RESEARCH ON KANSEI COLOR DESIGN BY PLEASANT SOUND

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Abstract: A new paradigm is urgently needed to create the textile product that appeal to human Kansei or Gosei. A future of textiles depends heavily on this new paradigm. In order to create new paradigm Kansei color designs by pleasant sound are tried. These computing color designs are treated by the method of Fast Fourier Transformation. As several result good color designs are given in forms of ring color patterns and band. But these judgments depend finally on human Kansei. These new technology give us good hints in order to create new paradigm that appeal to Kansei goods. This new concept should be developed to higher level by additional improvements.

Keywords: color, sound, Fourier transformation, color design, 1/f fluctuation, pleasant sound, paradigm

1. INTRODUCTION

Importances of the paradigm shift are emphasized in the way of thinking in the process of developing new product from synthetic fibers etc. Future product from synthetic fibers should bee more pleasant and more comfortable to our sense. Here a novel technical/scientific approach is required even more, and the novel approach is achieved only by the paradigm shift. The term paradigm was first introduced by a philosopher/science historian Thomas Kuhn in his book "Structure of Science Revolution ", and is defined as a theoretical frame, which governs the fundamentals of a particular science, or a series of hypothesizes. That is paradigm thus corresponds to a new world-view, or a fundamental change in thinking, understanding and evaluation. We could see the many paradigm shifts in the past fibers and textiles technology.

If 1/f fluctuation theory can be applied to the textile product, the fine structure control in the fiber and the integrated apparel design may open the door new products. As a new paradigm of our own we tried to challenge the sound-transformed color pattern.

When the ultra-fine polyester fiber was developed, nobody paid attention because no immediate application was foreseen at that time. Now the ultra-fine polyester is processed into the suede-type artificial leather and ignited functional fiber and the birth of Shingosen. The challenge is one of the most important factors for the innovation.

If natural phenomena are in common following the providence of nature, we are to expect to observe a pleasant colored pattern when transformed from a pleasant sound (often referred to as the 1/f fluctuation) according to a certain rule. How we can transform a bush warbler's twittering to a colored pattern? How we about the chorus of joy from Beethoven's No.9 Symphony or the wave sound at the Tahiti seashore? There are numerous patterns transformed from pleasant sound. Those patterns can be applied to not only the apparels including swimming costumes, sports wears, ties, scarves, and kimonos but also the other products and buildings such as amusing soft wear. The patterns thus created posses their story to tell in relation to the original sound, so that the products with those patters can be regards as Gosei product.

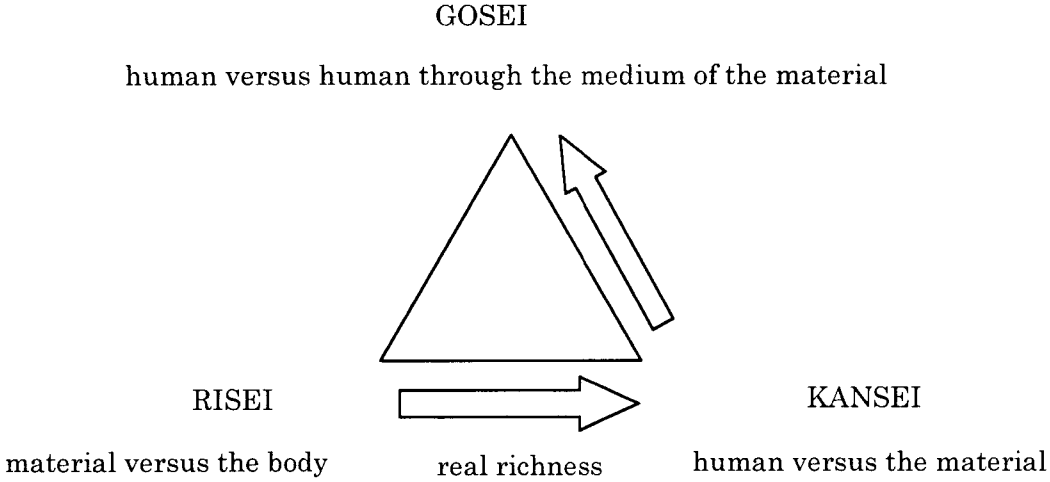


Figure 1. Total Engineering (Risei ,Kansei and Gosei)

2. CALCULATION METHODS AND COMPUTING PROCDURE

The one-dimensional signal (sound) can be converted into the two-dimensional signal (pattern) through a new creative process.

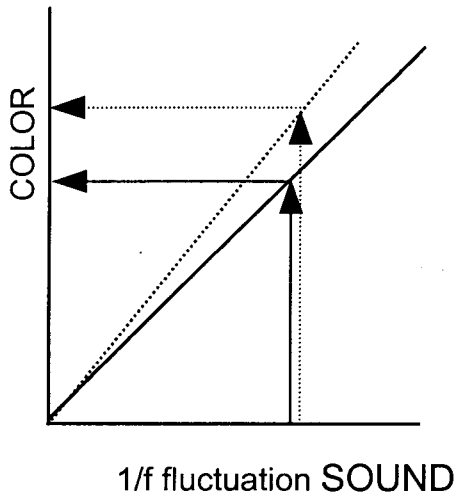


Figure 2 Transformation from Sound to Color Pattern

The sound is Fourier-transformed to yield the visible light spectra by corresponding the high or low frequency of sound to the high or low wavelength visible light, respectively.

A) CALCULATION

In order to compute data, the algorithm of Fast-Fourier transformation (FFT), which is proposed by Cooley-Tukey, is used in this case.

Namely,

$$X_k = \sum_{n=0}^{N-1} x_n W_n^{k_n}$$

Where,

k_n = 1,2, N-1

X_k = (light)frequency

x_n = (sound) sampling data

$W_n = e^{-j2\pi/N}$

N = Sampling data (power of 2)

In order to do short-time Fourier transform regarding to actual inputting data, sampling data are divided into power of 2 and window-function are used for this interval.

1) Rectangular window

$$w(n) = 1 \qquad 0 \le n \le N-1$$

2) Hanning window

$$w(n) = \frac{1}{2}\left(1 - \cos\frac{2\pi n}{N-1}\right) \quad 0 \le n \le N-1$$

$$w(n) = 0 \qquad \text{the other n}$$

3) Hamming window

$$w(n) = 0.54 - 0.46\cos\frac{2\pi n}{N-1} \quad 0 \le n \le N-1$$

$$w(n) = 0 \qquad \text{the other n}$$

Transfer from frequency to color data, the table of 400 colors is prepared according to the following formula;

cin x =400-400((f-min. f)/ (max.f-min.f))

cin x = Index from color table

f = frequency

min. f = minimum frequency

max.f = maximum frequency

B) COMPUTING PRECEDURE

1) Normalization of sampling data

Normalization according to the accuracy of A/D converter (analogue / digital)

2) Multiply window-function by sampling data in order to do short-time Fourier transform

3) Execution of Fourier transform

4) Determination of frequency

5) Converting the frequency into color

3. RESULTS

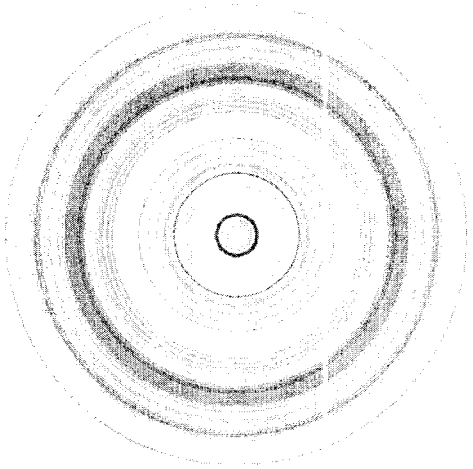
A first data is a color pattern translated from a Japanese bush warbler. The sound-transformed color is painted in sequence as the time progresses while a Japanese bush warbler twitters.

The time progresses from the center to the circumference in the ring pattern. The time progresses from the left to the right in the band pattern.

Color will change continuously when the sound wave is sliced as fine as possible, although a longer computing time is required. In the present example each slice is not fine enough to make color change continuously

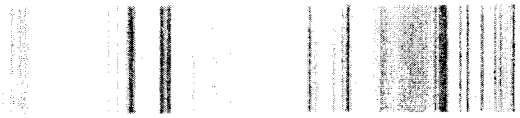
!) Japanese bush warble

A ring color pattern this photo shows the color pattern transformed from the twittering of a Japanese bush warble.



Uguisu (Japanese bush warble)

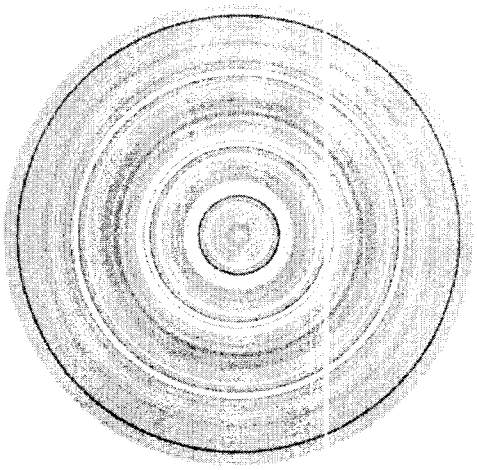
When the color pattern is made in a band it shows below



Uguisu (Japanese bush warble)

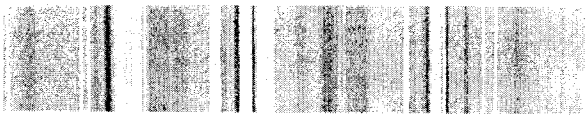
2) Japanese white-eye

Next ring pattern is the twittering of a Japanese white-eye.



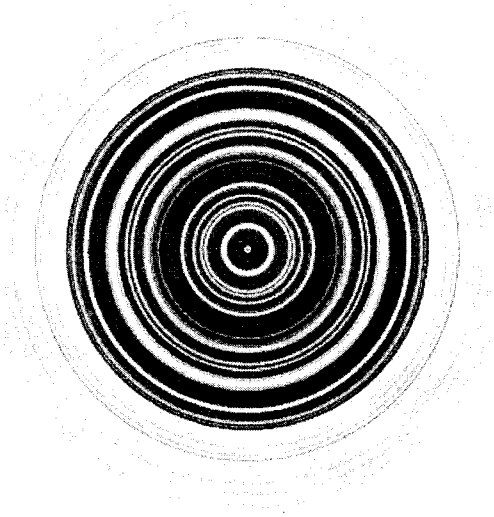
Mejiro (a Japanese white-eye)

When the color pattern is made in a band it shows below



Mejiro (a Japanese white-eye)

2) Narcissus flycatcher



Kibitaki (Narcissus flycatcher)

3) Meimuna opalifera

Next is a kind of cicada, Meimuna opalifera.

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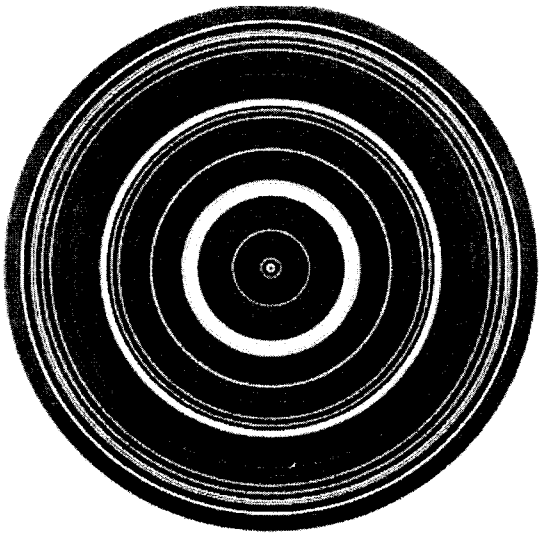
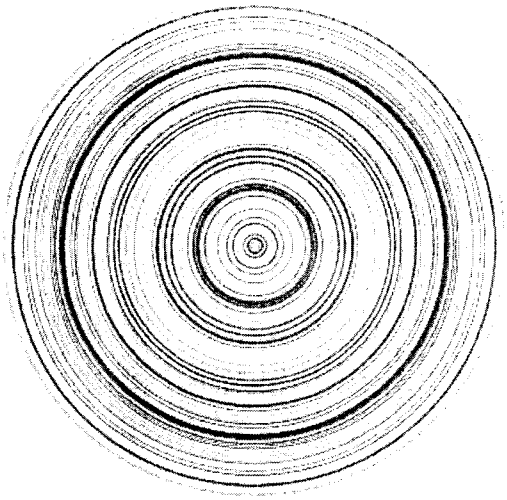


"Tukutukuhoushi "

4) Tahiti seashore

Tahiti seashore is famous for the alpha wave and 1/f fluctuation. A ring color pattern in this photo shows the color pattern transformed form the sound at the Tahiti seashore.



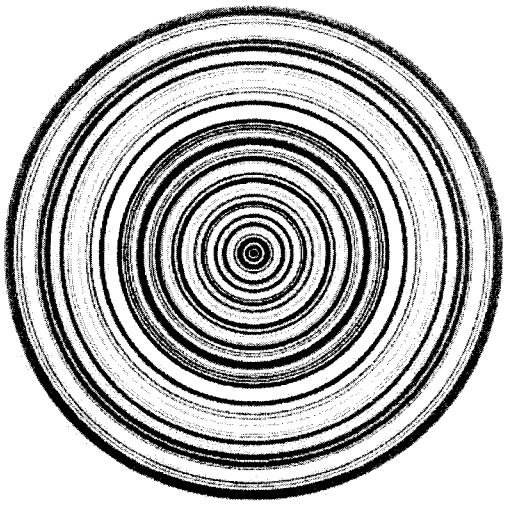
Tahiti seashore

(famous for the alpha wave and 1/f fluctuation)

Tahiti seashore

5) Beethoven's Symphony No.9"Choral"

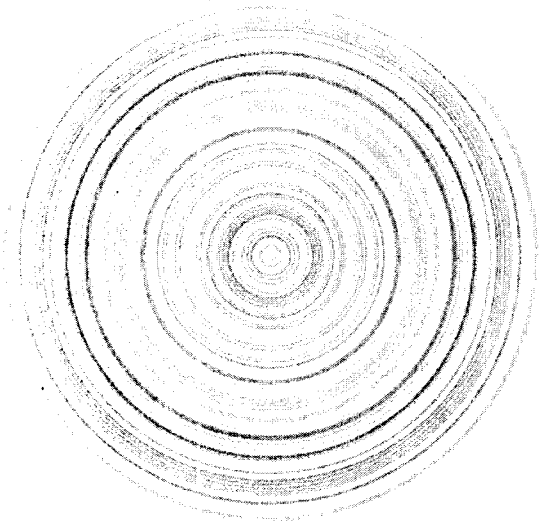
Beethoven's Symphony No.9"Choral" is transformed in a ring color pattern as this.



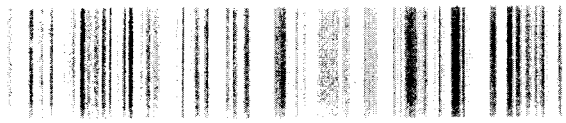
Beethoven's Symphony No.9"Choral"

Beethoven's Symphony No.9"Choral"

In different condition another ring color pattern is given like this..



Beethoven's Symphony No.9"Choral"



Beethoven's Symphony No.9"Choral"

4. CONSIDERATION

Those are only a few examples. The mutual correspondence between sound and color can be changed in various ways. The created pattern is quite unexpected. There may be infinite color pattern created in this way. Any sound or music can be transformed in color pattern, and our Kansei or Gosei can evaluate each color pattern created in such a way.

A few applications are developed, but I believe a big business chance is there in future.

5. CONCLUSION

In conclusion, a new paradigm is urgently needed to create the textile products that appeal to human Kansei.

Several transforms from pleasant color to color pattern are shown as one of the possible strong challenging methods that create new color patters.

Further research on this improved technology will give us much pleasant products.

There are many possibilities for this concept to apply other fields as developing new good business by this technology that should be greatly improved.

References

[1] Nakamura Shougo BEGINNERS DIGITAL FOURIER TRANSFORM: Tokyo Dennki Daigaku Shuppan-kyoku

[2] Oh-ishi Shin-ichi: FOURIER TRANSFORM: Iwanami Publishing Co

[3] Japan standard association JIS HANDBOOK JITEN:

[4] Okumura Haruhiko ARUGORIZUMU Gijutsu Hyouron-sha

[5] Monbushou ;COLLECTION OF TECHNICAL WORDS;

[6] Musha Toshimitsu YURAGI NO KAGAKU Morikita-shuppan

[7] Musha Toshimitsu YURAGI NO SEKAI Blue books

[8] Japanese patent laid-open Tokukaihei 10-278491

[9] Japanese patent laid-open Tokukaihei 10-320570

[10] Tsuda Takao: SUHCHI-SHORI PROGRAMMING; Iwanami-Syoten