Supporting Nail Art Consultation by Automatic Image Selection and Visual Information Sharing

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Abstract. People are increasingly becoming interested in nail art, and many of them have treatments in nail salons. Nail technicians decide nail art designs according to their understandings of their clients' requests. The results of nail art depend on the preceding consultations. However, there are problems with such consultations: some clients cannot appropriately express their requests; some nail technicians have difficulties in deciding designs because of their clients' unclear requests. In this paper, we present a consultation system that supports both clients and nail technicians. The system consists of two applications: one assists a client in selecting the images of nail art designs and sends them to a nail technician; the other enables the client and the nail technician to visually share their information including the client's requests. The combination of the two applications bridges the gap between the client and the nail technician about the design and treatment of nail art. We show the results of an experiment on the operation of our system in nail salons.

Keywords: Consultation support · Image search · Information sharing.

1 Introduction

People are increasingly becoming interested in nail art, and many of them have treatments in nail salons. Nail technicians decide nail art designs according to their understandings of their clients' requests. The results of nail art depend on the preceding consultations. However, there are problems with such consultations: some clients cannot appropriately express their requests; some nail technicians have difficulties in deciding designs because of their clients' unclear requests. However, to the authors' knowledge, no previous research exists on supporting the entire consultations between clients and nail technicians for the decision of nail art designs in nail salons.

In this paper, we present a consultation system that supports both clients and nail technicians. The system consists of the following two applications:

 One application assists a client in selecting the images of nail art designs and sends them to a nail technician;

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 - The other application enables the client and the nail technician to visually share their information including the client's requests.

The combination of the two applications bridges the gap between the client and the nail technician about the design and treatment of nail art. We show the results of an experiment on the operation of our system in nail salons. We perform the evaluation of the system based on the interviews with the participants in the experiment including professional nail technicians. Also, we discuss the benefits and limitations of our system.

2 Related Work

There have been studies on supporting nail art design in self-treatment (where nail technicians were not involved). Umezaki et al. [9] proposed a nail recipe retrieval system using words about impressions and difficulties of designs. Odajima and Ito [6] proposed a nail art recommendation system based on user preferences by the machine learning of the features of nail art images on the Web.

There has been research on nail art from other viewpoints than that of supporting nail art design. Fujishima and Hoshino developed a fingernail detection system [1] that used the distributions of pixel colors to distinguish fingernails from palms, and further developed a virtual nail art system [2] that appropriately superimposed nail chips on fingernails. Ishihara [3] studied the color and design factors of impressions on nail art by conducting sensory analysis on 36 nail chips with 9 colors and 4 designs.

Systems have been developed to support nail salons in client management and to support clients in searching for nail art designs and nail salons. Before After [5] is a client management system used in many nail art salons and other kinds of salons. However, some nail technician gave the opinion that its electronic record creation function was difficult to use. Nailbook [8] is a system that allows users to search for nail art designs and nail salons. When the users make requests to nail salons, they need to send nail art images one by one, which imposes the burdens of storing and sending the images.

Apart from nail art, Nakagawa et al. [4] proposed a system for supporting the expansion of variations of makeups. It enabled users to record information about cosmetics and their photographs after the makeups and to share the information and the photographs with other users.

3 Proposed System

In this paper, we propose a system that supports consultations on the design of nail art in nail salons. We particularly tackle the following two problems that the clients and the nail technicians encounter.

 Many clients search and view the images of nail designs before visiting nail salons. They need to store such images if they find interesting designs. Also,

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Fig. 1. Architecture of the proposed system for supporting nail art consultation.

it is sometimes difficult for them to appropriately inform technicians about details of designs such as colors and patterns that they prefer.

- Nail technicians sometimes face the problem of the gap arising between the designs that their clients imagine beforehand and the results of the treatments that the technicians perform according to their understandings, which is due to their verbal communications about the designs in nail salons. Some technicians have difficulty in deciding designs because of the differences of feeling and sense from their clients.

To solve these problems, we compose our system from two applications, one that enables the automatic selection of images for the clients, and the other that allows the nail technicians to share visual information with the clients. As depicted in Figure 1, the two applications share necessary information via the database connected to them.

The application for clients enables them to inform nail technicians about the designs and preferences of nail art even if these are difficult to verbally express. For this purpose, it provides the following two functions:

- Its view and search function allows the clients to view and search nail art designs without interfering with their actions;
- Its automatic image selection function eliminates the need to manually store images. Since it automatically shares the selected images with the application for nail technicians, the clients can inform their preferences without verbal communication.

The application for nail technicians enables visual information sharing as well as the creation of the electronic records of their clients necessary for consultations. By visual information sharing, we mean to allow a technician to visually recognize the requested designs by regarding the images of nail art as the requests of the clients. For this purpose, it provides the following two functions:

- Its function for showing the selected images of nail designs allows the clients and the technicians to view the screen at the same time to clearly share their understandings of the designs;
- Its client record creation function eases the task of the technicians to make the electronic records of their clients.

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Fig. 2. Application for clients showing (a) thumbnails, (b) an expanded image, (c) search results, and (d) selection results.

4 Implementation

We implemented the two applications by using Android Studio and Java. We used a smartphone (HUAWEI P30 lite) for the application for clients and a tablet (Lenovo Yoga Tab 11) for the application for nail technicians. We adopted Google Sheets API and Google Apps Script to implement a database for information sharing between the two applications. The images of the nail art designs used in the two applications were contributed by a nail technician [7]. The images were stored in the applications as their resources.

We developed the application for clients as shown in Figure 2. It provides the view and search function and the automatic image selection function. When a user enters a hashtag, the application displays the set of the images corresponding to the hashtag. Each image is assigned three hashtags that express its characteristics. Hashtags include the characteristics of nail art designs, primary colors, and words expressing related seasons. The automatic image selection function displays images in the order of the time that the client spent to carefully view the images by expanding them. The application sends information about the selected images to the database.

We implemented the application for nail technicians as depicted in Figure 3. When started, it displays nail art images by obtaining information about the images that were automatically selected by the application for the clients. In addition, it provides the function for the creation of the electronic record of clients based on check boxes for questions about their nails.

5 Experiment

To evaluate the proposed system, we conducted an experiment on its operation in nail salons. We combined expert review and subjective evaluation: the expert review was performed by two professional nail technicians; the subjective evaluation was performed by two participants who played the roles of the clients. The experiment consisted of two cases: case A with an actual treatment; case B with simulated actions but without a treatment. After the experiment, we

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Fig. 3. Application for nail technicians showing (a) selected images and (b) a client's electronic record.

conducted interviews about our system as well as questionnaires about their past experiences of nail art design. Table 1 summarizes the characteristics of the participants in this experiment.

Client	Gender	Age	Medium	Ordinary way of
			ordinarily used	presenting designs
А	Female	24	Instagram	Presenting Instagram
				images at the treatment
В	Female	25	Instagram	Presenting Instagram
				images at the treatment
Nail	Gender	Age	Medium	Ordinary way of
Nail technician	Gender	Age	Medium ordinarily used	Ordinary way of creating records
Nail technician A	Gender Female	Age 26	Medium ordinarily used Financial application	Ordinary way of creating records Application with
Nail technician A	Gender Female	Age	Medium ordinarily used Financial application with note taking	Ordinary way of creating records Application with text entry
Nail technician A B	Gender Female Female	Age 26 27	Medium ordinarily used Financial application with note taking Before After	Ordinary way of creating records Application with text entry Application with

Table 1. Participants	in	the	experiment.
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5.1 Procedure

In nail salons, we asked the clients and the nail technicians to operate the corresponding applications. We asked the clients to search for nail art images that they preferred and wanted to use for reference. After judging that they searched sufficiently, we asked them to check the results of the automatic image selection.

After the clients' operations were completed, we asked the technicians to view the selected nail art images by using the application for the technicians. Also, we asked them to create the clients' records by using the application. During consultation and treatment, they discussed nail art designs by viewing the images on the tablet together.

After the experiment, we interviewed the clients and the technicians. The interviews lasted for approximately 1 hour in case A and for approximately 40 minutes in case B.

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5.2 Subjective Evaluation by Clients

Concerning the view and search function of the application for clients, we obtained the following comments from clients A and B.

- A. A good thing is that it provides easy view and allows the expansion of images. Another good thing is that it allows search with hashtags like Instagram. I want it to provide more kinds of hashtags.
- B. Its ability to search with hashtags is the same as the existing one. Its operability does not feel bad. I want it to allow the tapping of hashtags and the expansion of images by pinching out.

Regarding the automatic image selection function, we obtained the following comments.

- A. It is easy to use because it does not require the process of sending and presenting images to the nail technician. The images that I particularly liked were displayed at the top of the screen. It would be better than Instagram if I could use it in the salon.
- B. It eliminated the task of storing and presenting images to the technician. I want it to allow the removal of the image that I expanded but did not like. I felt that it correctly selected the images that I liked.

Concerning the entire application for clients, we obtained the following comments.

- A. I will use Instagram if I search designs at home. However, I would like to use the proposed application if I would be in the treatment of removing the gel for new nail art.
- B. Because of the convenience of the search function, I would like to use Instagram rather than the proposed application. The application requires the verbal communication of requests for detailed colors that did not appear in the list of displayed images.

5.3 Expert Review by Nail Technicians

Concerning the showing of automatically selected images, we obtained the following comments from nail technicians A and B.

- A. It eases communication with clients about multiple requests, which is useful for deciding designs. Since it is sometimes difficult to verbally communicate, the application's ability to use images as design requests is good.
- B. The large screen is good because the client can point it out with a finger during her explanation. I normally use a smartphone to display the image sent from a client, and the tablet is not easy to use in the same way because I need to turn my eyes.

Regarding the client record creation function, we obtained the following comments.

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- A. Its use of check boxes is good for recording the items about which I always ask clients. I want it to additionally provide text fields. I want it to allow the storing of data specific to clients.
- B. I would like to use it as a part of record creation because it is simpler than the existing one. However, it is insufficient since it omits the storing of some basic information in electronic records.

Concerning the entire consultation support system consisting of the two applications, we obtained the following comments from the technicians.

- A. The elimination of the need for clients to send nail art images is good. It also is good that I can confirm the request of a client by looking at the tablet during the treatment. The system is useful for deciding designs since it allows the viewing of multiple designs at the same time. It will be useful when I communicate with clients only verbally and when I give treatments to clients who have not decided requests for designs.
- B. The automatic sharing of images is convenient. The system enabled me to grasp the client's request, and made me feel that I successfully shared information. There would be a risk of staining nails if a client operated the application after the removal of the gel. I would like to use it if the existing problems could be solved.

6 Discussion

Based on the comments obtained from the clients in Subsection 5.2, we consider that the automatic image selection function eliminates the troublesome task of manually storing and presenting images and enables the easy communication of the preferences of clients to nail technicians. However, it turned out that the application made the clients feel that it was difficult to view and search images. We consider that this is because the application did not provide basic functions including the tapping of hashtags and the pinch-out operation as well as sufficient numbers of nail art images and hashtags.

Based on the comments obtained from the nail technicians in Subsection 5.3, we consider that visual information sharing assists interaction between nail technicians and clients in deciding designs. However, it allows the sharing of only images stored in the application for clients. To allow them to appropriately share detailed colors and other designs that do not exist as prepared images, we need to additionally implement necessary functions.

Nail art designs differ among technicians, and preferences for designs differ among clients. Therefore, we need to consider providing functions for adding user-defined images and a wider range of images other than nail art. To treat a larger number of images, we will need to store them in a server.

7 Conclusions and Future Work

In this paper, we proposed a system for supporting clients and nail technicians in nail salons in deciding nail art designs and performing consultations by sharing

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nail art images and by bridging the gap between their recognitions of designs. The application for the clients eliminated the tasks of the clients by automatically selecting the images that they preferred, and assisted their communications of preferences to technicians. The application for the technicians assisted them in recognizing the requests of the clients by sharing the images that they preferred.

It was found that, in both applications, the insufficiency of data and the lack of the function for avoiding unclearness due to verbal communications caused problems. Therefore, our future work includes the enhancement of nail art images, hashtags, and the client record creation function as well as the visual sharing of information other than nail art images. Also, since we obtained many comments on additional functions from the participants in the experiment, we need to conduct interviews with multiple nail technicians and other involved persons before further enhancing our system.

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