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DATA SET CREATION FOR BASIC LESSONS OF CARNATIC MUSIC

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Abstract: Music is an art form built on sound, melody and emotion. There are various mathematical principles underlying music. To analyze patterns and structures in musical data, there is a need to create a dataset of compositions and to create a mapping between notes and numbers, which will be helpful in building algorithms on pattern recognition and other text related studies. Carnatic music can be classified into basic and advanced levels which mainly include compositions of various composers. Digitization of Carnatic music compositions creates a platform mainly for research, related to text analysis. Similar data sets can be created for notations of other forms of music such as Hindustani, folk and film music.

Index Terms **– Carnatic Music, Data Set, Basic Lessons**

I. INTRODUCTION

Data is the combination of numerical facts and information, which with the help of statistics and analysis can help arrive at meaningful conclusions and aid in decision-making. Data mining is a process used to extract usable data from a larger set (raw data). Computational approach in music-related research needs data for developing algorithms and testing methods. A well designed and substantial data collection is important for the algorithm to yield good results. Since there aren't any standard datasets available for the study and analysis of Carnatic music based on notation-text or lyrical content, there is a need to create of a dataset specifically for this purpose. Most of the available datasets are audio recordings of Carnatic and Hindustani music which are mainly useful for concepts like fundamental frequency estimation, note recognition, raga recognition, frequency analysis, and pitch analysis. We can find Carnatic rhythm dataset, mridangam stroke dataset, Carnatic varnam dataset etc. Not many text related data sets are available which can be used for text analysis. Text based dataset of Carnatic compositions was hence created for the purpose of analyzing the patterns related to ragas, talas, jatis of tillanas of various composers. Similar datasets can be used for analysis of other forms of music like Hindustani, folk and film music. In this work, the data collected includes all forms of compositions of Carnatic music, which can be mainly categorized as basic lessons and advanced lessons.

Basics lessons can be classified as:

1. **Sarale varase**
2. **Janti varase**
3. **Alankaras**
4. **Taggusthayi varase**
5. **Hecchusthayi varase**
6. **Datu varase**
7. **Geethas**
8. **Swarajatis**
9. **Jatiswaras**

Advanced lessons include:

1. **Varnas**
2. **Kritis/keertanas**
3. **Raga-tana-pallavi**
4. **Devara namas**
5. **Vachanas**
6. **Padas**
7. **Javalis**
8. **Ragamalikas**
9. **Tillanas**
10. **Astapadis**
11. **Prabandhas**

II. BASIC LESSONS IN CARNATIC MUSIC

Swarawali means a group of notes. Sarale, janti, tara and mandrasthayi, daaatu and alankaras can be classified as swarawali.

Sarale: It is a simple arrangement of seven notes in the middle and upper octaves (upto shadja). In the first part, of the first line and the first part of second line, we can observe different combinations of notes including dhatu prayogas, but the second half of the first line is "s r g m p d n s" and the second half of second line is "s n d p m g r s". It is a simple exercise of notes for the beginners.

Janti: Here, notes are repeated with a little stress on the second note and ascending- descending orders are followed.

Hechusthayi or Tarasthayi: Here, a middle and few higher octave notes are arranged mainly in ascending order along with some descending order notes. It is a good exercise of higher octave notes in the initial stages of learning Carnatic music.

Mandrasthayi or Taggusthayi: The focus is on descending order of notes, including lower octave notes, which serves as a good practice module for the beginners.

Daatu: Jumping from one note to another like, first to third, second to fourth, etc can be seen in dhatu prayogas. Proper positioning of notes can be achieved by dhatu practice.

All the above are also known as **varases**. Three octaves, namely, lower, middle and upper are mainly used in Carnatic music. Basic lessons help in reaching three octaves with ease. These are practiced in different speeds also. Adi tala is mainly used and the basic lessons are practiced in akara, omkara, makara, etc. which will find its application in elaborating a raga in later stages.

Alankaras: Various arrangements of notes in different talas with different combinations can be seen in alankaras. Seven talas undergo five jaati variations, which give rise to thirty-five talas. Alankaras in all these thirty-five talas impart great training of notes and rhythm. Here also, we can find ascending and descending order of notes. These swarawalis can be applied to any melakartha raga as they have

all the seven notes in ascending and descending order. We can have some alankaras in different ragas also. Example,

Mohana – Triputa Tala

s r g s r g p

r g p r g p d

g p d g p d s-

s- d p s- d p g

d p g d p g r

p g r p g r s

Geetha: It is a devotional song with a simple raaga, tala, sahitya form. We have sanchari or samanya or sadharana geetha, lakshana geetha, and ghanaraga geetha. Pillari geethas are a subset of samanya geetha consisting of the following – Lambodhara, Kunda Gowra, Kereya Neeranu, Padumanabha.

Lakshana Geetha: A description of the raga and other aspects of the composition can be observed in a lakshana geetha. It is generally on a particular deity. Example, Aarere Kosala in Shankarabharana, the notes Chatushruti Rishabha, Antaragandhara, Chatushruti Daivata, Kakali Nishadha, Shudha Madhyama are mentioned. The names of raga and tala are also mentioned in the song.

Jati Swara: It is a composition full of notes (sometimes jatis also). It consists of a pallavi, chittaswara/charana. We can see mathematical varieties in the arrangement of notes.

Swarajatis: They contain lyrics as well, which are also sung sometimes. Shyama Shastri has composed some beautiful swarajatis.

Mainly, Mayamalavagowla is chosen for basic lessons, especially swarawalis. As the distance between the notes is less compared to other ragas and has less gamakas. Especially, Kakali Nishadha is very close to Shadja. It becomes easier to learn Carnatic music through this.

III. CREATION OF DATASET BASED ON THE NOTATION TEXTS OF COMPOSITIONS

3.1.Key terms and their symbolic representations

While representing basic lessons on excel sheets, the following columns have been created as explained below.

1. Sl. No. in basic lessons.
2. Parts of the composition: it is represented as follows - Pallavi (1) Anupallavi (2) Charana (3) Chitteswara (4) Samashti Charana (5) Yattugadeswara (6) Others (7)
   We can have more than one charana or chitteswara or yattugadeswara. They will be represented as first charana (3), second charana (33), third charana (333) and so on. Similarly, first Chitteswara as (4), the second as (44), the third as (444) and so on.
   The Yattugadeswara can also be similarly represented.
3. Tala number - There are mainly seven talas, namely, Dhruvatala (1), Mattyatala (2), Roopaka (3), Jhamapa (4) , Triputa (5), Ata (6) and Eka (7).

4. Jaati of Laghu: Laghu has five jaatis. They are Tisra, Chaturasra, Khanda, Misra and Sankeerna. They are represented by 3, 4, 5, 7, and 9 respectively, indicative of the count of aksharas in the laghu.
5. Counts per avarta: One cycle of tala is known as an avarta. Example, Adi tala can have either 8 or 16 or 32 counts depending on the speed which means it will take 8 or 16 or 32 counts to complete one cycle. Similarly, Tisra jaati Triputa will have 7 or 14 counts per avarta.
6. Beat position of swara: This indicates the position of a particular note or swara in the tala. For example, this column will show the value of 7 against the Swara S if S occurs in the 7^{th} position of the tala cycle. Suppose we want to know the note occurring in the fifth position, it can be picked up easily.
7. Speed flag: A note within the avarta can have either slow or normal or fast tempo.
   One note per beat is normal. (0)
   Two beats per note is slow. (1)
   Two notes per beat is fast. (2)
   Within the beat count, more than one note can occur. Like, 4 or 6 or a note can stretch for more than one beat.
8. Total number of counts in dheerga (slow tempo): This indicates for how many beats the note is stretched.
9. Current number in dheerga: Suppose the note is stretched for 4 counts, 1, 2, 3, 4 will represent the position of the note.
10. Number of swaras (when speed flag is 2): This column gives the information about the number of swaras which are in fast tempo. We can find two, four, six, eight number of swaras in fast tempo.
11. Current number when speed flag is 2: This column gives the position of the swara in the corresponding fast phrase that it belongs to.
12. Swara: The note corresponding to the particular beat count is indicated in this column. Notes of different octaves are represented as follows.

Table 1. Mapping from notes to numbers

Notes	Ati Mandrasthayi	Lower Octave	Middle Octave	Upper Octave	Ati Tara
Shadja	1	13	25	37	49
Suddha Rishabha	2	14	26	38	50
Chatushruti Rishabha / SuddhaGandhara	3	15	27	39	51
Shatshruti Rishabha/ Sadharana Gandhara	4	16	28	40	52
Antara Gandhara	5	17	29	41	53
Suddha Madhyama	6	18	30	42	54
Prati Madhyama	7	19	31	43	55
Panchama	8	20	32	44	56
Suddha Dhaivatha	9	21	33	45	57

Chatushruti Dhaivatha/ Suddha Nishada	10	22	34	46	58
Shatshruti dhaivatha / Kaisiki Nishada	11	23	35	47	59
Kakali Nishada	12	24	36	48	60

3.2.Dataset creation for basic lessons

Carnatic music is based on seven notes namely shadja, rishabha, gandhara, madhyama, panchama, dhaivatha and nishada which can be represented by S, R, G, M, P, D and N. S and P remain constant for all ragas but other notes undergo variations. M has two variations namely suddha and prati madhyama. There are three variations each for R, G, D and N namely

R—Suddha, Chatushruti(chatR), Shatshruti(shatR)

G—Suddha, Sadharana and Antara

D—Suddha, Chatushruti (chatD) and Shatshruti (shatD)

N—Suddha, Kaisiki and Kakali

Among these variations, chatR and suddhaG are the same note or frequency, which means they can be considered equal. Similarly, shatR and sadharanaG are equal, ChatD and sudhaN are equal, and ShatD and kaisikiN are equal.

It means we cannot have a raga which will have both chatR and sudhaG which implies if the raga has chatR and a gandhara, then the gandhara in that raga will be sadharana or antara gandhara. So we can have a total of 12 notes including all variations - S, P, suddhaM, pratiM, suddhaR, chatR (sudhaG), shatR (sadharanaG), antaraG, sudhaD, chatD (suddhaN), shatD (kaisiki N) and kakali nishada. There is a mention of five octaves in Carnatic music namely atimandra sthayi, mandra sthayi (lower octave), madhya sthayi (middle octave), tara sthayi (upper octave) and atitara sthayi. Generally and practically we come across only three octaves namely lower, middle and upper octaves. To represent the notes in octaves they are denoted by - -N double dash to the left of note for atimandra sthayi, -N single dash towards left for mandra sthayi, N with no dash for madhya sthayi, N- single dash to the right side for tara sthayi and N- - double dash to the right atitara sthayi. Deergha notes have to be taken into consideration. If the note is deergha for two counts, let us say S, then it is considered as SS which occupies two beat counts. Similarly if a note is deergha for four counts, the note is repeated four times. Basic lessons generally have only one note per beat .Some compositions start after a few beats. In such cases, in the column for beat counts, that many counts are left empty. Using all these, digitisation of musical compositions of Carnatic music can be done. Shown below is an example of a basic lesson represented in the proposed dataset format in MS Excel.

sl.no	parts of a compositi on	tala no	jati of laghu	counts per avartham	beat position of swara	speed flag:norm al(0)/slow (1)/fast(2)	Total no.of counts in dheerga(when speed flag is 1)	current no.in dheerga(when speed flag is 1)	No.of swaras (when speed flag is 2)	current no.(when speed flag is 2)	swara1	swara 2	swara 3	swara 4		sarale-Mayamala vagowla-Adi
1	7	5	4	8	1	0	0	0	0	0	25					
	7	5	4	8	2	0	0	0	0	0	26					
	7	5	4	8	3	0	0	0	0	0	29					
	7	5	4	8	4	0	0	0	0	0	30					
	7	5	4	8	5	0	0	0	0	0	32					
	7	5	4	8	6	0	0	0	0	0	33					
	7	5	4	8	7	0	0	0	0	0	36					
	7	5	4	8	8	0	0	0	0	0	37					
	7	5	4	8	1	0	0	0	0	0	37					
	7	5	4	8	2	0	0	0	0	0	36					
	7	5	4	8	3	0	0	0	0	0	33					
	7	5	4	8	4	0	0	0	0	0	32					
	7	5	4	8	5	0	0	0	0	0	30					
	7	5	4	8	6	0	0	0	0	0	29					
	7	5	4	8	7	0	0	0	0	0	26					
	7	5	4	8	8	0	0	0	0	0	25					

Figure 1. Sarale representation

sl.no	parts of a compositi on	tala no	jati of laghu	counts per avartham	beat position of swara	speed flag:norm al(0)/slow (1)/fast(2)	Total no.of counts in dheerga(when speed flag is 1)	current no.in dheerga(when speed flag is 1)	No.of swaras (when speed flag is 2)	current no.(when speed flag is 2)	swara1	swara 2	swara 3	swara 4
hecchusthayi varase-Mayamalavagowla-Adi														
1	7	5	4	8	1	0	0	0	0	0	25			
	7	5	4	8	2	0	0	0	0	0	26			
	7	5	4	8	3	0	0	0	0	0	29			
	7	5	4	8	4	0	0	0	0	0	30			
	7	5	4	8	5	0	0	0	0	0	32			
	7	5	4	8	6	0	0	0	0	0	33			
	7	5	4	8	7	0	0	0	0	0	36			
	7	5	4	8	8	0	0	0	0	0	37			
	7	5	4	8	9	1	2	1	0	0	37			
	7	5	4	8	10	1	2	2	0	0	37			
	7	5	4	8	11	1	2	3	0	0	37			
	7	5	4	8	12	1	2	4	0	0	37			
	7	5	4	8	13	1	2	1	0	0	37			
	7	5	4	8	14	1	2	2	0	0	37			
	7	5	4	8	15	1	2	3	0	0	37			
	7	5	4	8	16	1	2	4	0	0	37			
	7	5	4	8	17	0	0	0	0	0	33			
	7	5	4	8	18	0	0	0	0	0	36			
	7	5	4	8	19	0	0	0	0	0	37			
	7	5	4	8	20	0	0	0	0	0	38			
	7	5	4	8	21	0	0	0	0	0	37			
	7	5	4	8	22	0	0	0	0	0	36			
	7	5	4	8	23	0	0	0	0	0	33			
	7	5	4	8	24	0	0	0	0	0	32			
	7	5	4	8	25	0	0	0	0	0	37			
	7	5	4	8	26	0	0	0	0	0	36			
	7	5	4	8	27	0	0	0	0	0	33			
	7	5	4	8	28	0	0	0	0	0	32			
	7	5	4	8	29	0	0	0	0	0	30			
	7	5	4	8	30	0	0	0	0	0	29			
	7	5	4	8	31	0	0	0	0	0	26			
	7	5	4	8	32	0	0	0	0	0	25			

Figure 2. Hecchusthayi varese

sl.no	parts of a compositi on	tala no	jati of laghu	counts per avartham	beat position of swara	speed flag:norm al(0)/slow (1)/fast(2)	Total no.of counts in dheerga(when speed flag is 1)	current no.in dheerga(when speed flag is 1)	No.of swaras (when speed flag is 2)	current no.(when speed flag is 2)	swara1	swara 2	swara 3	swara 4	Janti varase-	
1	7	5	4	16	1	0	0	0	0	0	25	(ss rr gg)			Mayamalavagowla-	
	7	5	4	16	2	0	0	0	0	0	25				Adi	
	7	5	4	16	3	0	0	0	0	0	26					
	7	5	4	16	4	0	0	0	0	0	26					
	7	5	4	16	5	0	0	0	0	0	29					
	7	5	4	16	6	0	0	0	0	0	29					
	7	5	4	16	7	0	0	0	0	0	30					
	7	5	4	16	8	0	0	0	0	0	30					
	7	5	4	16	9	0	0	0	0	0	32					
	7	5	4	16	10	0	0	0	0	0	32					
	7	5	4	16	11	0	0	0	0	0	33					
	7	5	4	16	12	0	0	0	0	0	33					
	7	5	4	16	13	0	0	0	0	0	36					
	7	5	4	16	14	0	0	0	0	0	36					
	7	5	4	16	15	0	0	0	0	0	37					
	7	5	4	16	16	0	0	0	0	0	37					
	7	5	4	16	1	0	0	0	0	0	37					
	7	5	4	16	2	0	0	0	0	0	37					
	7	5	4	16	3	0	0	0	0	0	36					
	7	5	4	16	4	0	0	0	0	0	36					
	7	5	4	16	5	0	0	0	0	0	33					
	7	5	4	16	6	0	0	0	0	0	33					
	7	5	4	16	7	0	0	0	0	0	32					
	7	5	4	16	8	0	0	0	0	0	32					
	7	5	4	16	9	0	0	0	0	0	30					
	7	5	4	16	10	0	0	0	0	0	30					
	7	5	4	16	11	0	0	0	0	0	29					
	7	5	4	16	12	0	0	0	0	0	29					
	7	5	4	16	13	0	0	0	0	0	26					
	7	5	4	16	14	0	0	0	0	0	26					
	7	5	4	16	15	0	0	0	0	0	25					
	7	5	4	16	16	0	0	0	0	0	25					

Figure 3. Janti varase

3.3. Notations of Basic Lessons

Here, the notations of a few basic lessons are shown as examples. The seven notes of Carnatic music are represented by s, r, g, m, p, d and n. Here capital letters like S, M, P etc are used to denote deergha notes. Upper octave notes are represented by s-, r-, g-, m- and p-. Lower octave notes are represented by -n, -d and -p.

Sarale – Mayamalavagowla - Adi Tala

s r g m p d n s-

s- n d p m g r s

Janti - Mayamalava Gowla - Adi Tala

s s r r g g m m p p d d n n s-s-

s-s- n n d d p p m m g g r r s s

Tara Sthayi or Hecchusthayi Varase- Mayamalavagowla- Adi Tala

s r g m p d n s- S-; S-;

d n s- r- s- n d p s- n d p m g r s

IV. RESULTS AND DISCUSSION

Data set for basic lessons is created which can be subsequently used for text analysis of Carnatic music. Lyrical parts of the compositions are not required for this, hence not considered here. This data set creation shows that any musical composition with notation can be digitised in a systematic manner. Text music can be coded and digitised very effectively by this method.

V. SCOPE

The work can be extended not only to all other forms of compositions such as varnas, kritis, padas, javalis, dasarapadas etc of Carnatic music but also to all genres of notated music like Hindustani, western, folk and film.

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