom ta	2	A-phrygian	[tam$_2$]	2	B-ionian
ta	1	A#-lokrian	-	-	

Here the result in musical notation:



Summary

The ultimate intention behind my research has been to show the great palette of creative potential that Indian classical music in general and the Carnatic system in particular can provide for western composers. This has been, I believe, successfully illustrated and shown in the few examples presented in the second, the empirical part of this text.

The Carnatic system does not only provide great efficiency when it comes to the performance of complex rhythmical ideas, but also when creative compositional approaches want to be explored.
It is the combination of the large arsenal of western compositional techniques with the Indian rhythmical discoveries that can produce completely new fields in western music.

In addition to that an analytical mind assorted with the ideas of Carnatic rhythm can extract parallels between compositions which originally were not based on Carnatic concepts and techniques per se. Further, this observations can be used to enhance the performance of the composition.

For all intents and purposes, the Carnatic system can be well considered as a concept for rhythmical precision as well as a pool of inexhaustible creative compositional ideas.

Appendix

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Scores and Illustrations

Figure 1: Illustration of Mridangam: Retrieved online from https://www.india-instruments.de/instrumentenlexikon-mridangam.html

Figure 2: Deçî-tâlas, Messiaen, Oliver (1944) Technique de mon language musical, II examples musicaux, (English Translation by John Satterfield) Paris: Alphonse Leduc

Figure 3: valour ajouté, Messiaen, Oliver (1944) Technique de mon language musical, II examples musicaux, (English Translation by John Satterfield) Paris: Alphonse Leduc

Figure 4: Messiaen, O. (1949–1992) Traité de Rhythme, de Couleur, et d’Ornithologie, Tome V, Volume One, Appendix B. Alphonse Leduc (United Music Publishers)

Figure 5: Messiaen, O. (1949–1992) Traité de Rhythme, de Couleur, et d’Ornithologie, Tome V, Volume One, Appendix B. Alphonse Leduc (United Music Publishers)

Figure 6: Ligeti. György (1986) Etudes pour piano, premier livre, Mainz: Schott

Figure 7: Nicolaus A. Huber (1986) Demijour Spielpartitur. Retrieved from https://www.breitkopf.com/composer/440 (12.01.2019)

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Charts

Chart 1: (The 35 talas) from: Reina, Rafael (2015). Applying Karnatic Rhythmical Techniques to Western Music. Farnham, England: Ashgate Publishing Limited, p. 15&16

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