A Design Supporting System for Kimono Pattern Preservation

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Abstract

Kimono is a key point in Japanese culture. In the kimono market, one type of kimono was called Yukata. Yukata is always produced in mass production in considering price. In order to promote prestigious kimonos, kimono stores usually present new styles or customer-tailored designs in response to different seasons. Of the varied kimonos, it is possible to let customers choose the style they prefer. From this point of view, this study tries to explore the behavior of the customers who get involved in the design process of a kimono where they participate and endeavor to create and even to promote their individual appreciation and value. This study collected many cases consisting of different kimono patterns and tried to analyze and induce the grammar of kimono patterns. Then, based on this grammar, a design system of kimono pattern can be built. Customers use this design system to input their likes such as floriography and various flowers. This system provides information concerning visualized patterns such as pattern elements (color, alignment, and etc.). Finally, the pattern elements generated by the customer's likes are incorporated into the kimono grammar. In other words, the grammar of kimono pattern is constructed and refined on the basis of the results of this design system. The refined grammar can be used to analyze the existing kimono patterns as well. Through the continuing refinement and analysis of the kimono grammar, we could trace back the history of a kimono by its pattern, and by use of the cycling work people are able to preserve one of the cultural assets - the kimono pattern, its design knowledge and Japanese cultural heritage.

Keywords---**Kimono Design, Culture Conservation, Shape Grammar, Generative Design, Information Visualization**.

1. Introduction

1.1 The importance of kimono in Japan culture

The pattern of Kimono provides a rich and visual language for connecting this important legacy of Japanese with the history it is situated. The kimono is not only the national costume of Japan, but also the important legacy of Japanese. Duo to it records the history variation of Japan, most of culture issues and traditional techniques are inherited by patterns of kimono. The flourishing age of the kimono history is the history of Japanese[1].Furthermore, a set of kimono can be divided to several parts; each part represents the different generation, history and rank of owners respectively. This information helps the research for the history of Japan significantly.

1.2 Digitize Culture Heritage

The information for culture heritage does not only preserve the heritage but also the experience and knowledge behind the heritage. Therefore, digitalizing the kimono should not just digitalize the texture and pattern of kimono, but should also digitalize the design itself. This is to say, with advance technology like grammatical and 3D computer graphics approaches, how designers or craftsmen design kimono according to who the owners are in a context of traditional Japanese society should be visualized or simulated. With this approach, we will be able to represent a design in the traditional context with the text remained in our time. Preservation and testing over existing information is an immediate task.

2. Review

2.1 Computer Added Kimono Design

There were some studies focuses on alignment of kimono pattern. The study of Kawasaki Sachikon provides a framework of layout, style, and some method of composition[1, 2]. It helped yukata in mass

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production process[2, 3]. The other one was simulation how kimono looks like on human body. It could help kimono designer preview the kimono pattern when human wore it before kimono has been produced. This study would collect pattern composition style, layout method, and kimono elements into a database to build system help user organize this elements.

2.2 Texture Conservation

The purpose of conserving texture or pattern of culture heritage is to conserve the design idea and knowledge of craftsman. There were many researches focus on texture conservation of architecture. The computer technology of culture heritage conservation has been developed a lot, such as "Three High Resolution 3D Digital Scanner" or "Laser Scanner" systems. These systems could be applied for conserving antiques[4-7]. The most of conservations of woofs were how to describe the design process of pattern, and how to analyze image, then visualize these information of image[8]. In this approach, the culture conservation was not only conservation, but also provided an environment for learning and understanding culture.

2.3. Shape Grammar of Culture Conservation

The analysis of Grammar of Kimono Pattern is a complex work. With Shape Grammar, the pattern can be represented and manipulated as a generative process that can be used to understand and simulate the generation of Kimono's Pattern as well as its consciousness when they are designed [9]. Shape grammar was a method to analyze, and formalize symbol. It could help people to understand the complex symbol, and the characteristics of graphic[10]. There were many researches focus on symbols of architecture[11]. However, shape grammar was not a perfect method to analyze any kinds of symbol, so there were some researches used shape grammar, genetic algorithm to analyze symbol, then provide CAAD tools to prove the rules of symbol[5, 6, 12]. This kind of methods was used on visualization[4, 13-16]. Broadly speaking, shape grammar was a method used to analyze visual graphic into rules. According to these rules, it is possible to implement system to represent the specific visual symbol. In this point of view, this study would use shape grammar to analyze kimono pattern into rules. Due to components of kimono and layout of pattern, the rules of kimono pattern would be analyzed in different conditions to find out details of design rules of pattern. These rules would be used to implement system which could represent idea, knowledge, and experience of craftsman to reach the purpose of culture conservation.

3. Research Process

With the related works above, we propose a grammatical approach over the kimono design. The research steps are described as followed. The first stage is to collect kimono cases. This study uses shape grammar to analyze the rules of kimono pattern. Finally, these rules would be used to implement system.

3.1 Digital preservation of Kimono Pattern

According to Kimono's features it can be separated into several parts, uchikake, shiromuku, tomesode, furisode, hikizuri, haori, and obi, shows in figure 1. This study which accounted the pattern of the kimono is differentiates into three parts analysis:
(1)Element of pattern
    kimono pattern usually are composed by different elements, so between two or more kinds of pattern elements should has some relationship.(Shows in figure 2.)
(2)Layout of pattern
    Sachikon provides a framework of layout, style, and some method of composition[1, 2]. Layout could be considered as pattern direction and size. (Shows in figure 2.)
(3) Distribution of pattern
    The kimono is folded when we wear it. Thus the motif of kimono has to be designed to attach suitably. (Shows in figure 3.)
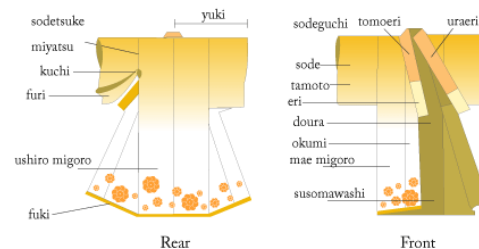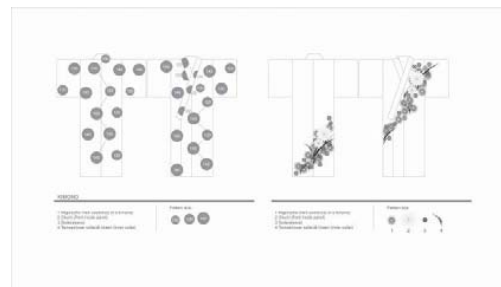

Figure 1 Components of Kimonon

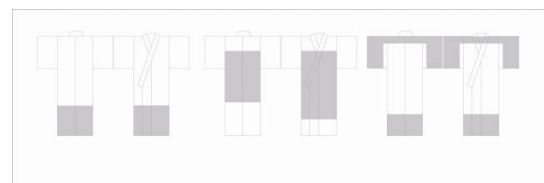**Figure 2 Layout of Kimono's pattern Design and Element of pattern**

Figure 3 Distribution of pattern

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This study would analyze the rules and relationship in these three dimensions, and conserve visual information into database. Then, this study should organize these rules to implement system, so it is necessary to parametric or formalize these rules. This is first purpose of this study to formalize kimono pattern design, and conserve the idea, knowledge in digital method. The purposes in this part are: 1) Conservation of kimono pattern. 2) Define the Grammar of kimono pattern. 3) Build knowledge base of kimono pattern, and visualize this information.

3.2 Kimono Pattern Representation

The process of methodology is to analyze kimono pattern, then translate into computational rules, finally, implement system to prove these rules in this study. In order to represent kimono pattern, the system would be designed as generative system. This generative system would generate kimono pattern due to the rules which analyze in shape grammar. Previous researcher mentioned about this kind of generative system. Researchers analyzed pattern or image in shape grammar, and implemented system using genetic algorism or cellar automata method[17, 18]. In this point of view, genetic algorism would provide optimize answer, or generative new design, so it is helpful to set up genetic algorism method and element system[10]. This study proposes to provide an environment which could let customer input their preferences. System would generate new kimono pattern due to user's preference.

Customer could choose elements of kimono pattern, color, or flower semantics of pattern. This system would generate optimize patterns which users could choose. For example, user input semantic of pattern "Passion", this system would show "Rose", "Anthurium". Then, user chooses color "Pink", system would generate some background pattern is pink, due to rules of kimono shape grammar. Finally, system would generate new kimono pattern due to user's preference.

3.3 System Architecture

To sum up, this system has two main purposes. One is to conserve kimono pattern, and build knowledge base of kimono pattern. Second is to generate new kimono pattern for customer. System structure shows in figure 4. There are two kinds of users. One is kimono researcher who could collect kimono cases, and this system would help them to classify the pattern elements, pattern layout, and kimono components. Then system would analyze each part in different conditions of kimono pattern. In this process, kimono knowledge base would increase.

As kimono knowledge base has building, customer could use this system for generating new kimono pattern. Customer could enter his/ her preference, such as pattern elements, pattern semantics, and color. The choices were got from kimono knowledge. Then,

customer preference would become parameter of genetic algorism, and this part would get some kimono grammar to generate new kimono pattern.

3.3.1 Texture preservation

Researcher can input the kimono's pattern which including the element, layout, distribution of kimono. According to the rules of kimono Grammar and history of kimono, we can know the kimono's data which was researcher input. Researcher also can create the kimono data in this texture conservation databank by themselves. The system processes shows in green arrow of figure 4.

3.3.2 Create new kimono pattern

This study differentiates into two parts to preserve kimono, 1) Symbolic meaning 2) Pattern of kimono. The system processes shows in blue arrow of figure 4.
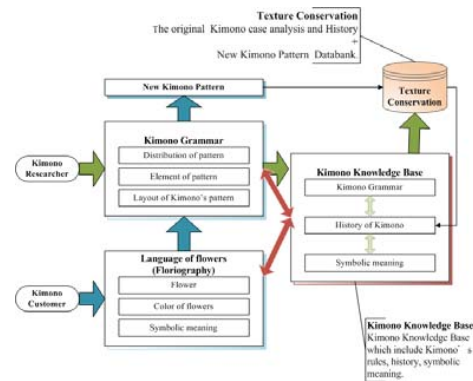

Figure 4 System Architecture

1) Symbolic meaning
According to the existing language of flowers, the system considers the types, colors and languages as the input datum. Base on this datum, it creates the forms as reference for users.
2) Pattern of kimono
The differentiation of kimono's pattern into three phases. 1. Motif and colors, 2. Distribution and layout, and 3. The apparel of wearing the cloth. Users can adjust it and give suggestions. Furthermore, the generated layout is able to be saved in compute and simulate the apparel of wearing the cloth. (Shows in figure 6.)
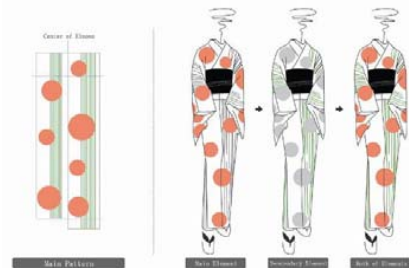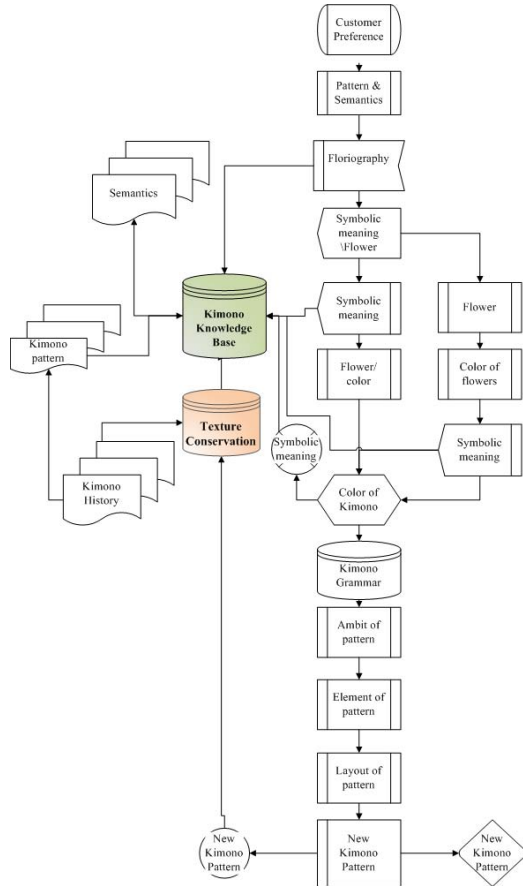

Figure 6 simulate the apparel of wearing the cloth

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Figure 5 System processes

4. Conclusions

This study tries to purpose a system which could help kimono researchers to conserve kimono pattern, and build a kimono knowledge base. Further more, this knowledge base could be used to preserve new kimono pattern. This system could conserve visual kimono pattern, and the knowledge of kimono craftsmen. In the point of culture conservation, this is a way to conserve culture to let people join and understand culture. It is the reason why this system needs to generate new kimono. Customers could get more understanding and idea of kimono by join kimono pattern design. The value of kimono pattern would be increase by adding owner's personality.

The future work of this study is to evaluate system when it really applied to culture conservation, or market. The kimono grammar might need to do more research, to help kimono researcher get more understanding of kimono design, and could let customer preserve diverse kimono pattern.

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