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Multiple Kansei Images in Product Form Design

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1. Introduction

Kansei (affection, emotion or feeling in Japanese) Engineering is a new technology for designers to develop products that satisfy users' affective needs. One of its main subjects is to study the relationship between product form and Kansei. According to relative studies in Kansei Engineering, researchers usually analyzed product form relative to a specific Kansei adjective. However, people usually describe product form in a group of Kansei adjectives. For example, a consumer may talk about a quartz watch as virile, strong and precise. Indeed, to describe a product form in one word never takes place in the real world because human beings have multiple thinking and speaking in everyday life. Based on this conception, this paper proposes a new concept, multiple Kansei, and its potential application in product design.

The basic assumption of multiple Kansei is different from that of single Kansei. Most of the prior studies regarded each Kansei image as independent to each other. As a result, the mutual relationship among Kansei adjectives has not been clarified. Due to this ignorance, synonyms or antonyms may be used to describe the very same product. The improper use of adjectives would negatively influence the reliability of Kansei Engineering. Designers need to attend to this issue when dealing with users' multiple Kansei in product form design. Therefore, this paper discusses three major parts: methods of analyzing the relationships among multiple Kansei images, a case study of existing products with multiple Kansei images and creating product form with multiple Kansei images.

This paper presents an elaboration of the multiple Kansei approaches useful to practitioners in product form design. Although most subjective measurement is considerably obvious, its relative techniques, methods and experimentation are fundamental in the exploration of multiple Kansei. As the main idea of this paper is to introduce a preliminary investigation rather than a new methodology for the research into multiple Kansei, the experimentation described is notional and experimental. In addition, as that customization for a relatively smaller group of customers or even a specific individual one is what Kansei Engineering emphasizes, 50 industrial design students were recruited for this study as potential product users with sensitive perception of product form.

2. Kansei Engineering and Multiple Kansei Images

Kansei Engineering has been applied to optimize the emotional appeals for form elements of products. This quantitative method helps designers to analyze the relationships between Kansei images and product form. In addition, due to individual difference and various user preferences, several Kansei image spaces have been developed for understanding users' affective response toward products. They offer product designers and researchers an overview of multiple Kansei images. The authors present three types of analytical spaces that deal with the mutual influence of multiple Kansei images in the sections to follow.

2.1 Kansei Engineering in Product Form Design

Kansei Engineering is a consumer-oriented technique for new product development. In product design, it is applied to translate consumers' favorite feelings or images into physical design elements. The research process includes at least five steps as following (Tanoue et al. 1997, Nakada 1997, Jindo et al. 1995):

(1) Collecting product pictures and Kansei adjectives. It is easy to collect both items in the marketplace such as websites of producers, catalogs, magazines and commercials. Then, researchers need to eliminate duplicates or similar ones and organize Kansei adjectives as polar adjective pairs for later use.

(2) Refining samples. Via pilot user survey and statistical analysis, the product pictures to which no Kansei adjectives relate and those Kansei adjectives to which no product pictures correspond could be eliminated. That is, the refined product pictures and Kansei adjectives will correspond well to each other.

(3) Building the relationships between product pictures and Kansei adjectives. A series of questionnaire and statistical analyses are applied to investigate a specific group of participants' (or even just one participant's) subjective evaluation and preference. Based on this subjective measurement, the relationships between representative product pictures and Kansei adjectives could be linked.

(4) Analyzing product form. The purpose of this step is to describe product form as a combination of form elements that contribute to the Kansei image. For example, an electric shaver could be decomposed as a body, a blade, a control panel, a switch and grabbing surface, etc.

(5) Synthesizing product form. Usually, the same participants are asked to evaluate a group of virtual products against preferred Kansei adjectives as criteria. After this evaluation is processed by quantitative methods, such as Artificial Neural Network, which styling alternative of a form element contributes to portray a certain Kansei image could be identified. In other words, the optimal product form with specific Kansei images can be created.

Four major issues that Kansei Engineering concerns itself with include; the measuring of consumers' feelings toward products, the mapping of the relationships between Kansei and product elements, the building of a Kansei Engineering system for design application, and the updating of Kansei data based on changing social values and individual preferences. Kansei Engineering has been applied in designing various products such as office chairs (Jindo et al. 1995), construction machinery (Nakada 1997), car interior (Tanoue et al. 1997) and shoes (Ishihara et al. 1997), etc. Chou et al. (2003) concluded form elements specifically conveying single Kansei image such as "sporty", "cute" and "simple". However, several technical problems need to be solved. These problems include how to deal with individual difference in Kansei, how to evaluate consumers' and designers' satisfaction toward the outputs of Kansei Engineering System, and how to improve the reliability of the system (Nagamachi 1995).

2.2 Studies on Kansei Spaces

Several studies have made efforts to build Kansei spaces for analyzing psychological or emotional images. Although the methods used were different, including artificial neural network, principal component analysis, multi-dimensional scaling, quantification category III or factor analysis, their common purpose was to parameterize various human feelings in fewer dimensions. Hence, through checking the space, designers can better understand the similarity, difference or categorization of Kansei images. For instance, Morishima et al. (1993) and Kawakami et al. (1994) developed emotion spaces for interpreting facial expression. Takagi et al. (1999) developed a Kansei space to define users' impression toward pictures, music and movies. Zhang et al. (1998) developed a Kansei space for analyzing users' evaluation toward package design. Ma et al. (1998) build a map that illustrates subjects' feelings toward the appearance of microelectronic products. Heo et al. (1999) developed image maps with pictures and adjectives for analyzing users' Kansei reaction. Ishihara et al. (1997) developed a Kansei space for analyzing female shoes. Jindo et al. (1997) positioned Kansei adjectives in a space that helps designers in car interior design.

In fact, several kinds of Kansei spaces have been developed. It suggests that human feelings can be simplified, parameterized and represented. Accordingly, the authors claim that Kansei spaces can provide an intuitive way through which designers can better understand users' multiple Kansei images and the mutual relationships among Kansei adjectives.

2.3 Multiple Kansei Images

Earlier studies usually regarded adjectives as input and products as output in Kansei Engineering systems. Some Kansei Engineering systems only accepted one adjective as input. For instance, Jindo et al. (1995) developed a Kansei Engineering system for designing office chairs taking a specific Kansei adjective at a time. Jindo et al. (1997) applied Kansei Engineering in car interior design and took a "serene" steering wheel as an example. On the contrary, some studies asserted their Kansei Engineering systems could accept more than one adjective as input. For example, Nagamachi et al. (1997) proposed a Kansei Engineering system that could design steering wheels for both males and females at the same time. Matsubara et al. (1995) developed a hybrid Kansei Engineering system that could design house doors for multiple preferred Kansei. Chou et al. (2002) applied an artificial neural network to create product form conveying multiple Kansei images. Generally speaking, if a Kansei Engineering system can process multiple Kansei adjectives, its mechanism must be able to analyze what multiple Kansei images a specific product conveys and to precisely calculate how strong each image is.

2.4 Kansei Spaces and Multiple Kansei Images

In order to select appropriate adjectives to describe multiple Kansei images, a well-organized Kansei space with various adjectives is needed. Several statistical methods such as Cluster Analysis, Multi-Dimensional Scaling (MDS) and Factor Analysis are able to construct Kansei spaces for specific purposes respectively. To illustrate, by applying Cluster Analysis, Kansei adjectives can be hierarchically categorized into an organization chart, as shown in Figure 1. The higher an adjective the broader meanings it signifies. Adjectives in the same branch are of similar meaning while in different ones are of different meaning. For example, "Advanced" comprises "hi-tech", "novel" and "reliable". "Hi-tech" indicates "futuristic" and "precise". The relation

between "futuristic" and "precise" is closer than that between "futuristic" and "efficient". Obviously, this hierarchical space clarifies the pedigrees among Kansei adjectives. However, it cannot provide information about different Kansei adjectives such as antonyms or independent ones.

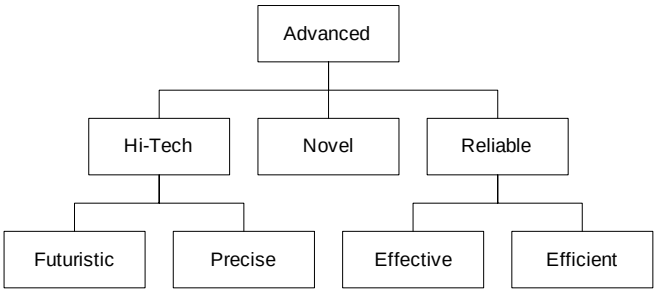

Figure 1: A Kansei space done by Cluster Analysis

MDS is another option for building Kansei space. As it can convert ordinal scale into metric data, subjects only need to compare two Kansei adjectives at a time based on a preset subjective criterion. After this comparison process, MDS can calculate and position each Kansei adjective in a multidimensional coordinate system. Figure 2 shows an example of Kansei space depicted by MDS. Because of its clear visualization, it is easy to figure out the relationships among Kansei adjectives through comparing the directions they locate. For example, the relation between "efficient" and "effective" is closer than that between "futuristic" and "precise". However, researchers have to name for each dimension (axis) and explain the difference among adjectives based on their professional knowledge. For example, in figure 2, the X and Y axes could be named as "future & modern" (from left to right) and "mechanical & digital" (from bottom to top) respectively. This would be troublesome and time-consuming when the number of dimensions is larger than three.

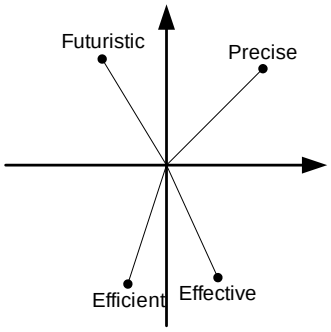

Figure 2: A Kansei space done by MDS

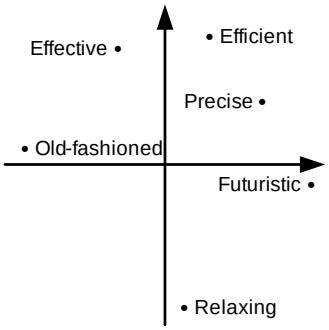

Figure 3: A Kansei space done by Factor Analysis

Figure 3 shows an example of Kansei space done by Factor Analysis. This method can process and position Kansei adjectives in a space with two or three dimensions. The space clearly shows the specific mutual relationship such as similarity, exclusiveness, independence and the difference in scale between any two Kansei adjectives. For example, "effective" and "efficient" locate closely meaning that they are very similar to each

other. “Futuristic” and “old-fashioned” locate oppositely along an axis representing that they are mutually exclusive. In other words, they are very different from each other, so that it is impossible for them to co-exist in a product form. While “futuristic” and “relaxing” are positioned at polar areas along with different axes, it illustrates that they are independent. That is, they don’t affect or influence each other. In addition, the coordinate distances between any two adjectives also reveal the meaning difference between the two. For example, the relation between “precise” and “efficient” is closer than that between “precise” and “effective”. Because of these advantages mentioned above, therefore, the authors applied Factor Analysis to build the Kansei space for analyzing and synthesizing multiple Kansei images.

2.5 Mutual Influence of Multiple Kansei Images

Technically, multiple Kansei images can be expressed by two or more adjectives. However, the relations among adjectives will inevitably influence the definition of multiple Kansei images. For instance, if two Kansei adjectives are similar to each other such as “innovative” and “creative”, it would be better to regard them as synonyms (one single Kansei image). If two Kansei adjectives are exclusive to each other such as “concise” and “complex”, they should not be considered as multiple Kansei images portrayed by a product form. It is simply because that a designed product form should not disclose any inconsistent images unless for artistic purpose. In addition, if two Kansei adjectives are independent of each other such as “cute” and “simple”, a product form itself must have adequate form elements for exhibiting both Kansei images. Hence, it is very important to carefully differentiate the similarity, exclusiveness and independence among Kansei images.

Also, two independent Kansei images make people curious about their priority. For instance, Figure 4 shows five possible combinations of two independent Kansei images, “cute” and “simple”. Area I implies the weights of “cute” and “simple” images are equally strong. It may be because they can be strongly portrayed by some form elements of a product. Area II and III imply both weights are equally moderate and weak respectively. It may be because the form elements of a product can only portray moderate and weak “cute” or “simple” image. That is, both images are not fully demonstrated. Area IV and V imply the weight of one Kansei image is significantly stronger than the other. It may be because the form elements portraying one Kansei image dominate the ones portraying the other. Alternatively, regression analysis can simplify these combinations into linear equations as shown in Figure 5. For instance, line A, B and C formulate areas IV & I & V, IV & II & V and IV & III & V respectively in Figure 4. In this way, any two Kansei images and their relative significance portrayed by a specific product form can be exactly defined. It is necessary for designers to be aware of such issues when designing multiple Kansei images.

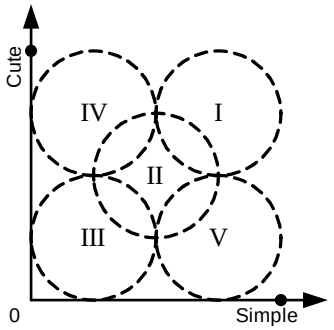

Figure 4: The probable combinations of two independent Kansei images

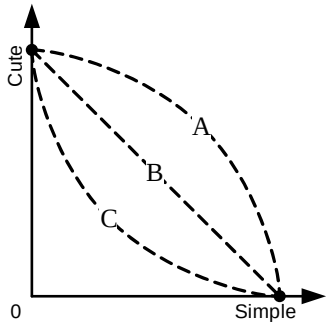

Figure 5: The profile of two independent Kansei images

3. Products Portraying Multiple Kansei Images

This section describes how to search for existing products that strongly portray multiple Kansei images. It not only proves the existence of multiple Kansei images but also provides a series of technical approaches for analyzing it in product design. These approaches contain collecting samples, refining samples and mapping the relationships between multiple Kansei images and product form. 50 industrial design students were recruited for this study as potential product users with sensitive perception of product form. Their preference investigated will become customized requirements for creating multiple Kansei images.

3.1 Collecting Samples

To search for products representing multiple Kansei images, both Kansei adjectives and products have to be collected. In a study on language for Gestaltung evaluation (1994), 148 adjectives appropriate to describe product forms had been collected in a checklist which can be used as Kansei adjectives. As for products, the authors extensively gathered more than 500 product pictures of home appliances or electronic products made by international leading brands. Then, two approaches were applied to narrow down product pictures. First, those products sharing similar form such as the same product families, those with complex or invisible shape details such as portable stereos and those with functions not recognizable such as semi-professional blenders were all deleted. It narrowed 500 product pictures down to 154.

Second, to save least product pictures showing particular forms and covering as many product categories as possible, Semantic Differential Method was employed to rank these 154 product pictures against eight pairs of polar adjectives. Among these eight polar adjectives, “harmonious and contrasting”, “geometric and biomorphic” and “simple and complex” were used in ranking form elements, “angular and rounded” and “functional and decorative” in ranking detailed treatments and “harmonious and contrasting”, “cool and warm” and “hard and soft” in ranking color. The authors had to browse the 154 product pictures before ranking so that the ranking could be kept consistent during the process. This ranking format is shown in figure 6 in which the scale value is bi-directional positive, it helps to pick out products with particular form.

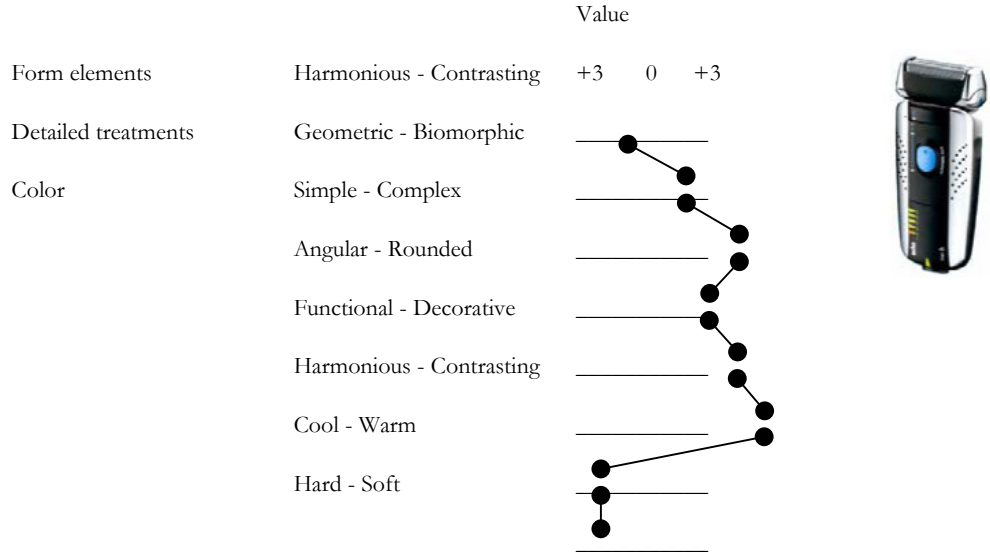

Figure 6: The ranking format for narrowing down product pictures

After ranking, the collecting process was continued as follows:

(1) Pick out those product pictures with the most +3 values from each product category. If there is more than one product picture with the same number of +3 values in one product category, the +2's or even +1s' have to be compared and therefore the most representative product picture can be selected. In this way, those product pictures with the most 0 values can be easily eliminated.

(2) After the picking process in step (1), for those adjectives with too few representative product pictures, a second-round picking is needed. The authors will pick out those product pictures, from the rest, with the highest value on these adjectives until every adjective has approximately same amount of product pictures representing. When comparing values, if there is more than one product picture with the same number of the highest values on any of these adjectives, the product picture of the product category with fewer ones chosen is prior to select.

(3) Repeat step (1) and (2) mentioned above until product pictures averagely cover all product categories and adjectives.

Finally, 54 product pictures covering 19 product categories with highest ranking values were selected. This amount of product pictures is good for saving time and reducing user load in the subjective investigation to follow.

3.2 Refining Samples

After collecting samples, both Kansei adjectives and product pictures need to be further refined. The Kansei adjectives that can better portray those 54 product pictures had to be chosen. To do so, 50 industrial design students were asked to scrutinize the 54 product pictures spreading out on a table and then sort them into approximately 10 Kansei-distinct groups. Each group was entitled with three to five Kansei adjectives from the checklist done in section 3.1. Each Kansei adjective could only be used once so that no two groups share one Kansei adjective. The reason to sort product pictures into approximately 10 groups is based on the result of a

pilot experiment in which three students sorted those product pictures into approximately 10 groups in all possible ways.

Then, two multivariate analyses were employed to process the data gathered in picture sorting. First, the sorting data performed by the 50 subjects were translated into the differentiation among 54 products. In this way, Multidimensional Scaling (MDS) could accept this data and quantify the relationships among the 54 products. More specifically, the 54 products were positioned in a multidimensional space consistent with their differentiation, so that their quantitative positions indicate their particular multiple Kansei images. Then, based on these quantitative positions, Cluster Analysis (with Hierarchical Method) was applied to classify the 54 product pictures into six groups. Thus, any two product pictures in the same group are considered similar to each other, in different group are different from each other. Also, based on the quantitative positions, better representative product pictures for each group could be verified after comparing the distance between the position of each product picture and its group center.

On the other hand, those Kansei adjectives used most frequently by the 50 subjects were regarded as representative ones. Because no subject used the same Kansei adjective to name two groups of product pictures, the representative ones are supposed to different from each other. After basic estimation, seven Kansei adjectives including "sporty", "cute", "simple", "rational", "hi-tech", "tender" and "traditional" were verified. Therefore, based on the confirmation of 50 subjects, 36 representative product pictures (six for each group) and seven representative Kansei adjectives were picked out, as shown in Figure 7. Consequently, these Kansei adjectives completely match the images of the six product groups.

3.3 Relationships between Multiple Kansei Images and Product Form

After refining samples, the corresponding relationships between Kansei images and product form can be connected. An online questionnaire with the 36 representative product pictures and seven Kansei adjectives was designed for the same 50 subjects to rank with Likert Scale. This survey reveals whether there is any existing product that strongly represents multiple Kansei images.

Figure 8 shows existing products with two or three Kansei images. The average scores ranked by the 50 subjects on these product pictures were translated into percentage. The multiple Kansei images each product picture represents were very strong and ranged from 75.0% to 93.7%. Six types of multiple Kansei images are shown in Figure 8 (a) to (f) respectively. For example, there is a portable audio and a CD player with "sporty and hi-tech" images, a lady shaver with "tender and simple" images, a CD player with "hi-tech and rational" images, a toaster, kettle and washing machine with "cute and simple" images, a toaster, lady shaver and coffee grinder with "simple and rational" images, and a kettle and coffee maker with "simple, rational and hi-tech" images. This result proves that subjects are used to multiple judgments in product appreciation and multiple Kansei images are able to be represented in products.

Sporty

Cute

Simple and Rational

Hi-Tech

Tender

Traditional

Figure 7: Representative product pictures and Kansei adjectives

4. Creating Multiple Kansei Images

First, the most appropriate Kansei adjectives for forming multiple Kansei images were gathered. Then, the elements of product form relative to each Kansei image are analyzed and, finally, seven virtual product samples representing single and multiple Kansei images were created. However, for simplifying this procedure, color, material and texture are not concerned in this case.

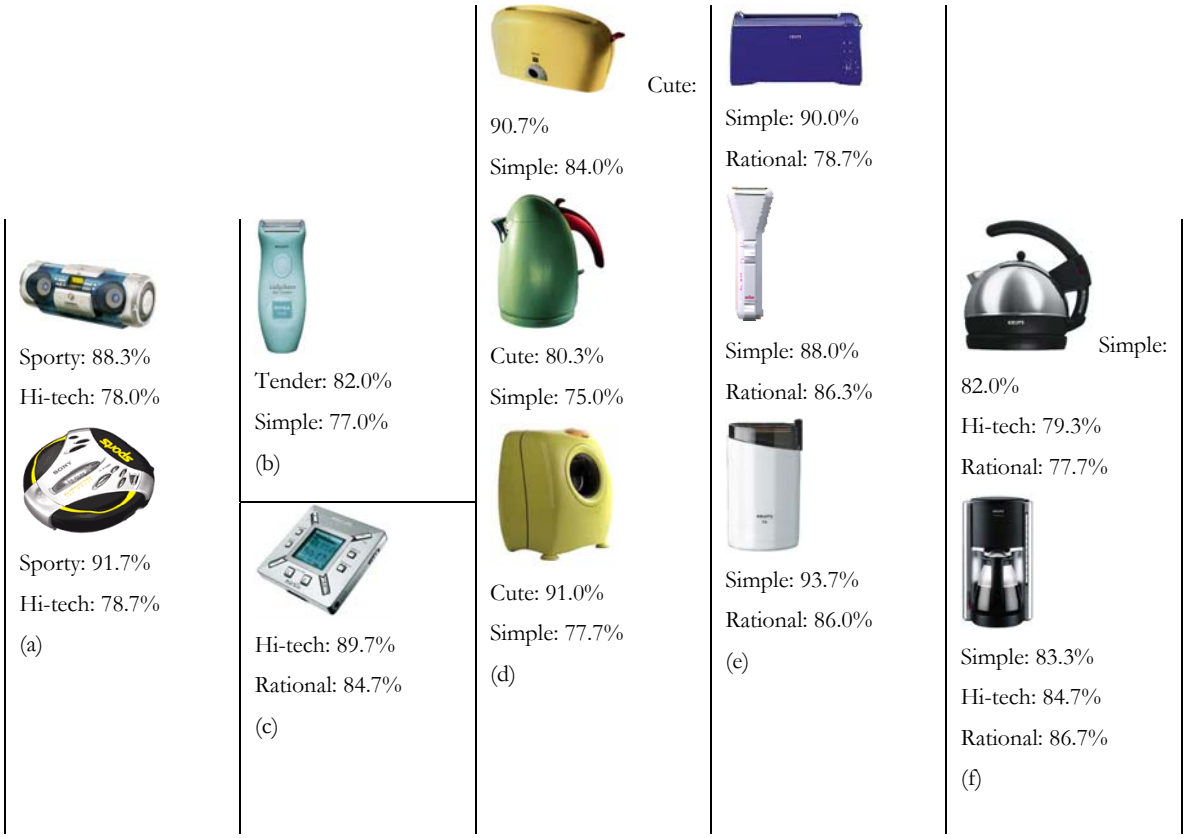

Figure 8: Existing products representing strong multiple Kansei images

4.1 Selecting Multiple Kansei Images

Based on the discussion in section 2.5, multiple Kansei images have to be independent to each other. For creating product forms representing dual and triple Kansei images, at least three independent Kansei adjectives are needed. According to the discussion in section 2.4, Factor Analysis could build analytical space for analyzing multiple Kansei adjectives. Therefore, the mutual influence of the seven representative Kansei adjectives could be clarified. Figure 9 shows the analytical space with the seven representative Kansei adjectives. It is clear to know that "tender" and "cute" are the same image. "Simple" and "sporty" are mutually exclusive to each other. "Cute" and "simple" are independent to each other because they locate at two orthogonal polar areas. And, "rational" and "hi-tech" are not strong Kansei images because they locate away from polar areas. As there are only two independent Kansei adjectives, "cute" and "simple", "sporty" was chosen as the third one so that multiple Kansei images such as "sporty and cute", "sporty and simple", "cute and simple" and "sporty and cute and simple" could be formed. Even though "sporty" and "simple" are mutual exclusive, their influence on product form can be studied.

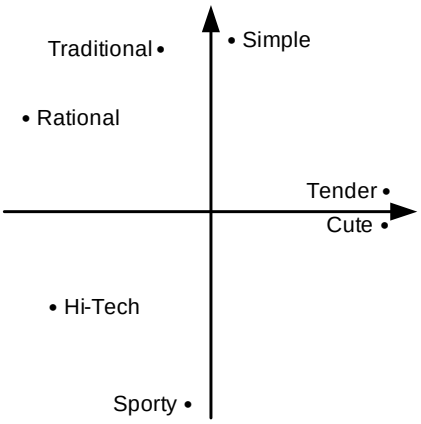

Figure 9: The space with seven representative Kansei adjectives

4.2 Analyzing Product Form

Kansei Engineering assumes that product form can be decomposed into a set of form elements and an optimal product form can be created by combining those form elements strongly relative to specific Kansei image(s). In this case, for creating product form with multiple Kansei images, a set of form elements strongly relative to "sporty", "cute" and "simple" images need to be determined. Thus, based on the survey in section 3.3, product pictures representing either "sporty", "cute" or "simple" image were analyzed by three experienced product designers for extracting form elements. Then, these form elements were classified into items and categories, as shown in Table 1. Here, items are physical components of product form and categories are alternative solutions for each item. For example, the items of a mug include the cup and the handle and the categories of the cup could be cylindrical, cubic or semi-spherical, etc. In Table 1, there are 22 categories respectively belonging to six items including principal forms, joining relationships, corner treatments, detailed features, panel forms and component forms.

These form categories, then, have to be assembled to form product samples, so that subjects could rank for their Kansei images. Applying Taguchi method, 34 virtual telephones containing the 22 form categories were created. Consequently, the same 50 subjects were recruited to rank the 34 black and white telephone pictures against "sporty", "cute" and "simple" with Likert Scale. Finally, this survey was processed for building the relationships between multiple Kansei images and product form.

Table 1: Items and categories for representing Kansei images

Items	Categories
Principal forms	(1) Curvilinear cubes (2) Geometric multiple form (3) Geometric single form (4) Organic concrete form (5) Organic abstract form
Joining relationships	(1) Fillet joints (2) Sharp joints (3) Same level joints
Corner treatments	(1) Radius = Height/4 (2) Chamfer = Height/4 (3) Radius = Height/2 (4) Radius = 2mm

Detailed features	(1) Rubbers on edges (2) Rubbers on corners (3) Bionic feature (4) None
Panel forms	(1) Non-parallel form (2) Parallel form (3) None
Component forms	(1) Non-cubic multiple form (2) Non-cubic single form (3) Cubes

4.3 Synthesizing Product Form

For synthesizing an optimal product form representing multiple Kansei images, artificial neural network (ANN) was applied to calculate the relationship between the three Kansei adjectives and virtual telephone samples. For this purpose, it is necessary to encode the survey data and define several parameter settings for ANN. In this case, the settings include the six form items (stand for a complete product form) as input, the weights of three Kansei adjectives as output, learning rate as 0.1, one hidden layer, 18 units in hidden layer and mean-square for error as 0.001. After having learned the survey data for 5812 times, ANN produced the optimal product form representing multiple Kansei images respectively, as shown in Table 2. For instance, "Cute and simple" images can be portrayed by organic concrete form, fillet joints, radius = height/4, none detailed feature, parallel panel form and non-cubic components with multi-forms.

Table 2: The relationships between form element and Kansei images

Kansei images	Principal form	Joining relationship	Corner treatment	Detailed feature	Panel form	Component form
Sporty & Cute	Curvilinear Cubes	Fillet joints	Chamfer = Height/4	Bionic feature	Non-parallel form	Cubes
Sporty & Simple	Curvilinear Cubes	Fillet joints	Radius = 2mm	Rubbers on edges	None	Cubes
Cute & Simple	Organic concrete form	Fillet joints	Radius = Height/4	None	Parallel form	Non-cubic multiple form
Sporty & Cute & Simple	Curvilinear cubes	Fillet joints	Radius = 2mm	None	None	Cubes

According to Table 2, four virtual telephones representing multiple Kansei images were created. Also, according to Table 1, three virtual telephones representing each single Kansei image were designed by experienced designers. These seven virtual products are shown in Figure 10. In this way, it is easy to evaluate each product form representing multiple Kansei images by visual comparison. However, as Figure 10 shows, the representation of single Kansei image is much better than that of multiple ones. No matter it is because both Kansei images are not fully represented with adequate form elements or due to independent Kansei images are also mutually exclusive to each other, this case proves that product form cannot represent equally strong Kansei images, as shown in Figure 5.

Sporty Cute Simple

(a) Product form representing single Kansei image done by designers

Sporty & cute Sporty & simple Cute & simple Sporty & cute & simple

(b) Product form representing multiple Kansei image done by ANN

Figure 10: Virtual products with single and multiple Kansei images

5. Conclusions and Discussions

This paper discusses the overall issues in multiple Kansei images that are what people actually feel toward product form in the real world. For better understanding multiple Kansei images, an image space mapped by Factor Analysis is provided to explain the mutual influence and relationships among Kansei adjectives. Thus, appropriate Kansei adjectives that can fully portray a product form are decided. In addition, this paper presents several existing products relative to multiple Kansei images. It implies that not only can users feel and tell about Kansei in multiple ways, but also multiple Kansei itself is very practicable in designing product form. Last, by creating product form with multiple Kansei images for experimentation, the authors proved that the weights of either Kansei image would be lessened after combining with others. In other words, addition rule is not applicable among multiple Kansei images portraying product form.

However, as this study only explored how to portray multiple Kansei images by applying 22 form elements, inevitably, each form element may only portray a specific single Kansei image rather than dual or triple ones. Besides, there were only three product pictures, among the representative ones, portraying "cute & simple" Kansei images as shown in figure 8. In other words, product samples portraying "sporty & cute", "sporty & simple" and "sporty & cute & simple" are scanty. Thus, how to extract form elements portraying both single and multiple Kansei images should be critically discussed in the further development of this study.

As mentioned in section 4.1, among the three Kansei adjectives applied, "sporty" and "simple" are mutual exclusive. As a result, two virtual products with "sporty & simple" and "sporty & cute & simple" Kansei images in figure 10 are unsatisfactory. For a better implementation, it is necessary to apply Factor Analysis with three dimensions so that three independent Kansei adjectives are available. To do so, however, more representative Kansei adjectives and product pictures are required. For example, in this study, merely two

independent Kansei adjectives were available among seven representative ones, even though they were supposed to be very different from each other according to section 3.2, refining samples. On the other hand, although the authors did extract form elements pertaining to each specific Kansei image from six representative product pictures, the authors believe that more than 6 representative product pictures are needed for better results of synthesizing product form with multiple Kansei images.

Furthermore, to question reasonably, the unsatisfactory results could also come from the deficiency of color and material representation other than form elements. For example, specific colors and materials are essential in portraying "sporty" Kansei image. The sporty colors are multiple and highly contrasting in hue, value and chroma. Of any sporty color, the foreground one is much brighter and more chromatic than the background one. For instance, the Sony products portraying "sporty" Kansei image in figure 7 is in black, yellow and silver. Similarly, the sporty materials are also multiple and highly contrasting. It is easy to find a sporty product on which plastic chunk or soft rubber is used for protecting the main body or absorbing the shock. This kind of material application portrays rigidity, strength and durability contributing "sporty" Kansei image. The same issues, likewise, take place in dealing with "cute" and "simple" Kansei images. For instance, cute products with soft materials are in whitened colors. Simple products with few different materials are in similar colors such as black and grey. Therefore, colors and materials that this study left out are as important as form elements for portraying multiple Kansei images. Researchers interested in this topic can expand these omitted issues further based on the suggestions mentioned above.

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