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COMPLEXITY OF MUSICAL COMPOSITIONS

SPECIAL PROJECT

BY

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Everyday we hear different kinds of musical compositions such as advertisement jingles, nursery rhymes and pure classical music. One kind of music is different from the other. We respond to the musical compositions on different dimensions. Some we say we hum, some we like, some we dislike, some are monotonous, some particular composition is considered simple and some other complex.

If we generally divide musical compositions into categories like vedic recitations, nursery rhymes, folk, tribal, advertisement jingles, film songs, semiclassical music and classical music (there can be other groups also if we consider western music), we can say that degree of complexity of the musical composition is different in all these compositions. Vedic compositions sound very simple than say a film song. Similarly pure classical music sound very ~~simple~~ complex. Complexity of the musical composition can be treated as one of the important variables of composition. What makes these complex or simple? How can we control the degree of complexity? Intuitive answers to these questions can

be given. However this study attempts to systematically investigate the complexity of musical and visual compositions.

Let us first try to understand complexity. It can be found in lot of things. Just now we were discussing complexity in music. Likewise a painting can be complex or simple to understand. Thus complexity exists in visual compositions also. Some smell can be simple to detect, some can be complex. Some ideas can be simple to be converted into reality, some may be just too complex even to understand or explain. Many examples can be added to this list.

Out of these, visual complexity and audio complexity are considered very near to each other. They are supposed to behave similarly in many areas and can be studied with relation to each other.

We can define complexity in many ways-

A composition can be semantically complex or it can be structurally complex.

This study deals only with structural complexities of visual and audio compositions—using a direct subjective judgement of complexity by subjects/listeners and reflects the difficulty experienced in encoding of patterns or the relationship of the compositions.

One of the ways to study complexity is to give people different specially designed compositions and ask them to rate the complexity on a scale. Since the compositions are developed by controlling the variables, it is possible to study what factors are giving it that particular degree of complexity and how these factors can be predictably controlled to control the overall complexity. This is the general approach followed in this project.

6 DOTS
SIMPLE

9 DOTS
SIMPLE

12 DOTS
SIMPLE

15 DOTS
SIMPLE

6 DOTS
NOT SO SIMPLE

9 DOTS
NOT SO SIMPLE

12 DOTS
NOT SO SIMPLE

15 DOTS
NOT SO SIMPLE

6 DOTS
NOT SO COMPLEX

9 DOTS
NOT SO COMPLEX

12 DOTS
NOT SO COMPLEX

15 DOTS
NOT SO COMPLEX

6 DOTS
COMPLEX

9 DOTS
COMPLEX

12 DOTS
COMPLEX

15 DOTS
COMPLEX.

DEALING WITH AUDIO AND VISUAL COMPOSITIONS

Experimenting with music directly has certain difficulties. One of them is that more than two compositions can not be judged at a time, which is possible in visual medium. This is because the time for which our brain can sustain the full richness of the audio input is very less .

For the experiment sixteen visual compositions were made. Initially the experiment was limited to black dots of equal diameter. Compositions were made on a 9x9cm. paper. A square grid was followed for composing. The compositions structured is given in  the diagram.

In order to fine tune these results, some of the compositions were modified and some of them were recomposed. The experiment was conducted again and the results were analysed. This time better results were obtained. One of the compositions behaved strangely, the reasons for which could not be interpreted.

In a musical composition there a lot of variables which can change its degree of complexity. ~~They are~~ -

.rythem

.speed of the tune and time interval used(tempo)

.combination and sequence of notes

.number of notes used

use of multiple voices or chorus

.combination of voices and instruments i,e, orchestration

.phonetic and linguistic variations

Effect of all these need to be studied seperetaly. Music is such a vast field that it is not possible to study all the variables seperetady in this project. The variables which were kept constant were -

.the number of musical frequencies used in a composition

.the time gap between two elements

.the timber i.e. the instrument used to play the tunes

.volume.

The variables used were number of sound frequencies used and the sequence of notes.

There can be two approaches for the experiment in musical compositions. One is to select already composed and known tunes and test the hypothesis. This has a disadvantage that familiarity with the composition will make the subject biased which will affect the results. Other approach is to compose the tunes ourselves and test them. The second approach allows greater control over the compositions and so this approach was followed for the experiment. the way in which the tunes are composed is shown in the diagram. Tunes are composed of 2 notes, 3 notes and four notes with eight elements.

The group with 1 note was possible because of the limitation of constant time interval. Here also the number of notes increase along the horizontal axis and complexity increases along the vertical axis. The criteria for making these tunes were -

- .repetition of a note can take a composition towards simplicity
- .formation of pairs of notes can make a composition simpler.
- .formation of patterns using a simple rule also can simplify a composition.
- .total lack of pattern, repetition or pairs may make a compos-

& repetition

X sequentiality decreases

ition ~~sim~~ complex.

As it is mentioned earlier that comparing more than two patterns in music at a time is difficult. Therefore the method of paired comparison is suitable for the experiment.

In this method each sample is compared with every other sample and rating is taken on a scale. all these data can be fed to the computer which will process it and give the evaluation of the samples.

This method was used for experimentation. The tunes were recorded in pairs. If we take all the twelve tunes together then the number of pairs we can form is sixty six. This could become fatiguing for the listener. To overcome this, two sets of seven tunes each were formed. tunes in sets were randomly selected and experiments were conducted with two sets. The ratings given by the computer are (in the order of increasing complexity)-

SET I

1. 2a	= .85
2. 2b	= .095
3. 2b-d	= .095
4. 3a	= .095
5. 4b	= .095
6. 4d	= .38
7. 3d	= .47

SET II

2a
2c
4a
3c
4b
3b
4c

2 NOTES
SIMPLE

2a

3 NOTES
SIMPLE

4 NOTES
SIMPLE

2 NOTES
NOT SO SIMPLE

2b

3 NOTES
NOT SO SIMPLE

4 NOTES
NOT SO SIMPLE

2 NOTES
NOT SO COMPLEX

2c

3 NOTES
NOT SO COMPLEX

4 NOTES
NOT SO COMPLEX

2 NOTES
COMPLEX

2d

3 NOTES
COMPLEX

4 NOTES
COMPLEX

One more thing that was tried out as, a part of the experiment was to study the musicality of a tune and its relationship with complexity.

It was noted that, the musicality is low for very simple tune. Musicality is also low for very complex tunes.

Musicality is high for tunes whose degree of complexity is between the two extremes.

The rating of musicality is given by the computer.

The computer rating in the order of increasing musicality is -

<u>SET I</u>	<u>SET II</u>
1. 2a	2a
2. 2c	2d
3. 3d	3d
4. 3c	2d
5. 4c	4d
6. 4a	4b
7. 4b	3a

The analogy between visual and musical compositions can be given as follows -

we have a visual and a musical composition.

.Space required forr a visual composition is analogous to the time required for a musical composition.

.The number of dots is analogous to the number of notes.

.Different colours are analogous to diffent notes.

The question which comes naturally after is why this project?
If these are the conclusions so what?

As was mentioned in the begining, all catagories of music like,vedic recitations, film songs,classical music etc. have different degrees of complexities.One of the ways to predictably get these effects is to control the complexity of the compositions. For one more application I would like to refer to Mr. Sivakumar's study of hummability of tunes which was done as a part of his Master Of Design in 1984-85. He suggests that most hummable tunes fall somewhere in third-and fourth column of our experimental chart. Thus the tunes can be designed for hummability to an extent by controlling its complexity.

26 small square
size illustrations inside
(colored dots)

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10 small squares
+ 16 Big squares

26 Total.









