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SIMULTANEOUS EVALUATION OF FRAGRANCE AND PICTURE USING KANSEI PARAMETER METHOD

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ABSTRACT

The language is a most typical means to impart information, but it is considered that information expressed in the word influenced on knowledge, intelligence and thinking. Therefore, it is difficult to evaluate the fragrances, scenic shots and portraits in the same category space that was composed by SD method. This paper describes a technique for equally evaluating the fragrances, scenic shots and portraits. These objects evaluated by *KANSEI*-parameter (KP) method. As a result of principal component analysis and cluster analysis, it is shown that KP method is useful as a mean to collect the intuitive information of the objects. Also, it is suggested that scatter plot of component scores can be used for sharing impression of the objects.

Keywords: *Fragrance, KANSEI-parameter, KANSEI information*

1. INTRODUCTION

The words are usual for adjusting and analysis of information. Some methods using the words (e.g., Semantic differential (SD) method) are used by many researches for evaluating objects [1-2]. And, the language is a familiar means of communication. But, the means has some problems; complicated explanation is difficult to understand the information intuitively.

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For example, it assumes that a certain development group thought as a theme "It has clean and sweet feeling that is loved by female in her teens". In this case, they might feel gaps among the developed package design, fragrance and planner's intention.

This problem might be solved by metaphorical and comparatively expression. In particular, a means that shows some concretely objects is usual for transmission of fuzzy information. We know this as a proverb "Seeing is believing". But, it is expected, the objects used for metaphor are selected by intuition in each occasion on the development site. Because, it is hoped that the object can be selected by evidenced based data. Accordingly, Senoo et al. proposed a means of communication using color image [3]. In this Senoo's paper, the odor of the flavors and the perfumes are expressed by some color images. There are a lot of studies about the relation between the odor and the color [4-6]. However, these methods cannot use the scenic shots, the portraits, and the other concretely images to express the odor.

This paper evaluated the impression similarity among the fragrances, the scenic shots and the portraits for expressing the fragrances using visual images. These diverse objects with difference features evaluated using *KANSEI*-parameter (KP) method. KP method is a non-verbal technique for evaluating the objects [7]. Collected data analyzed simultaneously, and visualized the impression similarity among the objects. Also, the objects are evaluated by SD method together, the result compared with it of KP method.

2. KANSEI-PARAMETER (KP) METHOD

Firstly, KP method gives some patterned figure for subjects. Figure 1 shows the figures for examples. Secondly, subjects selected the figures. The criterion is based on the impression similarity among the objects and the figures. The figures have some parameters of features, for example, number of corner, edge length, information entropy et al. Thirdly, the parameter-values are averaged, and analyzed. The evaluation values are written as

$$x_{ik} = \frac{1}{f_{i+}} \sum_{j=1}^{J} f_{ij} \cdot p_{jk} \qquad \dots (1)$$

where i, j, and k are the natural numbers from 1 to I, J, or K, x_{ik} is the evaluation value, $\underset{I\times J}{F} = \left(f_{ij}\right)$ is frequency of selected figures, f_{i+} is sum of row of matrix F, $\underset{J\times K}{P} = \left(p_{jk}\right)$ is parameter value of selected figures This is written using matrix as

$$X = NP \qquad \dots (2)$$

where $\underset{I\times K}{X} = \left(x_{ik}\right)$ is the evaluation value matrix, $\underset{I\times J}{N} = \left\{q_{ij} = \frac{f_{ij}}{f_{i+}}\right\}$ is the profile of row (ratio

Figure 1: Patterned figures

patterns of row). The objects are scattered on the K-dimensional evaluation space.

The value x will be shown the *KANSEI* information of the object. But, the value x isn't directory related with the meaningful words. For example, it shouldn't that number of corner have meaning such as "sharpness" and others. Because, the value x will be related latent information that is hard to collect easily using the word. So, we call them "*KANSEI*-parameter (KP)" values. So far, KP method has been shown useful as a means to collect very intuitive impressions from evaluators [7-11]. For example, authors have reported that classification of flagrances was evaluated by ordinary evaluators has been similar to olfactory descriptions of perfumers using KP method [10-11].

3. INVESTIGATION

Firstly, we selected the fragrances of perfumes, the scenic shots and the portraits. As for the fragrances, 15 perfumes (F1, F2, …, F15) on the market were selected. they were evaluated by perfumer that these fragrances have differential impressions. Table 1 shows the summary of fragrances. As for the scenic shots, 20 images (S1, S2, …, S20) from the web sites [12-15]. As for the portraits, 20 images (P1, P2, …, P20) of actress et al. that are employed as image character by cosmetic firm were selected. The evaluators are university students 19 to 29 years old. Table 2 shows the Code of the Objects and number of evaluators.

The objects are evaluated using the SD and KP method by the evaluators. In SD method, the evaluators worked in the scales of 1 to 5 between differential word pairs shown in table 3. For example, "非常に自然な" (very natural) is 1 point and "非常に人工的な" (very artificial) is 5 points. The other hand in the KP methods, one patterned figure with similar impression to object was selected from the five figures. It was repeated eight times using different figures for an object. The physics parameters calculated from the figures are coordinates of color image (C_x, C_y), entropy (S), peripheral length (L_2), number of edges (A) and number of elements (N). This investigation was executed as well as references [9-11].

Table 1: Summary of fragrances

Code	Principal note	User	Code	Principal note	User
F1	Citrus	Unisex	F9	Floral	Female
F2	Green	Female	F10	Floral	Female
F3	Watery	Female	F11	Floral	Female
F4	Green- (Fruity)	Female	F12	Oriental	Female
F5	Fruity	Female	F13	Vanilla	Female
F6	Fruity	Female	F14	Fruity- (Chypre)	Female
F7	Floral	Female	F15	Chypre	Female
F8	(Floral)-Musk	Female			

Table 2: The code of the objects and of number of evaluators

Code	Object of evaluation	Number of evaluator
F1, F2, …, F15	Fragrance	46 (Male 0, Female 46)
P1, P2, …, P20	Photograph (portrait)	20 (Male 6, Female 14)
S1, S2, …, S20	Photograph (scenic shots or other)	22 (Male 7, Female 15)

Table 3: Pair of adjective

No.	Pair of adjective (Supplementation in English)		
1	自然な (natural)	-	人工的な (artificial)
2	やさしい (gentle)	-	きつい (harsh)
3	清潔な (clean)	-	不潔な (dirty)
4	女性的な (feminine)	-	男性的な (manly)
5	暖かい (warm)	-	冷たい (cold)
6	重い (heavy)	-	軽い (light)
7	フォーマルな (formal)	-	カジュアルな (casual)
8	複雑な (intricate)	-	単純な (simple)
9	大人っぽい (adulty)	-	子供っぽい (childish)
10	個性的な (unique)	-	平凡な (ordinary)
11	派手な (flashy)	-	地味な (conservative)
12	深い (deep)	-	浅い (shallow)
13	好きな (favorite)	-	嫌いな (detestable)

4. RESULTES AND DISCUSSIONS

4.1. COMPARISON BETWEEN SD AND KP METHOD

The evaluation values are analyzed by the principal component analysis (PCA) using the correlation coefficient. Additionally, obtained principal component scores were also analyzed by cluster analysis (ward's method). Figure 2 shows the cluster dendrograms. In Figure 2, clusters 1 to 5 are obtained from SD method, and clusters 6 to 9 are obtained from KP method.

These results are compared based on the classification according to the SD method. The all objects that belong to the cluster 1 and 2 are grouped into the cluster 6, the objects of 72% that belong to the cluster 4 are grouped into the cluster 8, the objects of 77% that belong to the cluster 5 are grouped into the cluster 9. Also, the objects of 38% that belong to the cluster 3 are grouped into the cluster 6, the objects of 38% are grouped into the cluster 8. Therefore, the result of cluster analysis in KP method is partially similar to it in SD method.

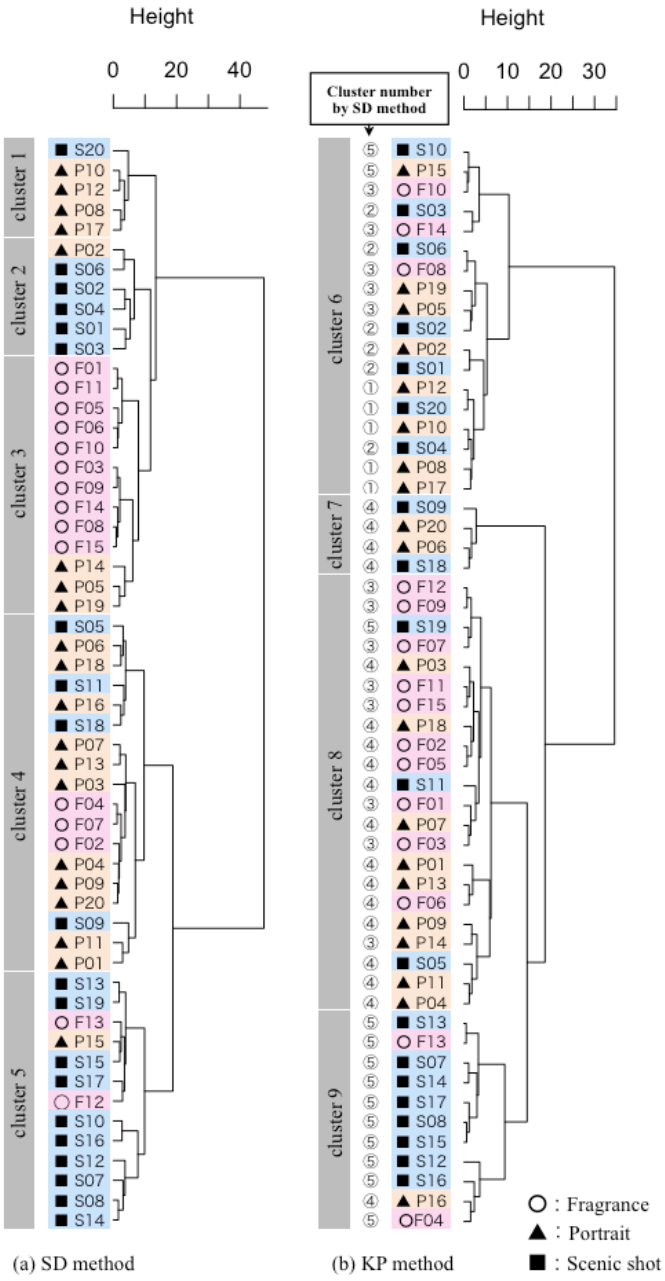

Figure 2: Classification using cluster analysis

Also, cluster 4 includes objects of "F02, F04, F07, P03, P04, P09 and P20". And, objects of "F12, F13, S13, P15, S15 and S17" are grouped into the cluster 5 (in Figure 2 (a)). Accordingly, these objects have the impression similarity. But, the fragrances of 67% are grouped into the cluster 3. So, it is difficult for SD method to relate the fragrances to the photographs. Additionally, the portraits of 55% are grouped into the cluster 8, and the scenic shots of 50% are grouped into the cluster 5. Therefore, it is thought that the difference of each features (of the fragrances and photographs et al.) strongly influenced the result in SD method.

However, the details of the result are shown the impression similarity among the fragrances, the scenic shots and the portraits in KP method (Figure 2 (b)). The fragrances of cluster 3 are dispersed to some clusters by KP method. Cluster 6 includes pairs of "F08 and

S06", "F10 and S03" and "F14 and P15", also objects of "F01, F03 and P07", "F06 and P13" and "F11, S15 and P03" are grouped into the cluster 8.

4.2. SIMULTANEOUS EVALUATION

We think about using the scenic shots and portraits to express the odor. Table 4 shows component loadings of PCA. Figure 3 is a principal component scores scatter plot. PC 1-2 has showed about 77% of cumulative proportion in table 4. So, the principal ingredient score scatter decided to be requested by two dimensions.

It is expected that Figure 3 can apply for sharing an impression of the object in non-verbalization. For example, when the concept of new perfume to be developed is "womanly and sweet". We can know the target will be included in cluster 9. Perfume can build the in of new product from scenic shot were P01, P16 and S07, S12 and also it is similar to F13 and F14 in non-verbalization. This technique will grasp more easily than expressing "womanly and sweet". The planner and designer aren't experts for evaluating the fragrances. So, it is difficult for them to understand the olfactory descriptions. But, the above-mentioned technique may be solved the gap among the planners, designers and perfumers to "womanly and sweet".

Moreover, the scenic shots of the flower did not exist in cluster6 though fragrance F08 was floral note. Therefore, it was shown that the expression was not transmitted to the designer and planner well in "Floral". Then, it was suggested it was effective when the photograph of cluster6 was used when the impression of fragrance F08 was shared.

In addition, the scenic shots with cluster 7 are water though fragrance F03 is "Watery". Therefore, fragrance F03 is guessed to be able to share the impression by word "Watery". However, F03 it differs from the impression obtained from these photographs a little because the distance is a little away with scenic shots S09 and S18.

Table 4: Factor loadings

***KANSEI*-parameter**	**Comp 1**	**Comp 2**	**Contribution**
Cx	0.387	-0.604	0.514
Cy	-0.943	-0.030	0.890
S	-0.617	0.650	0.804
P	-0.079	-0.946	0.902
L2	-0.478	-0.630	0.625
A	-0.789	-0.353	0.747
N	-0.949	0.051	0.904
Eigen values	3.178	2.208	5.386
Proportion	45.395	31.543	76.938
Cumulative Proportion	45.395	76.938	

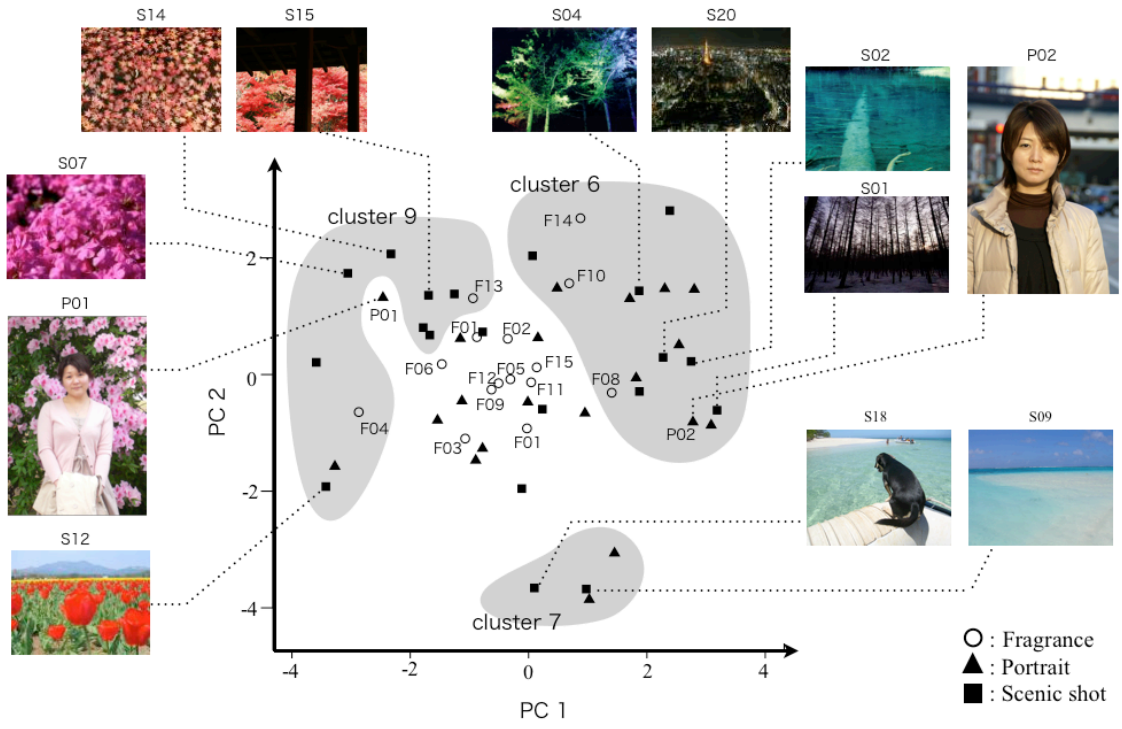

Figure 3: Simultaneous evaluation by principal component score scatter plot

From the above, about the evaluation object with a different kind, it was considered that explaining by arranging the similarity of a *KANSEI* impression on the evaluation space was effective as the means to transmit vague information that was not able to be explained in the word well.

5. CONCLUSION

We proposed a means of communication using concretely objects. This paper evaluated the impression similarity among the fragrances, the scenic shots and the portraits for expressing the fragrances using visual images. These diverse objects with difference features evaluated using KP and SD method.

As for the KP method and the SD method, it was shown that the results are partially similar. Also, it is thought that the difference of each features influenced the result strongly in SD method. But, the details of the result are shown the impression similarity among the fragrances, the scenic shots and the portraits in KP method. Additionally, obtained the impression similarity information is usual as a means of communication.

Therefore, KP method can collect *KANSEI* impression similarity information. And, this method is useful for a means for getting a handle on non-language information.

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