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Study of Emotion Perception for Indian Classical Raga Music

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ABSTRACT

Indian Classical Music (ICM) has a long tradition and people from various cultural backgrounds are fascinated by it. Each performance of a given raga in ICM is supposed to create a common mood among the listeners. We have selected all clips of instrument flute in order to eliminate the effect of timbre and lyrics on perceived emotions. For our initial experiments, we have selected 2 ragas. The 3 clips selected in each raga were one with fast rhythm, one with medium rhythm and one with alap which is arrhythmic. We have obtained total 240 responses with 40 responses per clip during 6 different sessions. Each session was planned with 2 clips per session with same tempo of different raga. The sessions were planned to eliminate the effect of possible ordering of music clips. Listeners provided rating for 13 different emotions on a numeric scale of 0 to 100 for musical clip. The results are presented using different statistical data charts along with the analysis of data. The critical findings about the expression creation are presented with support of data. These initial experiments revealed strong evidence of raga association with the specific emotion for novice listeners.

I. INTRODUCTION

ICM has a long history. It has evolved to its present form over at least 600 years. The khyal form of vocal music and instrumental presentation mimicking vocal styles are relatively recent developments in ICM. In vocal music, the lyrics in the song are associated with possible meaning. In case of instrumental music one can eliminate possible effect of lyrics on emotion perception.

Instrumental classical music has numerous variants considering different instruments. ICM instruments are traditionally classified into different types based on sound production method such as wind instruments, string instruments, vitata instruments etc. Popular string instruments are Sitar, Sarod, Santoor, Sarangi etc. Popular wind instruments are bamboo flute or Basuri, Shahanai, Harmonium etc. Vitata instruments like Tabla, Pakhwaj etc generally used for taal or rhythm in ICM.

We have selected one wind instrument Bansuri or Bamboo Flute for our experiments. Bansuri has also long history and is also associated with lord Krishna in Hindu religion. In recent years, artists like Pandit Pannalal Ghosh, Pandit Hariprasad Chaurasiya etc. are the main contributors for popularizing Basuri among ICM listeners.

Raga in ICM is a framework with certain rules about notes to be played, their sequence, their prominence etc. In a framework of raga, we have many bandishes or melodies composed by different composers. These different compositions in the same raga along with enormous possibilities for improvisation during presentation are the main features of ICM. Raga music in ICM is covered by many books in detail with noticeable contribution in the context of computational musicology.

The ICM performance in Khyal form usually has music rendition in 3 parts: first alap, followed by vilambit or Madhya laya and finally drut laya. In alap, raga notes are played or sung with slow tempo to build the atmosphere at the beginning. During alap, there is no rhythm accompaniment. Vilambit laya means slow tempo, Madhya laya means medium tempo and drut laya means fast tempo.

We have discussed the emotion and raga correlation with performers and some seasoned listeners. Most of them were agreeing to specific emotional feel associated with the raga. Some of them expressed an opinion that they can reach at the highest level of happiness with a meditative feeling after listening to their favorite artist/ raga in ICM.

Like every human being raga has its own name and individual characteristics. Raga can be classified according to time of playing or moods created from them. Raga- bhava or mood is the expected atmosphere created or experience of listeners to a raga rendition. It is very difficult to express it in words and is matter of personal experience according to many seasoned listeners and the performers.

We have chosen 2 ragas - Marubihag and Marwa for our initial experiments. They are perceived to create different emotional atmospheres. Marubihag is supposed to create happy and excited emotion whereas Marwa is supposed to create sad and depressed emotion. The work presented here is the extension of our own work done before.

Ethnomusicologists around the world are also exploring association between music and felt emotions. Martin Clayton made the following points in his article “Musical experience depends on our attention primarily on auditory information and perhaps in the extent to which sound information is understood in a non-linguistic mode. Each individual perceives and decodes the information differently. Thus the meaning or experience is always experience to someone.” He further states that “We need to recognize that musical experience is meaningful in a variety of ways, that these ways are interconnected and that the relationships between different dimensions of meaning are important”.

The feeling or expression or emotion created by music in different listeners, or even the same listener at different times, may vary. The response of a listener depends on many factors such as cultural background, upbringing, current emotional state of the listener and individual likes and dislikes as factors related to individuals. The response is also dependent on the attention of the listener towards timbre of voice or instrument, notes played, tempo and rhythm in the clip. Meaning or expression from music can be entirely different depending on

the focus of the listener. Our aim was to catch possible common expression for the specific raga for different perceived emotions.

II. AIM

Although it is difficult to catch the common expressions from any music form, we have attempted to find, as far as it is possible, the common expression created by ICM on Indian listeners with almost similar cultural background. All the listeners in the experiments were young Indians with age group of 18-20 years studying in the college.

Considering the viewpoints and findings by researchers, the emotional experience is generally subjective and different for individuals. We have attempted to validate the hypothesis as "Each raga is associated with specific mood" by listening experiments for novice Indian listeners with no or little background of ICM.

Our main aims in this pilot study for 2 selected ragas are,

- Identify Raga association with distinct emotional musical appeal.
- Study of effect of tempo variations on different emotion perceptions.

III. LITERATURE SURVEY

Emotional modeling and conceptualization has been attempted by many researchers to capture emotional response of music from the listeners. Emotions were clustered in 8 categories by Hevner for representing perceived music by listeners. Different approaches proposed in the literature mostly refer to either emotion categorization or using valence-arousal dimensional approach.

In emotion categorization approach, subjects or listeners report emotions in specific category such as happy or sad etc. Listeners can express emotions in their own words or they are asked to rate given emotions on the scale from low to high. This approach has advantage as it is easy for listeners to report ratings and specific emotions experienced in their own words. It is likely that sometimes listeners unable to express their emotions in proper words and can lead to false emotional interpretations.

In dimensional approach, listeners select some position on emotion dimension axis. This position is associated with some number to identify intended emotion. Valance arousal circumflex model proposed by Russell is a dimensional model used widely. Two dimensional model with X axis as Valance to represent emotion as positive or negative and arousal to represent intensity on Y axis as high or low for specific emotion. It divides the plan in 4 different quadrants. Three dimensional models are also proposed but they lag in visualization aspects and issues related to annotations from subjects. Two dimensional models are better compare to three dimensional models considering the simplicity aspect.

Musical piece may have changing emotions over a timeline as listeners may perceive different emotions corresponding to different musical sections or segments of same musical clip. Annotation by listener over a timeline by selecting musical segment and stating experienced emotion is another approach used by researchers. This approach is also termed as expert approach.

Annotation methods used to record emotions are time consuming and do have certain flaws. No design is perfect considering the goal to catch emotions. Since perceived emotions are subjective, complete agreement among listeners is unlikely. Ground truth is generally obtained by averaging the opinions of the subjects.

IV. METHODOLOGY

We decided to use novice listeners as subjects in our experiments to understand the expression created from a raga. Seasoned listeners have their predefined mindsets built through listening to raga music for years and knowledge of convention. We have selected all clips of bansuri in order to eliminate possible impact of timbre variation. We have discussed with Pandit Keshav Ginde, a renowned bansuri player, about the emotions associated with ragas and his own experience while presenting specific ragas. We discussed about features of bansuri performances and perceived feedback from the listeners. He advised us about suitable duration and experiment conduction considering the listener's age and background.

We selected 3 clips of each raga with naming convention as A, M and D corresponding to alap (no rhythm accompaniment), Madhya laya(medium tempo) and drut laya(fast tempo) respectively. For 2 different ragas 6 clips are named as A1and A2 for alap clips, M1 and M2 for Madhya laya clips and D1and D2 for drut or fast tempo clips.

Generally duration of alap and fast tempo is small as compared to Madhya or Vilambit laya in the raga performance. We selected all clips of duration around 2 to 3 minutes regardless of the duration of the corresponding section of the performance. We selected the clip durations of 2 to 3 minutes considering the attention span of novice listeners and an estimate of the minimum time required to embark the emotion.

Before the actual sessions, we did experimental sessions with one clip per session without any feedbacks to understand the patience and get feedback to design the actual experiments. After getting initial feedback about possible patience of novice listeners to listen ICM, we decided to play 2 melodies per session with a gap of about 5 minutes for the 6 sessions done. We decided to observe effect of same tempo and different raga notes on same set of listeners. We conducted total 6 listening sessions with 20 listeners in each session and playing 2 clips per session.

Sessions planned with clips combination and sequence as shown below. As one can notice sessions 1 and 2 used same clips but the order of playing of clips was changed to eliminate possible effect of order in the perceived emotions. Similar logic is reflected in sessions 3, 4 and 5, 6.

Session 1: A1 followed by A2
Session 2: A2 followed by A1
Session 3: M1 followed by M2
Session 4: M2 followed by M1
Session 5: D1 followed by D2
Session 6: D2 followed by D1

Since most of the listeners were in the age group of 18-20 with almost no exposure to ICM, we kept an open mind about the outcome of the sessions. We gave them a brief introduction before the session, explaining the objective of session and how to fill the feedback forms. This exercise helped us to bring the mind sets of all listeners into a common

mode of listening and to experience the emotion created from the clip.

The feedback consisted of 2 parts. First part contained questions about personal musical background and information about the listeners. In the second part, we asked them to rate 13 different emotions on the scale of 0 to 100. For example extremely happy can be 100 and very sad can be 0 for the emotion "happy". After rating about individual emotions, listeners expressed their listening experience with rating their enjoyment association with parameters timbre, melody and rhythm in the rank 1 to 3. This gives us possible attention or influencing features of music for emotions perceived. We also held personal discussions with some of the listeners to understand the effectiveness of the session and understand their view points about listening music. The exercise of discussion after session has given us insight into thought processes of youth and their perceived emotions and expectations from ICM.

V. RESULTS

We have presented comparative data for 2 ragas Marubihag and Marwa [referred as MB and M respectively in figures and tables. Figures 1 to 3 shows comparative average responses for Alap, Madhya laya and Drut for different emotions on the numeric scale of 0 to 100. We have shown data in the range 30 to 85 as all average responses were in this range. Each figure represents average rating response related to each emotion to both ragas. We can analyze different emotional parameters at different tempos for 2 ragas. Table 1 represents responses of user counts in percentage about the comparative perception of specific emotions to each raga. Table 2 represents enjoyment rating matrix to understand liking and possible attention parameters.

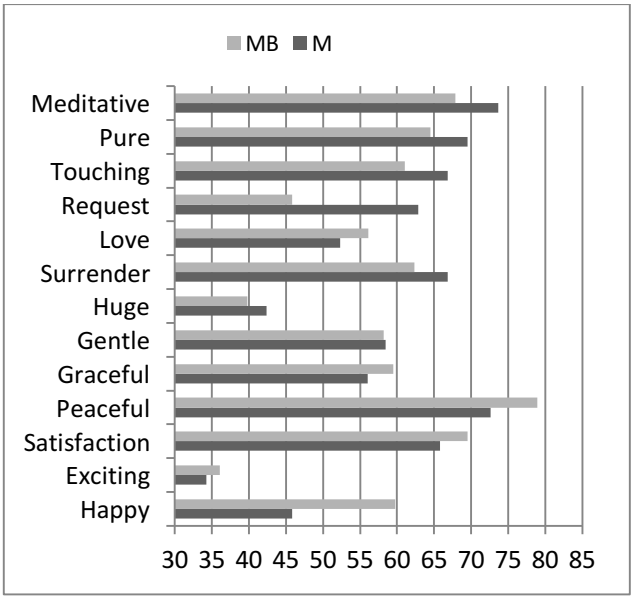

Figure 1. Comparison of alap clips A1 and A2

Comparative average rating of 40 responses per clip recorded in session 1 and 2 are shown in figure 1. This session had alap musical clips of 2 ragas without any rhythm association. We can observe that meditative and peaceful are most prominent emotions related to alap music for both ragas. Request is more prominent feeling in Marwa compare to Marubihag and Happy is protuberant in Marubihag compare to Marwa. Poor rating for exciting feeling indicates that alap form does not excite the listeners.

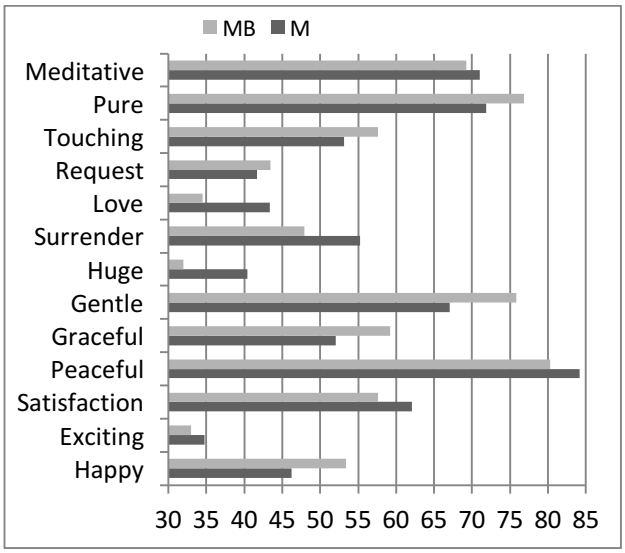

Figure 2. Comparison of Madhya laya clips M1 and M2

Comparative average rating of 40 responses per clip recorded in session 3 and 4 are shown in figure 2. This session had Madhya laya or medium tempo musical clips with rhythm accompaniment. We can observe that peaceful is most prominent emotion for both ragas. Marubihag is perceived as more pure, gentle, graceful and happy compare to Marwa. Marwa perceived to have more surrender, love and satisfaction feel compare to Marubihag.

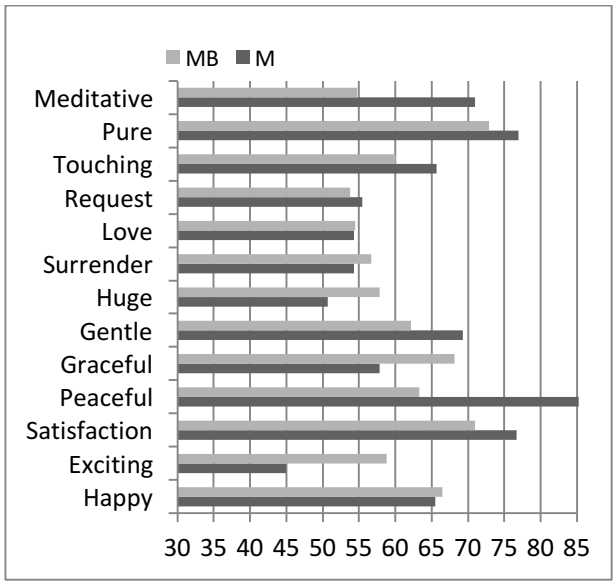

Figure 3. Comparison of drut clips D1 and D2

Comparative average rating of 40 responses per clip recorded in session 5 and 6 are shown in figure 3. This session had drut laya or fast tempo musical clips with rhythm accompaniment. We can observe that peaceful is most appealing emotion for Marwa compare to Marubihag.

Marubihag is perceived as more exciting, huge and graceful compare to mawa. Marwa perceived to have more surrender, love and satisfaction feel compare to Marubihag.

This average response for each emotion perceived can be misleading as it only represents the average ratings by user. Thus we have decided to observe relative response of each user for different emotions. Table 1 shows the percentage of 240 relative responses for each emotion reported as same perception in both ragas, perceived more in Marubihag and Marwa respectively. Figures in bold indicates percentage of listeners with majority perceptions. Pure, love, surrender, huge and exciting feeling is observed at same level by majority of listeners. Marwa is perceived as more touching, request and peaceful feel compare to Marubihag. Marubihag is perceived as graceful and happy compare to Marwa.

Emotions	Perceived same in both Raga	Perceived more in Marubihag	Perceived more in Marwa
Meditative	33.33	17.5	49.17
Pure	**54.17**	25.83	20
Touching	22.5	24.17	**53.33**
Request	22.5	12.5	**65**
Love	**62.5**	27.5	10
Surrender	**52.5**	22.5	25
Huge	**65**	15	20
Gentle	35	37.5	27.5
Graceful	27.5	**52.5**	20
Peaceful	15	30	**55**
Satisfaction	35	35	30
Exciting	**57.5**	22.5	20
Happy	30	**55**	15

Table 1: Raga wise comparison in percentage response

Listeners also provided information about the enjoyable parameters as what they like more on the rating scale of 1 to 3. We have provided parameters as Timbre and melody for first 2 sessions with 80 responses. 58% rated timbre at rating 1 and remaining 42% rated melody at rating 1. Enjoyment rating matrix for sessions 3 to 6 is shown in table 2 for 160 responses as it had additional component as rhythm. This information is useful to understand possible attention and liking of listeners.

Parameter	Timbre	Melody	Rhythm
Rating 1	38.75	36.25	25
Rating 2	30	47.5	22.5

Table 2: Enjoyment rating Matrix

Table 1 represents better comparative perceptions for each emotion in selected 2 ragas. Table 2 corresponds to rating matrix representing percentage of listeners with attention rating to musical parameters as timbre, melody and rhythm.

VI. CONCLUSION

Raga association with specific emotion is a non-trivial task. Many musical dimensions such as timbre, tempo, rhythm etc. influence the listener perception. Isolating effect of melody of raga to associate emotions to raga is difficult. Subjects with same Indian cultural background were participated for the experiments. It would be interesting to extend the experiments for different cultural backgrounds to see the effect of culture in the emotion perception of raga.

Marubihag is perceived as more happier and graceful than Marwa. Marwa is perceived as creating a stronger feeling of request, touching and peacefulness than Marubihag. Other emotions as Pure, Huge, Gentle and meditative for which we have strong support in both ragas can be perceived as effect of quality of sound or can be a reaction of genre or both. Fast tempo seems to be the most important factor in creating "excitement". Marwa is perceived as sadder and more pleading as compared to Marubihag. This is most prominent in their responses to alap and Madhya laya clips. Rhythm adds more excitement and faster tempo perceiving towards the happier mood whereas slow temp with the reflection of sad mood. However, experiments reveal strong evidence of raga association with the specific mood.

Another interesting observation is statistical data can be misleading at times. The average absolute mean values for each emotion related to each raga shown in charts does not reflect raga-wise comparative data. Table 1 with subject-wise comparative information can be more useful to compare raga emotions. Due care needs to be taken for representation of data and drawing conclusions in such multivariate data analysis. It would be interesting to further explore data in Table 2 about enjoyment rating matrix to classify and analyze possible effect of attention of listener on emotions.

We have plans to conduct similar sessions with clips of different ragas, and other sessions with clips in the same raga with wider range of instruments to verify our observations about raga and observe inter-instrumental differences. We are of the view to conduct sessions with clips of different duration to verify our assumption about the minimum time span required to affect the emotion of the listener. All these exercises will help us to verify our assumptions and observations. Our exercise can be useful for musicologist or researchers working in the area of music emotion recognition.

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