# How We Improve Sense of Beauty? Kansei Improvement Process and Its Support System

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**Abstract.** Some art works need Kansei, such as a sense of beauty, to create. Kansei is implicit so that it is difficult for improving our artistic ability to create the art works. The objective of our research is to propose a method for improving Kansei for creating art works. Firstly, we define process of improving Kansei. Then, methods for supporting each steps in the process are proposed. Kansei improvement support system which embeds proposed methods is also developed, whose target art works are designs created only by circles. According to the example use of the system, our Kansei improvement process and its support methods are proved to be effective in broaden Kansei.

**Keywords:** Kansei improvement process · Kansei improvement support system · Artistic ability

## 1 Background

Some art works need Kansei, such as a sense of beauty, to create. For instance, when we draw an image, we need to decide what to draw, where to locate them in a canvas, what color to use, and so on, according to our Kansei. Kansei is implicit so that it is difficult to improve our artistic ability to create art works. Some people take lessons. However, in the most case, the way to improve Kansei is not explained clearly even in the lessons. Instead, people obtain Kansei of teachers implicitly through the experience of imitating the teachers' art works, or being modified their art works by teachers. This way of acquiring Kansei makes some people difficult to improve their artistic ability. In addition, people cannot create better art works by themselves without teacher.

The objective of our research is to propose a method for improving the Kansei of creating art works. Several researchers developed systems that introduce Kansei to support creating art works [1, 2]. These researches tried to recommend some ideas to create art works according to the Kansei words input by users. Following the given ideas, users are able to create art works easily that fit for their Kansei. However, user's Kansei is not improved so that they are not able to create art works by themselves without the system. Mukai, et al. developed simulation environment in which users are able to practice artistic activity that needs Kansei, such as flower arrangement [3]. This research only provides environment for enjoying artistic activity without preparing real flowers. It does not support creating art works nor improving ability for creating them.

Systems of CAI (Computer-Assisted Instruction) or CAL (Computer-Assisted Learning) supported people to acquire knowledge [4, 5]. Such systems usually store knowledge to teach as teaching materials. However, Kansei is implicit and correct or appropriate Kansei cannot be defined, and teaching materials are not able to be prepared. On the other hand, skill support systems focus on improving implicit knowledge, such as physical skill [6, 7]. Many of such systems point out differences between students' performance and teacher's performance. In these systems, users are able to understand the inappropriateness of their performances, but are difficult in obtaining the ability of how to perform like a teacher. In addition, in the context of the artistic activity, the performance corresponds to the art works and teacher's art works are not always prepared. Thus, people should improve Kansei without using art works of others. Some idea inducement support systems encourage users to derive new ideas by themselves [8, 9]. The aim of these systems is to make users derive new ideas, not to improve ability for deriving ideas.

Our research supports learners of improving Kansei. Kansei is a part of artistic ability of creating art works. Since creating art works is subjective activity and it is sometimes difficult to find teachers who have the same Kansei, our system does not introduce teacher's help. Instead, we focus on thinking process in creating art works and propose methods for improving the Kansei by themselves. Firstly, the process of improving Kansei while creating art works is defined. Then, methods for supporting each steps in the process are proposed. As an example of our proposal, the system for improving Kansei is developed, whose target art works are designs created only by circles. We believe that if people are able to improve Kansei by the developed system, the proposed process of improving Kansei is valid and the supporting methods are effective. We have executed the experiment using the developed system to evaluate them.

## 2     Approach

### 2.1     Process of Improving Kansei

The art works have several features. In the case of drawing image, features are colors to use, size of objects, the number of objects, and so on. In creating art works, people decide values of these features in the way they satisfy. Features to recognize and consider are different according to the people. For example, some people do not consider the space between objects in the image, while others are strict on it. Such differences lead to the quality of the art works.

In this research, the Kansei is defined as states of features that people prefer. The states have both quality and quantity aspects. In the case of designing clothes, if the designer likes to design pink silk dress with three buttons, his/her Kansei is represented as "material=silk, color=pink, the number of buttons=three". Since "prefer" is a subjective sense, it is difficult to define what is the improvement of Kansei. However, if the preferable states of features are increased or changed, we can think their Kansei has been changed. In this research, to improve Kansei is defined as to increase the number of states of features that people prefer.

Based on this definition, we have proposed Kansei improvement process as Fig. 1. In step 1, people discover features of art works. Without recognizing features, they are not able to find preferable states of the features. In step 2, people create several art works by changing states of the features. In this step, they know how art works changes according to the features. In addition, since people try to create art works that they satisfy, they may use their Kansei implicitly to consider the states of features that they prefer. In step 3, they find the states of features that they prefer by comparing art works that they have created in step 2. If they found new states of features, their Kansei has been improved.
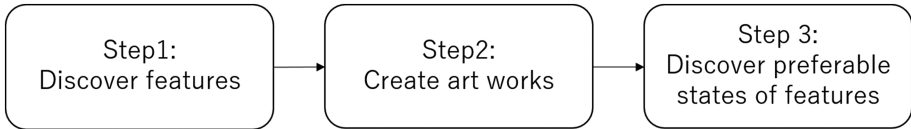


**Fig. 1.** Kansei improvement process

## 2.2   Support for Improving Kansei

Usually, Kansei is improved implicitly and people are not conscious of Kansei improvement process. Therefore, we believe that to follow Kansei improvement process shown in Fig. 1 helps people to improve their Kansei. However, the steps has several difficulties, so we propose support methods for performing each steps easily.

- **Method 1: for supporting step 1, to give hints for noticing new features that are not considered.** People are sometimes difficult for observing art works from different points of view. For such people, to give small hints for unknown features may trigger them of noticing new features. Hints do not need to indicate unknown features directly. Instead, the hints should push people feel to observe consider art works from different point of views.
- **Method 2: for supporting step 2, to provide simulation environment for creating art works.** In real world, there are several constraints so that it is sometimes difficult for creating art works freely. Let's consider designing houses as artistic activity. Building a house is expensive and takes a lot of time. Therefore, designers cannot build several houses in a short period even if they wish. In order to cope with such constraints in a real world, the simulation environment may help. People are able to create any art works by considering states of features freely without considering any constraints.
- **Method 3: for supporting step 3, to provide environment in which their art works are compared.** Art works that people prefer are created based on their Kansei. In most cases, Kansei is represented implicitly in their art works and may appear as common characteristics in their art works. Here, characteristics mean feature and its state. When their art works are displayed side by side in one environment, people may notice of the common characteristics and grasp them as their preferable states of features.

## 3    Case Study: Kansei for Designs Using Circles

In order to evaluate our Kansei improvement process and its support methods, we have developed the system as a case study. Target art works is designs that consist of circles of three different sizes, such as 25, 50, and 100 pixels. Some of the features of the art works are the number of circles, the area of circles in the canvas, positions of circles, the way of ordering circles, and so on.

Our system embeds functions correspond to the support methods described in Sect. 2.2. As for the method 2, drawing tool using circles of three sizes are prepared. Figure 2 shows the interface. When users select the size of circles by pushing the buttons and click canvas, the circles with the selected size are appeared on the clicked position in the canvas. Users can move the circles in the canvas freely, and also delete them. These operations can be performed by changing the operation mode by pushing buttons for changing drawing operation. Users can save their designs when they complete. In this tool, users cannot change the colors and sizes of circles freely. Instead, they can select sizes of circles by selecting one from three candidates and can put them at any locations. When the button for comparing designs is pushed, interface for comparing users' art works is appeared.
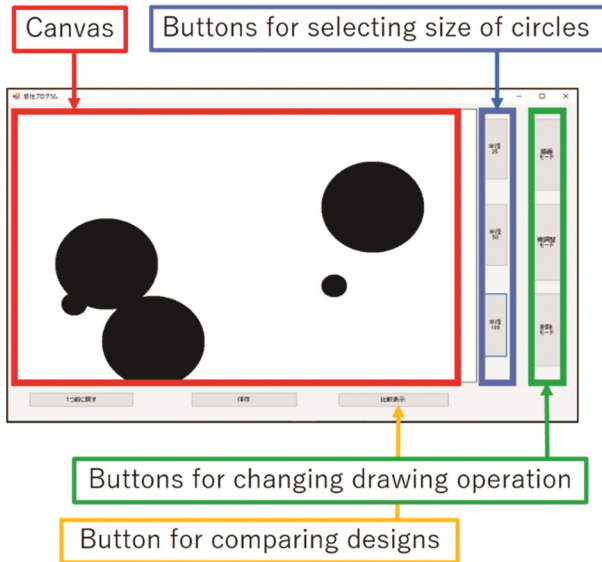


**Fig. 2.**   Interface of drawing tool

The interface for comparing art works is shown as Fig. 3. By observing all art works that they have created, users may find common characteristics of their art works. When users find common characteristics and push the button for discovering features, the interface for inputting the characteristics is appeared.
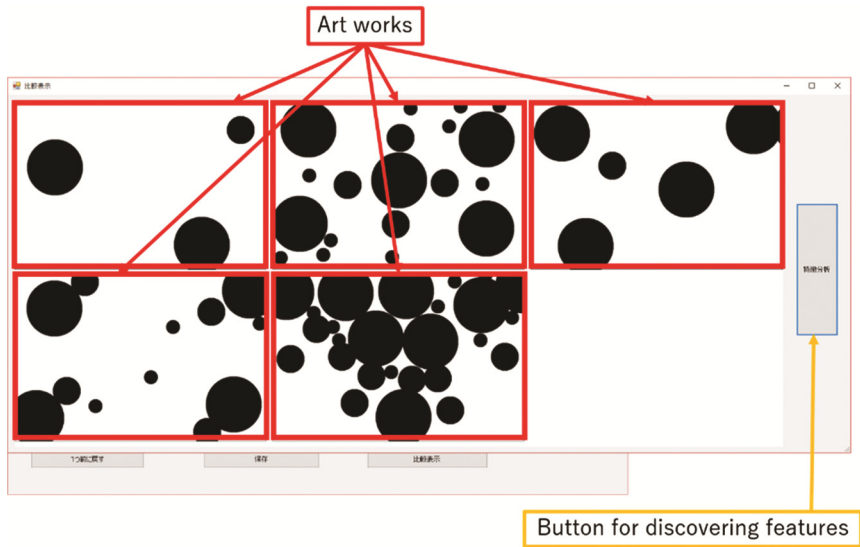
**Fig. 3.** Interface for comparing art works

Figure 4 is the interface for inputting the discovered characteristics. In order for the system to give hints, the system needs to know the characteristics that users recognize. Characteristics are represented by features and their values. Therefore, the interface has two input areas. One is for inputting feature and the other is for state. The representation of features are different among users, so text area is prepared for inputting features and users can describe features freely. On the other hand, states represent quality or quantity values of features and the ways of representing them are different according to the types of features. If the feature indicates the number of items, its states are large or small. If the feature shows the quality, its states are better or worse. If the feature indicates size,
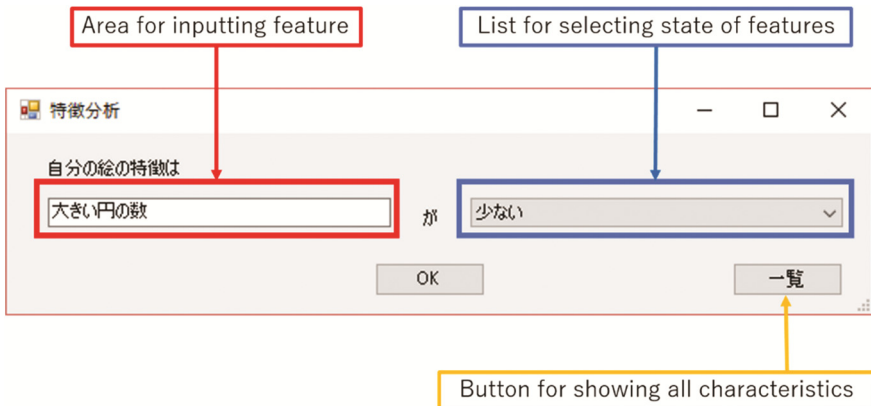


**Fig. 4.** Interface for inputting characteristics

its states are big or small. Therefore, the candidates of states are prepared in the system beforehand and users select one from the list. All inputted characteristics can be shown by pushing button for showing all characteristics.

Based on the input, the system gives hints for notifying new features. It is difficult to list up all the features that can be recognized by people, so it is also difficult to determine the features that users are not noticed. The inputted characteristics by users through the interface shown in Fig. 4 are common characteristics of their art works. It means that the opposite state of the same features (*opposite characteristics*) are not observed in their art works. If users try to create art works based on the opposite state of the same features, they may find new features and, hopefully, reach to the art works of different characteristics. Based on this assumption, our system gives characteristics of opposite state of inputted one as hints. Figure 5 is the example of hint given by the system. This hint is generated after user input his characteristics as <*feature: the number of large circles, state: small*> The system uses the same feature but changes the state from *small* to *large*.
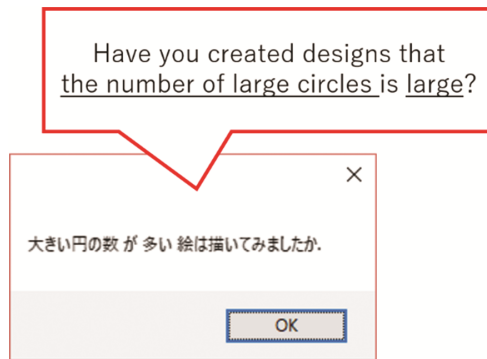


**Fig. 5.** Hint given by system

## 4    Experiment

### 4.1    Experimental Setting

We have asked 10 university students (*A* to *J)* to use our system for creating designs using circles and find preferable characteristics that they did not recognize. The system follows the process of Kansei improvement process. Therefore, if participants improve Kansei using our system, the validity of the Kansei improvement process as well as the effectiveness of the developed system is proved.

Firstly, participants were asked to answer questionnaire (pre-questionnaire). The pre-questionnaire consists of only one question: "In this experiment, you are asked to create designs using circles of three different sizes. Do you have any idea what kind of designs do you like?" This questionnaire checks if participants have already have characteristics of their preferable designs as Kansei. Then, they were asked to use the system for about 15 min. During the experiment, they were asked to write down characteristics

of their preferable designs when they noticed and the timing in Kansei improvement process in which they noticed. After using the system, they were asked to answer questionnaire (post-questionnaire). The post-questionnaire consists two questions: 1) "Did the system help you for finding characteristics of designs that you prefer?" and 2) "Did the hints given by the system help you for creating designs of different characteristics?" For both questions, participants were asked to select one answer from "yes" or "no."

## 4.2    Result

The number of characteristics that participants recognized before they used the system, which was acquired from the pre-questionnaire, and the number of characteristics that they have noticed while using the system are shown in Table 1. All participants were able to find new characteristics of the designs that they prefer by using the system. Table 2 shows some of characteristics that noticed. Some participants described about the features that are manipulated directly by the participants through the interface, such as size of circles. Others focused on the features that are not indicated directly through the interface, such as areas of circles. Such characteristics may be noticed through the repetitive designing activity.

**Table 1.** The number of preferable characteristics that participants noticed

|  | A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|---|
| Before using system | 0 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| After using system | 3 | 5 | 3 | 2 | 4 | 2 | 4 | 6 | 4 | 3 |

**Table 2.** Examples of characteristics that participants noticed

| |
|---|
| • I prefer circles with smaller sizes. |
| • I prefer designs with circles of different sizes. |
| • I prefer to divide the circle area and empty area clearly. |
| • I prefer to put circles in the corner. |
| • I prefer to order circles in the even interval. |
| • I prefer to order circles in line. |

Table 3 shows the total number of designs that was created during the experiment and the number of designs that were drawn after hints were given in the step 1 in the Kansei improvement process. As the results of Tables 1 and 3, participants who have created more designs (B, E, G, H, I) recognized more characteristics than others. On the contrary, participants who did not created many designs could not list up many characteristics.

**Table 3.** The number of designs drawn by participants

|  | A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|---|
| In whole experiment | 5 | 9 | 4 | 4 | 9 | 5 | 8 | 7 | 7 | 4 |
| After hints were given | 2 | 2 | 1 | 0 | 0 | 2 | 5 | 4 | 1 | 0 |

Table 4 describes the number of characteristics that was noticed during each step. According to this result, participants could find more characteristics when they finish creating designs and comparing their designs. However, they could not find out characteristics when they considering new features. As shown in Table 3, some participants did not create any new designs after hints were given.

**Table 4.** The number of discovered features for each step

| Step1: discovering features | Step2-1: during creating images | Step2-2: finish creating images | Figure 3: comparing their designs |
|---|---|---|---|
| 4 | 7 | 10 | 15 |

Table 5 shows the post-questionnaire results. "y" means "yes" and "n" indicates "no." According to the result of the first question, all participants answered that system was effective in finding new characteristics of designs that they prefer. One participant commented that to compare created designs was very useful in finding common characteristics. Therefore, our system as well as Kansei improvement process were proved to be effective in improving Kansei. On the other hand, from the second question, not all participants thought the hints from the system were effective. The participant who answered "yes" said he could successfully discover new characteristics by creating designs according to the hints. However, the participants who answered "no" complained that he have already recognized the characteristics given as hints and he did not like it. Current our system only indicates the opposite state of inputted features and does not consider whether user already know the characteristics or not. The hint function should be updated so as to consider the preference of user more correctly.

**Table 5.** Post-questionnaire results

|  | A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|---|
| Did the system help you for finding characteristics of designs that you prefer? | y | y | y | y | y | y | y | y | y | y |
| Did the hints given by the system help you for creating designs of different characteristics? | y | y | y | n | n | y | y | y | n | n |

## 5    Conclusion

In this research, we have proposed the method for improving the Kansei of creating art works. Firstly, we have defined the process of improving Kansei. Then, the methods for supporting each steps in the process were proposed. In order to prove the effectiveness of the defined process and our support methods, we have developed the Kansei improvement support system for the creating designs that consists of only circles. According to the experimental use of the system, creating many art works and comparing created art works were effective in recognizing new characteristics of the art works that they prefer. However, hints for noticing new characteristics that were given by the system were not so useful.

As hint, current our system only gives the characteristics whose state is opposite to the inputted characteristics. These hints sometimes have already been recognized by some participants. During the experiment, some participants said that they wanted to see art works for others. Current our system was developed for improving Kansei by users themselves. However, if they could not find new characteristics, hints from others may help them. Therefore, as future work, we plan to embed functions for exchanging art works with others for finding new features.

This research realized Kansei improvement system for only art works of creating designs with circles of different sizes. We believe that our Kansei improvement process is applicable for other artistic activity as well. In order to prove it, we need to develop systems for other art works and evaluate if our Kansei improvement process and its support methods are effective for other artistic activities.

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