

Color Scheme Scrapbook Using A Character Color Palette Template

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Abstract. The visual appearance of a character is just as important as the script when it comes to convey the personality and charm to the audience. Our Design Engine [6] aimed to improve the efficiency of character development by providing support to the planning phase, where the character blueprints are drawn based on literal information provided by the producer. Previous research exists on color scheme design work, but these methods are not useful for character design for producers and directors. This paper aims to provide a character color scheme support system that uses a scrapbook made up of the color palettes of existing characters. This is one part of our Design Engine, which purpose is to support the process of character making that is based on only literal information. The concept of the Digital Scrapbook (DSB) is to set up a personal database that helps creators to pin down the appearance of characters the designers want to sketch.

Key Words: CG, Character Design, Character Making, Color Scheme, Color Palette, Scrapbook

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1. Introduction

Video content, such as animations, has become easy to produce by using advanced CG technology. In recent years it is not uncommon for a single animator to produce an animation alone. Video content production has come to be widely performed. The appearing characters

are those who determine the value and appeal of the video content, along with the scenario. For the displayed character the color of clothes and hair is some of the important factors for video contents, because the impression of video contents is strongly affected by the color of the characters. In many cases the colors have been determined based on the personality and the social setting of the character and the backstory of video contents [3]. Color scheme work for a character is said to be work sensuous. This is because it is determined according to personality, setting and a variety of other relevant factors [7].

Color design is used in many fields related to daily life such as interior design and fashion design. There is a study on color image scale, color scheme system and such as harmony color scheme system. KOBAYASHI [4, 5] performed an application and an impression evaluation of various designs by classifying the color scheme using the color image scale. IMAHASHI et al. [2] and UNAMI et al. [8] worked on the production of the illustration image, that is, convert the color harmony by extracting the image color representing the characteristics of an image. COHEN-OR [1] proposed a method for image conversion using a harmonious color scheme.

However, in these studies, there are three problems that have been brought to attention. The first one is that for character design, a conversion of a combination of a character's color scheme, a study of color conversion for each part of hair and clothes, cannot be found. In addition, the fashion design field also deals with the color scheme, but those methods can't be used for the color scheme of an entire character because clothes and colors for animation are not always realistic.

The purpose of this study is to develop a clear management scrapbook for creating the color scheme of a new character by using color schemes from existing characters. We propose a template and a system for the character color scheme creation using color templates. The character template of a color scheme is based on results of an analysis of every part of hair, skin, and clothing of existing characters. In the next stage, the existing character's color scheme is applied to a color scheme template in order to record the color scheme data. We then constructed a coloring support system that uses the extracted data for users to create their own characters from a color combination percentage from the color scheme template. Finally, we conducted an evaluation experiment of the character color scheme creation using our color scheme support system.

2. Previous research

In deciding the color scheme of a character, it can make sense in many cases to look first on examples used in the past. Therefore, the production is highly dependent on the experience and sense of creation of the producer. MOTEGI et al. [6] showed that it is possible to support the producer by making a draft design of the character based on literal material using a character design support system. However, the support system did not deal with the creation of a character's color scheme (Figure 1).

WAYAMA et al. [9] classified a color scheme for animated characters. This study proposed a search system for comparing color schemes by applying templates on a character's face and clothes. Thus, it has become possible to search for the color scheme of characters by using the personality and the main color as input. However, the color scheme generation and the change process of characters based on research results is not addressed (Figure 2). Therefore, performance enhancement of the data library as well as functionality of the implementation simulation of the color scheme is still desired. This study constructs a digital scrapbook of existing characters and a color search simulation system in order to solve this problem.

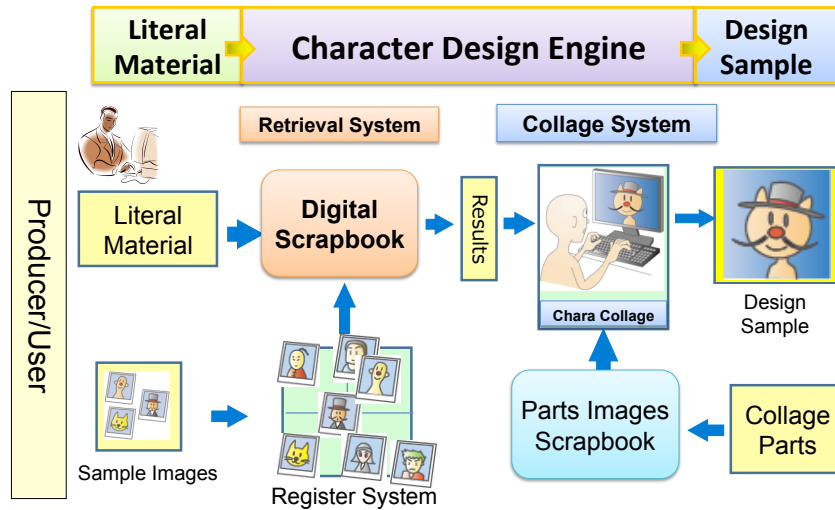


Figure 1: Overview on the ‘Character Design Engine’

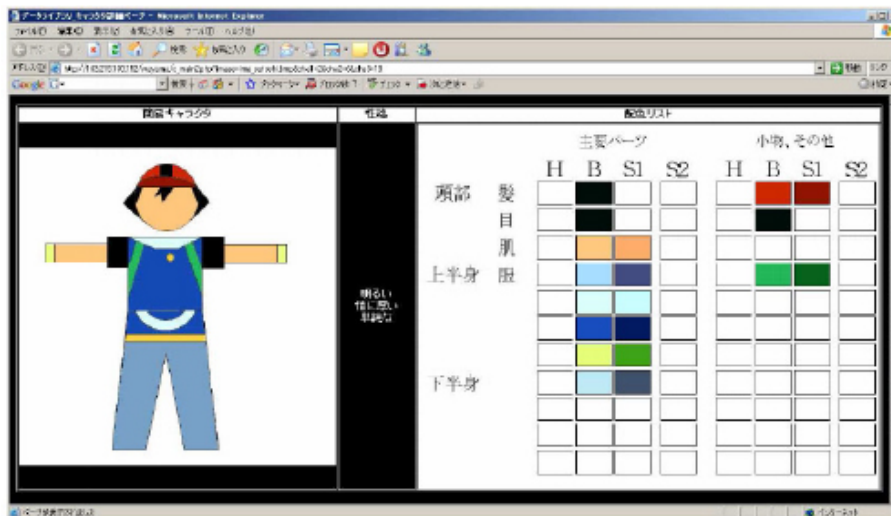


Figure 2: Classification of a character’s color scheme

3. Color scheme template and analysis of character’s parts

3.1. Parts quantity of a character

We classified hair, skin and clothes of characters for simulating a color scheme. Unlike a real person, any character’s hair can have various colors. We believe this helps to strongly define a character’s personality. On the other hand, the color of skin has no large difference between characters, because it is represented by human variations of the skin tone. As for the clothes, the color scheme and colors have a great variety. For the purpose to figure out a number of ornament types and of character clothes needed for a color simulation, we examined 51 characters. In this study, the clothing parts were shirts and pants, and ornaments showed up as tie and ribbons. In addition, also hair and skin were considered for the analysis.

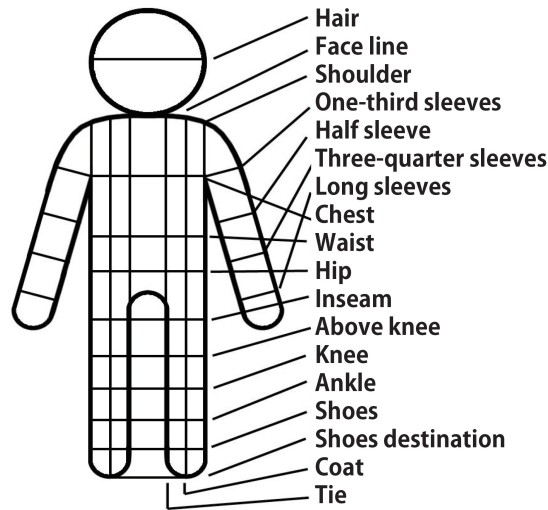


Figure 3: Character color scheme template



Figure 4: Example of registered character color scheme in the scrapbook

Our research results showed that the ornaments are formed by the 0-2 types, and the clothes are formed by the 1-3 type, as shown in Table 1. A combination of ornaments and clothes for all characters other than two lead to four types. Furthermore, hair and skin are composed of one color basically, while ornaments and clothing show a wide variety of colors and parts, basically. By virtue of these results, in our study the color scheme of characters is based on one type hair color, one type skin color, three types clothes color and two types ornament color.

Table 1: Numbers of parts of clothes and ornaments for characters

		Ornaments				Total
		0	1	2	3	
Clothes	1	4	5	8	0	17
	2	11	4	4	1	20
	3	4	9	1	0	14
Total		19	18	13	1	51

3.2. Character color scheme template

In this section, we describe character templates that intuitively can communicate the image of character's colors. For this purpose, we examined existing characters which parts are used for ornaments and clothes. We also analyzed the area of clothing parts to determine a wide variety that were originally designed from existing clothes such as, school uniforms, suits, robes and kimonos.

As a result, hair, face line, shoulder, one-third sleeves, half sleeve, three-quarter sleeves, long sleeves, chest, waist, hip, inseam, above knee, knee, ankle, shoes, shoes destination, coat, tie, and so on were used as base for dividing the body into 58 areas by 18 solid lines. The color template was created as an intuitively understandable way of placing color to each region, as shown in Figure 3. Figure 4 shows an example in which a character's color scheme has been registered in the scrapbook.

4. Proposed system

4.1. Overview of the color scheme support system

Figure 5 shows an outline of the color scheme support system. This system consists of search systems, a reflection system, and a registration system. Figures 6–7 show the steps of the color scheme simulation. First, the color scheme of an existing character is registered as a color scheme image with the color balance for each part, for hair, skin and clothes. Now the user can set the color scheme for each part and check the color balance by selecting a color scheme image. After that, fine-tuning is done for each part of the color scheme, and the result is exported as image data.

4.2. Registration and character color scheme scrapbook

Figure 9 shows the color scheme registration system, and Figure 8 shows the underlying flow. The registration system constructs a library of the existing characters data. When an existing character image is loaded, a total number of 7 types of base colors, one type of hair, one type of skin, three types of clothes, and two types of ornaments are extracted.

After the selection, the colors are set to the 58 locations of the created template. At the same time they can be compared with an existing character. The saved data is exported as CSV data and stored in the character color scrapbook. The saved data consists of seven colors and their placement information for the 58 areas of the template.

4.3. Simulation system

Figure 11 shows the color scheme search system and, in turn, Figure 10 shows the underlying flow. Our simulation is used by producers to design a color scheme on the basis of the character color scheme data registered by the registration system.

First, an uncolored design draft is loaded into the system, and the color areas for hair, skin, clothes, three types, and two types of ornaments are defined. A search for color and the parts of registered character data is performed, and the search results are reflected in the 7 types of areas.

Minor adjustments on the result can be done by using the color picker and color bar. The final result is then saved as image data and becomes a color scheme draft. Furthermore, a re-

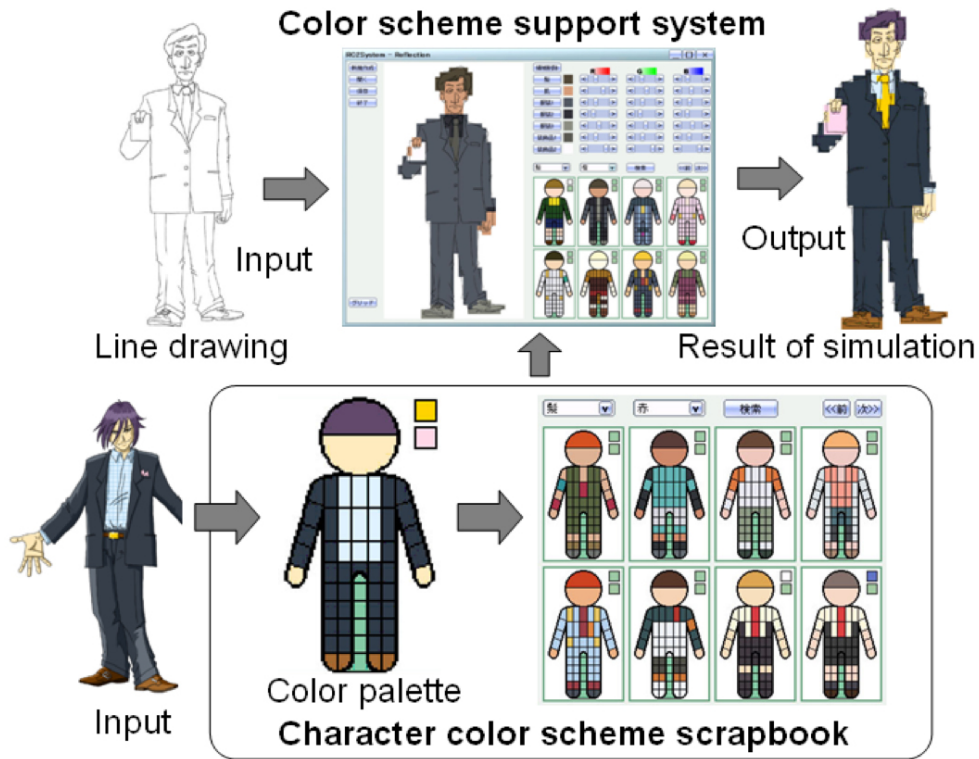


Figure 5: Color scheme support system with DSB

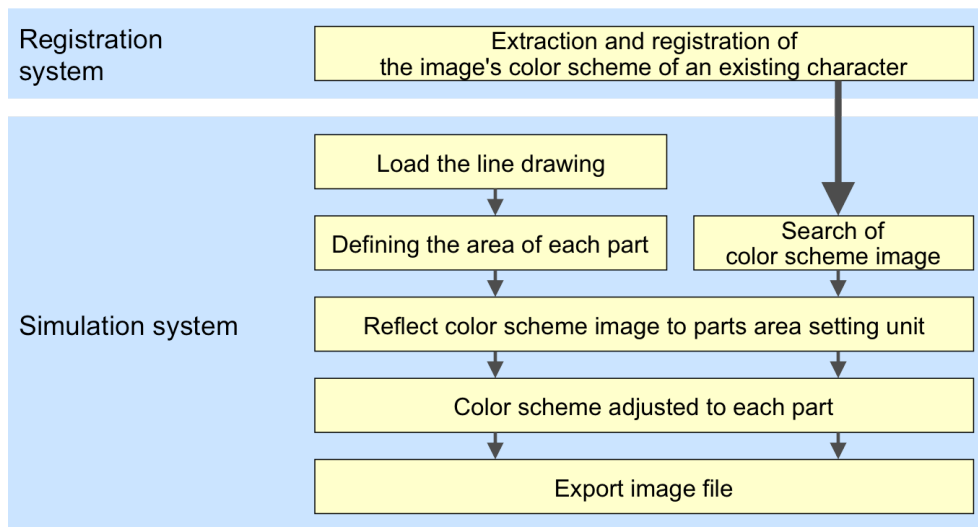


Figure 6: Steps for registration, search and simulation of the characters color scheme

edit of the data can be done, and the color data can be exported into CSV data. Figures 12–14 show the state of each step.

4.4. Color scheme experiment

Figures 15 and 16, both show the result that was fitted to the line drawing of the defined areas of each part such as hair, skin, clothes, etc., by using the color scheme of an existing character. Figure 16 shows a case where the result of the color areas of shirt and coat is

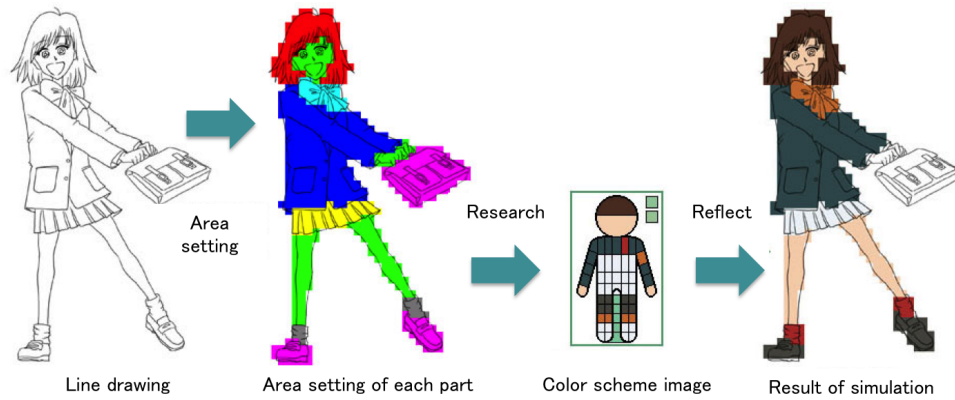


Figure 7: Step of color scheme processing

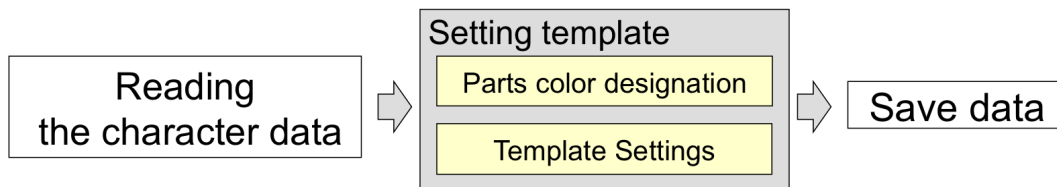


Figure 8: Flow of the existing character color scheme registration

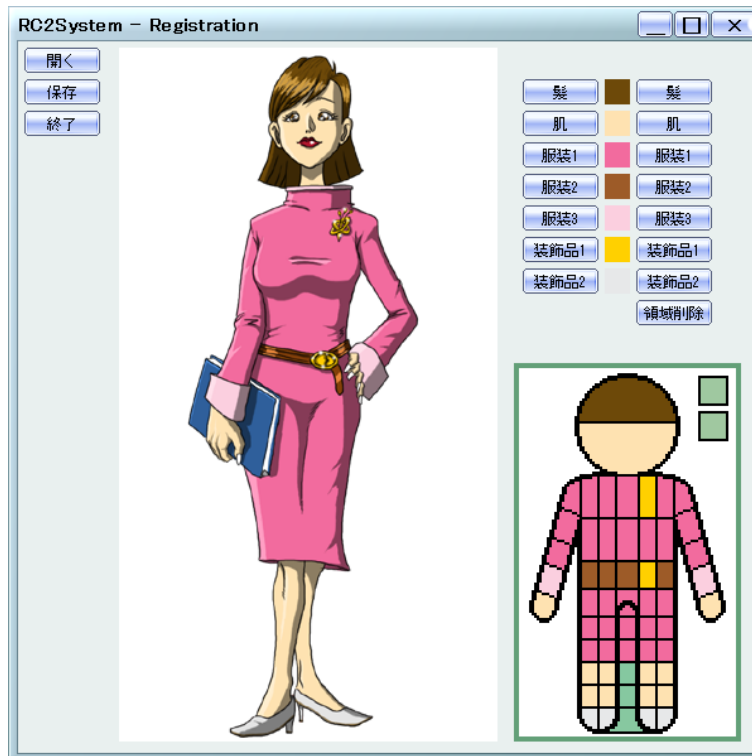


Figure 9: Color scheme registration system of an existing character

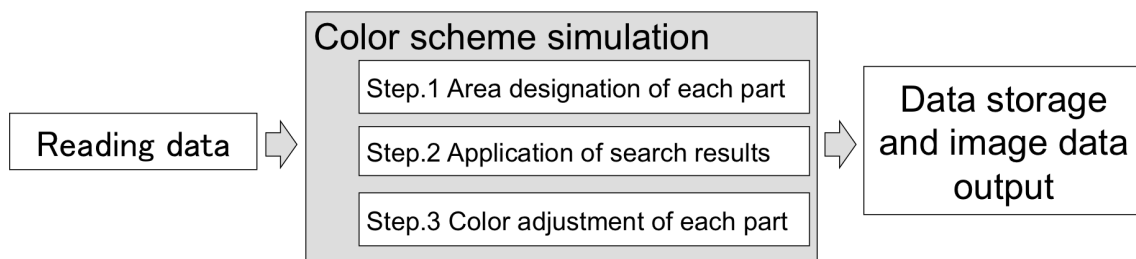


Figure 10: Color scheme registration system of an existing character

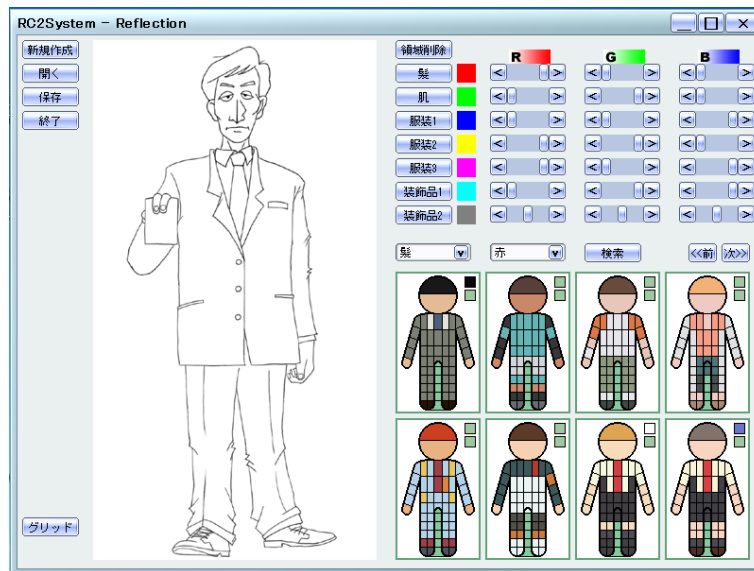


Figure 11: Color scheme registration system of an existing character

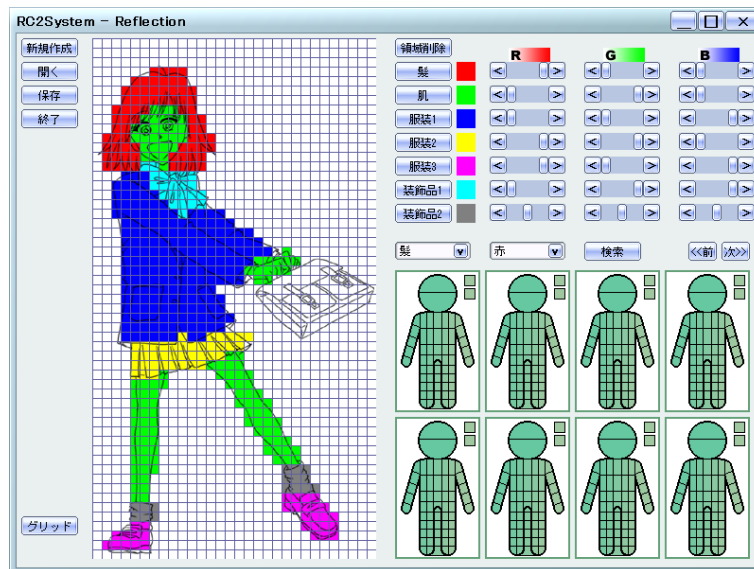


Figure 12: Color scheme registration system of an existing character

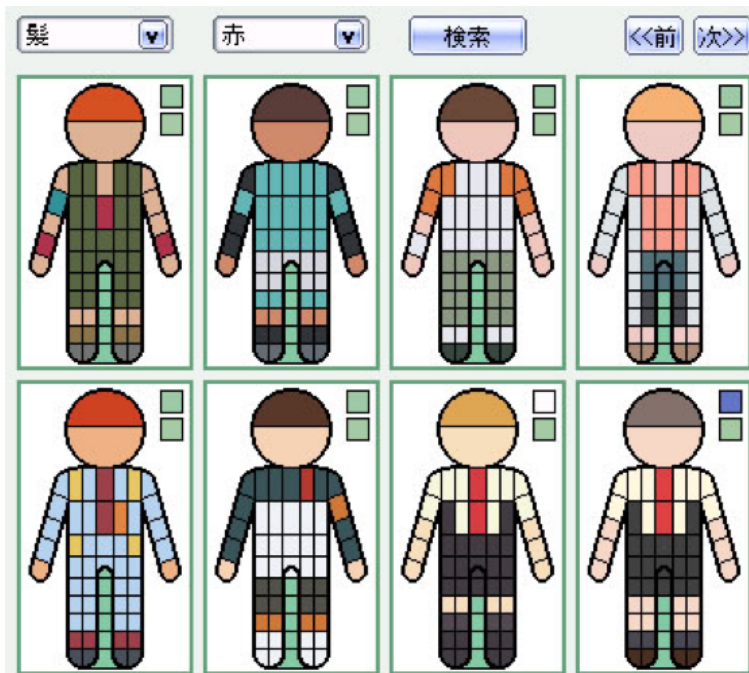


Figure 13: Color scheme registration system of existing characters

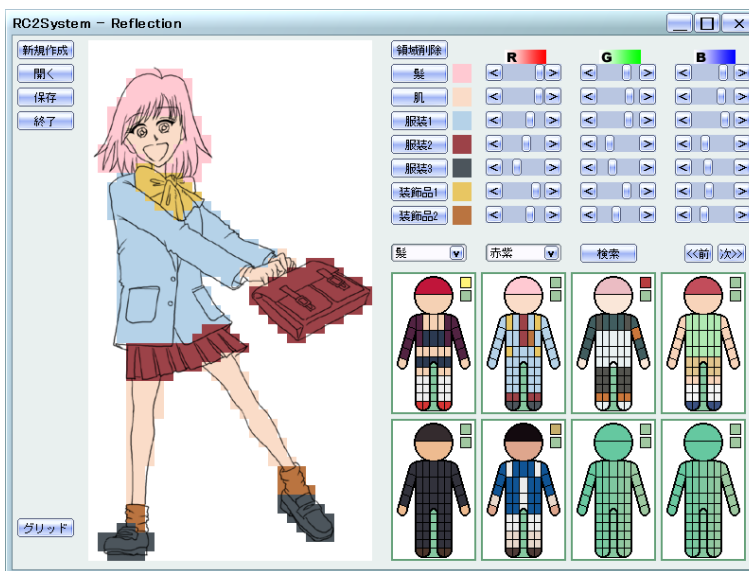


Figure 14: Color scheme registration system of existing characters

different from the template. A comparison can easily be made with a line drawing as a base, and it is possible to produce the intended color.

5. Evaluation of experiments and reflection

We had 15 test subjects for the evaluation of the system. Figure 17 shows an example of results, of creating color schemes using the color scheme support system, by our test subjects. Table 2 shows the results of surveys filled in by our subjects. The right column in the table shows the average value in a 5-point scale; it reveals that a higher number would be desirable

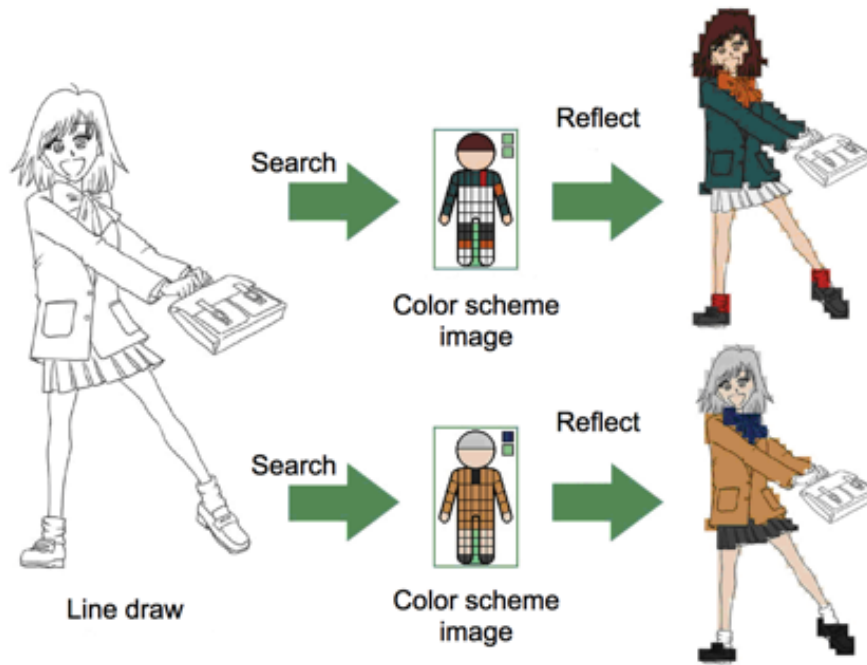


Figure 15: Color scheme registration system of an existing character

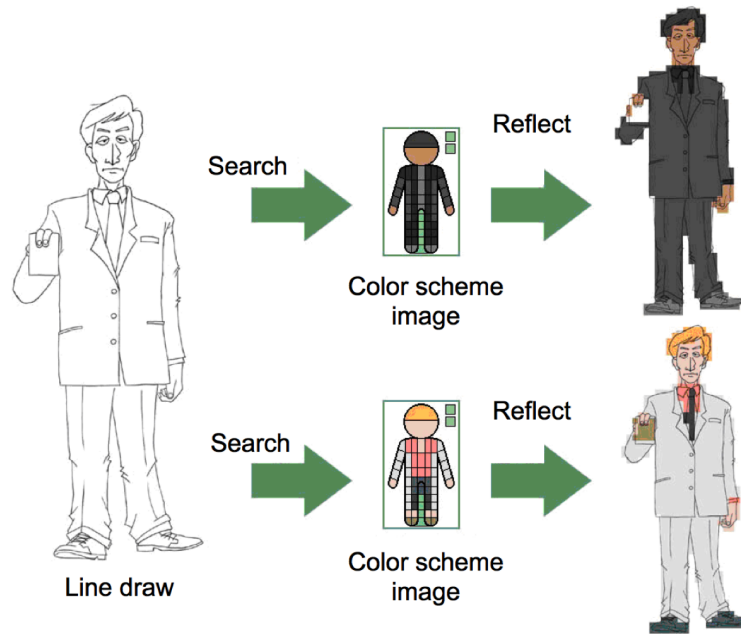


Figure 16: Color scheme registration system of an existing character

in the future. Figure 18 shows a “7. Color scheme simulation” on the left and a “8. Intentional color management ” on the right. The average value for these two items of the color scheme simulation was 4.5. They account for more than 85 percent of the total “very good” and “good” in each evaluation. In addition, an improvement of the color scheme search algorithm and increasing the number of registered color scrapbooks is desired.

The results of the evaluation experiment show:

1. By setting the part areas of the character, it is possible to easily create a character color



Figure 17: Color scheme registration system of existing characters

Table 2: Color scheme registration system of an existing character

Question contents	5	4	3	2	1	(M)
1. Defining part regions	3	11	1	0	0	4.1
2. Search Results	2	7	5	1	0	3.8
3. The fit to the design image	7	5	2	1	0	4.2
4. Color scheme adjustment	8	6	1	0	0	4.5
5. Flow of system use	7	7	1	0	0	4.4
6. Steps of the entire system	7	8	0	0	0	4.5
7. Color scheme simulation	10	4	0	1	0	4.5
8. Intentional color management	9	4	2	0	0	4.5

scrapbook capable of color conversion.

2. By reflecting an existing characters color scheme on a new characters line drawing, it is possible to intuitively consider a variety of character color schemes.
3. A production support for creating intended colors is possible by using the proposed system, and it reduces the number of steps at the characters color design process.

6. Conclusion

In this study we create a character color scheme scrapbook that allows users to manage and search a color scheme for existing characters. And, we also aimed to build a color scheme

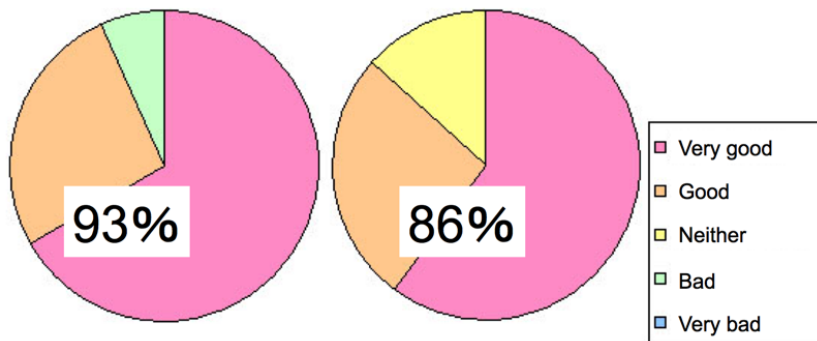


Figure 18: Color scheme registration system of existing characters

support system when creating a character's color scheme. For this purpose, we proposed a character standard template for collecting the color scheme of an existing character. Then, we constructed a color scheme support system for defining the color of characters completely, and a search method for searching a character's scrapbook color scheme. As a result of experiments it turned out:

1. The color processing system proposed in this study is more efficient than directly filling color in an uncolored image.
2. A character color scrapbook can increase the efficiency of using an existing character color scheme.

Future work:

1. It is necessary to register more character scrapbooks. By doing so, the color work will become more smooth and will broaden the simulation.
2. A higher performance of the search method for an intentional color scheme should be achieved by users.
3. Our system should correspond to a more detailed design, and it should be possible to refine each area in the grid.

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