CADo: A supporting system for flower arrangement

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ABSTRACT

Flower arrangement is enjoyed all over the world as a way of gardening and in decoration of rooms. However, it is difficult to make arrangements as beautiful as possible for beginners. Some rules about layout and color combination of flower arrangement are required in order for beginners to beautifully arrange the flowers. Moreover, the process is sometimes unreversible; that is, if a user cuts a stem too short, it may irrevocably spoil the arrangement. To solve these problems, we propose a computer-supported flower arrangement simulator, "CADo", which helps beginners enjoy flower arrangements using familiar materials. The name CADo is a combination of Kado (the Japanese art of flower arrangement) and CAD (computer aided design). CADo helps users with arrangement suggestions based on traditional layout and color combination of flower arrangement, and instructs users on how to cut flowers and to arrange them step by step. First, we performed a feasibility study to implement the proper rules of flower arrangement to our system, after which the system was built and developed. Finally, we verified the effectiveness of our system through evaluative experiment.

Categories and Subject Descriptors

H.5.2 [**Information Interfaces and Presentation**]: User Interfaces—*input devices and strategies, user-centered design,prototyping.*

General Terms

Design, Experimentation

Keywords

Mobile Interaction Design, Interface Evaluation, Simulation

1. INTRODUCTION

Flower arrangement is an art where various materials are combined with some flowers. It is enjoyed all over the world in gardening and decoration of rooms. Everyone, from beginners to experts, needs to know that there are some rules to layout and color combination in flower arrangement. The reason is that if a user cuts a stem too short, it may irreversibly spoil the flower arrangement. In order to begin a flower arrangement, it is necessary to prepare flowers and materials by oneself. Because there are many types and colors of flowers, many people would be confused about how to select flowers. From the above, it is difficult to make it look as beautiful as possible for beginners.

In this paper, we proposed a computer-supported flower arrangement simulator, "CADo", which helps beginners enjoy flower arrangements using familiar materials. The name CADo is a combination of Kado (Japanese flower arrangement) and CAD (computer aided design).CADo helps users with arrangement suggestions based on traditional layout and color combinations of flower arrangement, and instructs users on how to cut flowers and to arrange them step by step. In this way, the beginner can easily create beautiful flower arrangements.

2. CADO

CADo is an Android application that presents the beautiful design and procedure of flower arrangement based on the flower materials of a photograph taken by the user (Figure 1).

The Japanese art of flower arrangement involves structured layout and color combination of flower arrangement. Therefore, this system is developed as a new program using algorithms derived from these rules. Following the program, flowers are placed automatically according to the picture taken by the user. Using this system, beginners of Kado can easily create a flower arrangement.

Figure 1: Screen image of CADo.

2.1 Usage of Cado

Using the CADo(Figure 2), users: 1. Shoot flowers. 2. Add list of flowers. 3. Generate an automatic simulation. 4. Looking at the screen, make the flower arrangement.
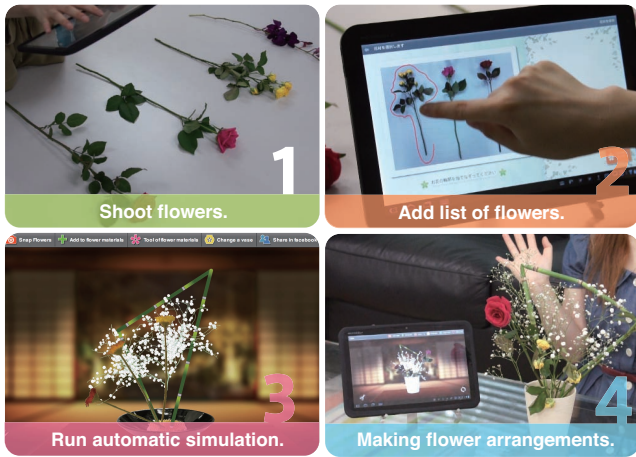

Figure 2: Steps to use CADo.

First, a user places flower material on a white table. The user can arrange the flowers on it, taking pictures in this system.

Next, the user cuts pictures of flowers taken. The user can cut out flowers by tracing the outline of a flower, and flower shape is registered. Then, the user removes the background image by on-screen slider. As a result, the information of stem length and color of flower size is retrieved, and the flower is added to the list. After completing the previous task, the user gets a flower arrangement simulation of user's prepared flowers by tapping the button to layout the design. Moreover, the user can also deploy special materials often used in Kado, such as "Babies-breath" and "Equisetu".

Finally, the user is looking at the results of the simulation and actually making the flower arrangement. In addition, the user can share simulation results on the Internet and view other people's work.

2.2 Implementation

CADo is implemented on Motorola Xoom powered by Android 3.0. This device has a 500-megapixel camera and 10.1 inches wide LCD (1280x800) capacitive touch panel. A user shoots flowers and touches the panel. In development, we are using Flash Builder 4.5, which was created with the Adobe Air application.

2.3 The flower arrangement simulation mechanism

CADo aims to simulate a flower arrangement according to the rule of Kado (the Japanese art of flower arrangement). At this time, we use two rules: color and form.

First, this system retrieves the color saturation and brightness of the flowers. In this system, flowers that have high saturation and brightness are placed above. There layouts are based on the way of standard Japanese flower arrangements that takes downward of vase as "Ground" and upperward as "Sky".

Second, this system uses the standing form, the tiled form, and concentrated form. These forms are basic styles of Japanese flower arrangements (Ikenobo and Obara-ryu).
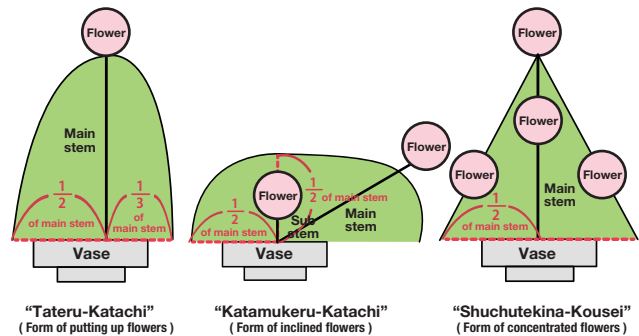
2.3.1 Forms of Kado

Figure 3: Three forms of Kado.

Kado has many basic forms. In this system, three basic forms were chosen and implemented: "Tateru-katachi" (form of putting up flowers), "Katamukeru-katachi" (form of inclined flowers), and "Shuchutekina-kousei" (form of concentrated flowers) (Figure 3) [4].

When we make flower arrangement according to the rule of Kado, the flower that is featured in the prepared flowers by the user is the basis of the simulation.

The first placed flower is one with the largest petals in the flowers prepared by user. Subsequent flowers are placed on the edge of the green area (ellipse). The arrangement of these flowers is random according to the value of colorfulness and brightness. Therefore, the flowers with low values of colorfulness and brightness are placed on the lower side of the ellipse, and the flowers with high values of colorfulness and brightness are placed on the upper side of the ellipse.

In the case of "Tateru-katachi", the first flower is placed vertically in the vase.Subsequent flowers are placed the 1/2 length of the major axis of an ellipse on the left side, and the 1/3 length of the major axis of an ellipse on the right side, and the flowers are cut accordingly for this arrangement.

In the case of "Katamukeru-katachi", the first flower is placed at random in the 60 to 90-degrees range from center. Subsequent flowers are placed the 1/2 length of the major axis of an ellipse on the left side, and the flowers are then cut accordingly.

In the case of "Shuchuteki-na-kousei", the first flower is placed vertically in the vase. Other flowers are placed as if

filling a triangle. In this case, the flower is placed on the corner of a triangle, and on the center of the area a triangle voronoi is split.

3. EXPERIMENTAL EVALUATION

In order to determine user experiences and usability of CADo, the evaluation experiment was conducted by introducing beginners to flower arrangement. In this experiment, we investigated opinions of the subjects about flower arrangement with or without the CADo system. Then, we checked the usability of CADo by means of the System Usability Scale(SUS) [2].

3.1 Setup

This experiment was conducted in RFMedia-laboratory in Ylivieska, Finland on December 1st and 2nd, 2011. Ten subjects(range 19-51 years) participated in the experiment. All the subjects were female because flower arrangement is mainly preferred by them. Nationalities of the subjects were Finnish, Romanian, Spanish and Polish. We did not invite Japanese subjects to evaluate international acceptance of Kado algorithm used in our system. Seven out of ten subjects had no experience of using tablet-type devices. Five different artificial flowers (10 sets), a white desk, a white vase, a pinholder, scissors, and the CADo system were prepared before the experiment. Also, a video camera for recording the experimental process was set up. In addition, a camera was prepared to record subjects flower arrangements.

Two questionnaire forms were created to collect user data. The first form included questions about background information, seven general questions about flower arrangement, and three open questions concerning experiences about using the CADo system. The second form used was the System Usability Scale (SUS)[2]. It is Likert-based usability evaluation form including ten questions. Five of them include evaluation of positive aspects and five negative aspects of the system.

3.2 Tasks

First, the subjects were informed about the purpose of the study. After that, the subjects were instructed verbally and given a written instruction how to use the CADo system. The subjects freely made flower arrangements with five artificial flowers on the white desk. Then, the subjects made flower arrangements using the CADo system (Figure 4). After that, the subjects made the same flower arrangement with artificial flowers on the desk watching the screen of CADo. Finally, they filled in the questionnaires.

3.3 Results

A SUS score is calculated from the values given by the subjects, and it is mapped in the numerical range 0-100. The SUS score for the CADo system in this study was 73, varying between 57.5 and 85 (see Table 1). The most positive values (4 or 5) concerned two questions: "I thought CADo-system was easy to use" and "I would imagine that most people would learn to use CADo-system very quickly". Five subjects preferred their flower arrangement before using the CADo system, and five subjects after using the system (Figure 5). Subjects commented in open answers: "It is easy to use, user friendly, it stimulates creativity" and "it really helping and giving interesting ideas". Seven subjects out of
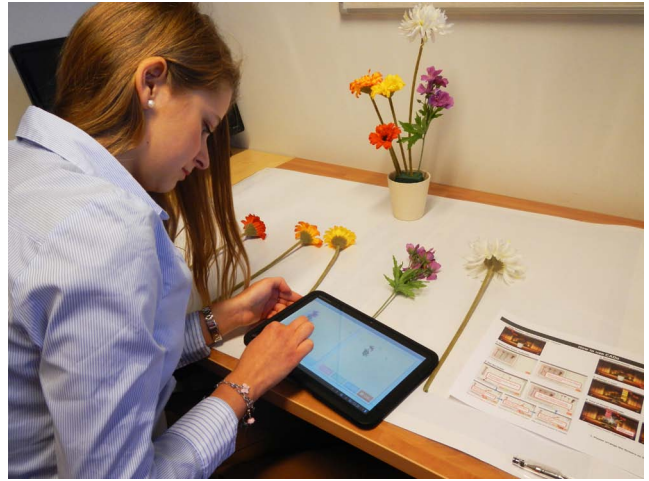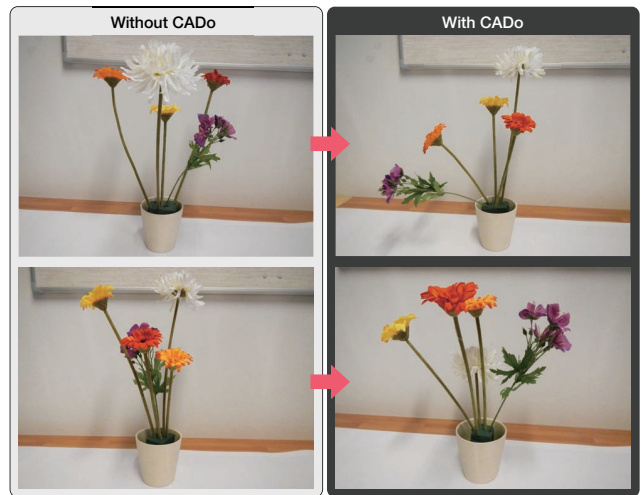

Figure 4: Subject using the CADo system.

Figure 5: Flower arrangements without and with CADo.

ten answered that they were interested in flower arrangement after the experiment.

3.4 Consideration

Although the subjects have a lack of experience in Japanese flower arrangement, they readily made the flower arrangement. However, every subject arranged and cut all the flower material at the the same length. Moreover, every work was arranged in the form concentrated on the flower vase. In addition, in the case of making flower arrangement without CADo, the subjects efforts had a tendency to use inclines, but the subjects made inclined flower arrangement after using CADo(Figure 5). So, it is possible for the beginners in Kado to make flower arrangement in consideration of height and inclination of flower.

4. ASSOCIATED RESEARCH

There are several research projects related to flora image recognition and flower arrangements. Huang et al. [5] developed flower image recognition algorithms based on image

Table 1: Score of the System Usability Scale.

User	1	2	3	4	5	6	7	8	9	10	Avarage
Score	82.5	67.5	77.5	57.5	70	77.5	80	85	57.5	75	73

rotation and difference image entropy. Ijiri et al.[6], in turn, have presented a system for modeling flowers in three dimensions preserving correct botanical structures. Ijiri et al. [6] have also implemented an interactive 3D modeling system for seamless transformation from rapid prototyping to finer sketches or 3D components. Mukai et al.[3] have introduced a training system for flower arrangement with two kinds of PCs. However, this system does not yet support a variety of flower models. Our CADo system is unique because it supports mobility, and because it can be used flexibly with various types of flower models.

5. CONCLUSION AND FUTURE WORK

Here, we propose software supporting flower arrangement simulation, CADo, for the beginner in Kado, and conduct an evaluative experiment on CADo. CADo is as an Android application that has the function of shooting images of flower, generating designs of flower arrangement, and supporting actually making of flower arrangements. In order to this, it is possible for the user to make flower arrangement according to the rules of Kado. Also, we confirm that CADo has good usability by means of the evaluation in this experiment. In addition, actually making flower arrangement by using CADo, it is possible for the subjects to make arrangements involving the length of stem changing and the flower inclining. Then, if running a simulation in advance, we can solve the problem of stems cut irrevocably short.

In the future, a big challenge is to generalize the design of beautiful flower arrangement by means of a system supporting Kado. Also, CADo is only a 2D simulation, so we have the potential of developing a 3D system in the future. For example autostereoscopic displays seem to be one promising technology to be utilized in our future research activities. In fact, there are already some mobile devices in the market with autostereoscopic displays[1]. Therefore, we plan to develop CADo with reference to this evaluation's feedback in order to implement this function.

In the future, it will be interesting to test this system in Japanese that are familiar with traditional Kado.

6. ACKNOWLEDGMENTS

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