Application Research of Process Design Analysis based on Digital Technology

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Abstract. With the improvement of people's aesthetic concept, simple bamboo-rattan knitting technology has been unable to meet the people's design requirements for fur fabric, people hope that fur products have a sense of fashion, artistry and personalized characteristics. We study the development of bamboo-rattan knitting technology, adopting survey method, literature analysis method for data collection, mining the design methods of bamboo-rattan knitting technology in the field of packaging design. From the perspective of bamboo-rattan packaging, we analyze several common methods, but the designing efficiency is low, and the designing accuracy is not high. In order to further improve efficiency of designing, we introduce the digital technology, which can provide an interactive platform for designers, control the whole design process, monitor the production of design schemes and the effect of design schemes, and this technology can achieve standardized production, improve design accuracy, and adopt CAD, Photoshop and 3Dmax, which can be taken as digital technology platform to realize the simulation analysis of bamboo-rattan packaging design. We take digitalization technology as the main method, and integrate with the existing bamboo-rattan packaging methods, put forward the design process of bamboo-rattan fur knitting technology packaging based on digitalization technology, design the bamboo-rattan fur knitting packaging, therefore, get the design effect of bamboo-rattan packaging based on digitalization technology, and confirm that this method can improve the design efficiency of bamboo-rattan knitting products, but also meet the needs of people for bamboo-rattan fur knitting products.

1. Introduction
With the improvement of people's living standards, people's demands are gradually improving for all levels of life. In the fur knitting industry, many fur fabrics have the problem of homogeneity. As a traditional process of fur products, knitting technology has exquisite technical process, however, most of the current fur products, its patterns, manufacturing methods and materials are no longer suited to the needs of people for fur products. Fur products need to update the production methods, improve the use of materials, increase the use of color, to further meet the individualized demand for fur products. In order to achieve this goal, we need to speed up the change of design concept, combine traditional technology with modern aesthetic concept, then, it can improve the added value of fur products.

The fur products can be packaged and designed by the way of bamboo-rattan weaving, as an ancient cultural heritage of China, bamboo-rattan weaving has rich cultural value and artistic value. Designers can find inspiration from the bamboo-rattan knitting technology, expand the application of bamboo-rattan knitting technology in different handicraft and clothing fields; at the same time, in
order to further meet people’s pursuit of fashion, the beauty of fur products, can be displayed by the way of bamboo-rattan knitting way, thereby, it can enrich the visual experience of fur products. Changing the way of bamboo-rattan weaving also can optimize the outer outline of fur products, help people understand traditional culture and deepen their understanding of different cultural themes. Some researchers[7] analyzed the development process of bamboo-rattan knitting, and did principle analysis and technical explanation by means of graphic description; some researchers[8] studied the artistic development of bamboo-rattan knitting, analyzed the characteristics of bamboo-rattan knitting in different places in China, and selected the animals of bamboo-rattan knitting and the screens of bamboo-rattan knitting as the research objects; some researchers[9] have studied the application of bamboo-rattan knitting methods, analyzed the production process and historical evolution of bamboo-rattan knitting methods, selected different cases to compare the results, got the advantages of bamboo-rattan knitting methods, at the same time, interviewed some people to obtain their views on bamboo-rattan knitting products, so we can give a new direction to the development of bamboo-rattan knitting technology; some researchers[10] sorted out the application of bamboo-rattan knitting in daily necessities, and summarized the design methods of modern bamboo-rattan knitting.

Bamboo-rattan knitting method can be worked for packaging design[11], but the production efficiency of general methods are too low, and the production accuracy is not high, which can be easy to cause material waste. The birth[12] of digital technology has a far-reaching impact on traditional industries and production patterns, it can help many industries achieve intuitive and efficient generation, at the same time, based on digital technology, a large number of 2D platforms[13] and 3D platforms[14] can build a strong design system. In a sense, digital technology has replaced the existing design methods, change the design methods of designers, change their thinking of design, and enhance their aesthetic requirements. Designers not only need to grasp the changes of times, but also need to grasp the operation of design software, so as to accurately obtain the design effect, and efficiently modify the blueprint of design. According to the relevant research, digital technology can be used for packaging, the forms of implementation include: (1) CAD/CTP technology is applied to the digitization of products, achieve no-drawing development of products; (2) using the internet technology, we can check packaging design of product by remote monitoring, achieve resource's sharing, and give real-time help; (3) digital technology technology changes the product development process, optimize the design of product; (4) a large number of computer-aided softwares[15] are applied in product packaging design, which can achieve the switching of product image in different dimensions; (5) adopting digital technology, hand-drawn can be transformed directly into standard design drawings, it makes the editing of design more convenient. Based on digital technology, product packaging design is gradually developing towards integration, the system can evaluate the data of product generating, establish wireless communication network, master the design process, designers and analog products can realize real interaction, therefore, digital technology can make the packaging design process more closer to the real life environment.

We apply bamboo-rattan packaging technology to fur products, the production efficiency of this technology is low, and the pattern's accuracy is not high. In order to further improve the efficiency of design, we introduce the digital technology, which can provide an interactive platform for designers, control the whole design process, monitor the production of design schemes and the effect of design schemes, the technology can achieve standardized production, improve design's accuracy, and adopt CAD, Photoshop and 3Dmax tools, which can be taken as digital technology platform to realize the simulation analysis of bamboo-rattan packaging design. Compared with the traditional design methods, the use of digital technology has obvious advantages, at the same time, only adopting this technology, the packaging design of bamboo-rattan fur will be lack of dynamic, even get the problem of the same pattern design. Therefore, we take digitalization technology as the main method to integrate with the existing bamboo-rattan packaging methods, and put forward the packaging design process of bamboo-rattan straw knitting technology based on digitalization technology, and design the packaging of bamboo-rattan straw knitting, so as to obtain the design effect of bamboo-rattan packaging based on digitalization technology. By this research, designers can get valuable reference in the field of bamboo-rattan and fur packaging design.
2. Packaging Design of Traditional Bamboo-Rattan Fur Weaving Technology

Bamboo-rattan knitting technology can be taken as a cultural heritage in China, its technology can be integrated into modern life, adopting survey method, literature analysis method for data collection, mining the design methods of bamboo-rattan knitting technology in the field of packaging design. Traditional bamboo-rattan packaging products are out of touch with market demand and are lack of innovation in product design, on the one hand, we need to pass on the culture of bamboo-rattan weaving, on the other hand, we need to combine traditional manufacturing technology with modern technology, so as to meet the needs of people for bamboo-rattan packaging.

2.1. The Combination of Traditional Bamboo-Rattan Fur Weaving and Modern Style

Chinese culture is closely related to nature, traditional aesthetic concepts emphasize that people, nature and morality should be regarded as an organic whole, based on this background, people adopt natural materials for packaging, among them, bamboo-rattan packaging, which is a part of natural packaging, it affects all aspects of people's lives, people still use the products made by bamboo-rattan and apply them to life. Bamboo-rattan products can be used for carrying food, carrying medicinal materials, and even can be used for carrying heavy stones, that is, bamboo-rattan products can be used for transportation.

As a part of the modern industrial system, packaging industry needs to consume a large number of paper and plastic materials, so it can provide a large number of jobs for the chemical industry; at the same time, packaging can reflect the national aesthetic standards, packaging texture design, packaging text labeling, can indirectly reflect the popular trend of society. The contemporary packaging materials are metal and plastic, bamboo-rattan are seldom used as packaging materials, but as a cheap and environmentally material, bamboo-rattan still occupy a large market share in the handicraft market. With the improvement of people's living standards, packaging is not only to wrap objects, but also to show the cultural heritage of goods. Bamboo-rattan products have the problems of simple shape and simple workmanship, which can not meet the aesthetic requirements of people, therefore, we need to further optimize the appearance of bamboo-rattan products.

2.2. The Integration of Bamboo-Rattan Weaving and Green Design

The rapid development of industrialization has produced a lot of negative effects, one of which is that there is a large number of white pollution in people's living environment, the government issues relevant policies, tells people to use environmentally handbags as much as possible, reduce the use of plastic bags. Some businesses provide consumers with paper bags, which produce less pollution than plastic bags, but paper bags are easy to break and can not be reused. We used bamboo-rattan materials for the design of basket, the basket's texture is the style coarse pattern-dense pattern, so that the basket has a sense of hierarchy. Baskets can be combined with cloth bags, that is, in different places in the basket, sewing different areas of cloth bags, so that different types of goods can be placed in different areas, the space of basket is maximized.

Bamboo-rattan fur material can also be used for the design of leather bag, that is, the combination of bamboo-rattan fur material and leather material. In the modern life, leather bag is one of the most favorite items for women, and it can set off the career of women. The present leather bag is made of leather, cloth and other materials. The president of Gucci brand adopted bamboo-rattan as materials to design a new handbag, this is Bamboo Bag, which combines bamboo-rattan with leather, save leather materials and add exotic flavor of handbag. Bamboo-rattan fur material can be used for making vases and tea sets, these household goods are made of ceramics. Bamboo-rattan fur material can further improve the packaging level of these household goods.

2.3. Innovative Design of Bamboo-Rattan Weaving in The Field of Packaging Applications

In the process of packaging design, the choice of design materials should be based on the specific object, specific environment, so as to increase the value of product itself, promote the sale of the product. General product packaging design, should includes the design of external shape, surface's texture effect, touching design of packaging, external color matching of packaging. Bamboo-rattan can
be taken as a natural product, the use of special knitting techniques, can increase the interesting of product packaging.

In general, the packaging of tea, adopting plastic, stainless steel, wood as the main raw materials, tea as a gift, people often hope that it can have exquisite packaging, which can better convey the feelings between people. Traditional bamboo-rattan fur products, its workmanship is more complex, the cost is higher, it can be combined with the fabric, adopting a reasonable knitting method, the appearance of design is not only with national characteristics, but also with a sense of fashion. Generally, the tea cup is made of stainless steel and glass materials, this design is difficult to highlight the characteristics of cup, the design of cup needs to be related to the tea ceremony in china, bamboo-rattan fur material is used for designing the shape of cup, and green coloring is used, the cup itself shows a strong natural flavor, so that people can feel bamboo culture of china. Therefore, bamboo-rattan is more appropriate as the outer packaging of tea-cup.

3. Digital Demand Analysis of Bamboo-Rattan Packaging

Bamboo-rattan packaging is a traditional chinese technology, adopting digital technology to design, can further improve the efficiency of design, but also can improve the accuracy of texture design. We make an aesthetic comparison of different textures, analyze the differences between bamboo-rattan texture and other textures. We adopt digital technology to optimize Taketo's packaging, and we can not ignore the cultural details of bamboo-rattan's packaging.

3.1. Comparative Advantage between Bamboo-Rattan's Digital Packaging Design and Hand-Painted Design

The traditional bamboo-rattan packaging pattern is realized by hand-drawn method, marked by ruler, compass, pencil, ink, and revised repeatedly on the draft, the revision of draft is a long process. In order to save time and improve design efficiency, many designers put sketches as templates, draw objects directly, which will reduce the level of drawings. Designers choose watercolours for coloring, and other coloring tools, it include markers and pens, there are rarely used, hand-painted housing solutions are shown in figure 1:

![Figure 1. Hand painted effect of housing design](image)

As we can be seen from figure 1, the hand-painted house needs to be drawn many maps, each map needs to capture different angles of the house, these different angles of the house need different backgrounds, different brightness, it need to have a clear contrast of brightness, this method is inefficient, difficult to achieve the desired effect. Housing needs to occupy a certain area, its orientation, its location needs to meet certain requirements, these designers need to have some experience, but the experience of designers will also make mistakes. In the process of design, designers need to communicate and reach an agreement, but it is difficult for designers to say the same
thing because their design ideas are different. The digital design method constructs a unified platform for designers, which is conducive to technical exchanges among designers.

Designers can adopt digital technology to precisely measure the design of physical objects, different directions of physical objects can be displayed in an all-round way, at the same time, the coloring of physical objects will be more abundant, designers can use various tools and commands provided by the digital platform, they can be used for modifying physical objects efficiently, and the scale and 3D effect of physical objects will make the image more realistic. With the help of digital technology, in order to display the results, it is possible to display the results from multiple angles and it doesn't need to be repeated the drawing, as shown in figure 2:

![Figure 2. Distribution effect of digitized eigenvalue](image)

In figure 2, we do the description of characterize for an object, (A) chart denotes the air humidity around the house, (B) chart denotes the formaldehyde density inside the house, (C) chart denotes the compressive strength of house material, (D) chart denotes the light intensity at different locations of the house. In the process of housing design, we only need to input the coordinates of house, the material used in the house, the size of key position, so we can get a lot of information, which is described in 3D graphics. When we modify the parameters of house design, these 3D graphics will also change at the same time. Compared with digital technology, adopting hand-painted design, it is difficult to get so much information by minor changes in the house.

Digital technology can greatly reduce duplication of labor in packaging design. We will combine bamboo-rattan fur knitting method with digital technology, bamboo-rattan packaging texture, as a graphics file, in the digital platform, they can be invoked, rather than be repeated the texture of design packaging. In order to better design the effect, we can change the color of texture according to the effect, establish the corresponding color library, and store it in the folder of digital platform.

3.2. Comparison between Bamboo-Rattan's Packaging Texture and Traditional Texture

Digital technology can design different textures, and texture is very important for the beauty of packaging. Packaging needs installation of texture, and texture can reflect the meaning of packaging. In a broad sense, most objects have textures, as shown in Figure 3, (A) graph represents the texture of bamboo-rattan, and the realization of the texture is a superposition of layer-by-layer; (B) graph represents the texture of floor, and the texture pattern is the pattern of tree root; (C) graph represents the texture of wall, there are gray cracks in the texture pattern; (D) graph represents the texture of leather bag, the texture is similar to the texture of lizard. Digital technology can extract textures from these patterns, apply them to the packaging of bamboo-rattan, the thickness of bamboo and rattan is different, adopting a certain amount of bamboo-rattan, you can weave such patterns.
Compared with other textures, the texture of bamboo-rattan is more neat, but in morphology, the texture of bamboo-rattan knitting has similar composition with other textures, and in vision, it has a sense of 3D object. In order to achieve irregular, different styles of texture, we can design corresponding texture in the outside of bamboo-rattan packaging, thereby, it can improve the overall shape of bamboo-rattan packaging.

![Figure 3. Patterns with different textures](image)

3.3. Digital Strategy of Bamboo-Rattan Packaging

Bamboo-rattan fur knitting technology contains Chinese traditional culture, the use of this technology is put into packaging design, it need to be designed exquisite patterns. Adopting hand-drawn method, drawing efficiency is low, and the accuracy is not high, adopting digital technology can be a good solution to this problem. In digital technology, we use Photoshop software and CorelDraw software for designing the packaging of bamboo-rattan, one is a kind of graphic-processing software, the other is a kind of graphic-making software, two softwares provides a friendly user interface, common tools is at both ends of the interface, the operation is very simple.

Photoshop software can realize the deformation of graphics, make the graphics zoom in or zoom out, but also make graphics tilt, at the same time, the software provides layer function, the picture as an object, it can be stored under multiple objects in a layer. As an object, graphics can be moved and be deleted, which greatly improves the efficiency of drawing. Photoshop software has a powerful function, that is, filter function, which can make special effects on pictures, the brightness of the picture, texture, color of the picture will be changed, as shown in figure 4:

![Figure 4. Filter effect of Photoshop](image)
In Figure 4, (A) graph denotes the original image, a beautiful woman is represented; (B) graph denotes, the image of the woman is done some processes of brightness, and the contrast of the picture is very obvious; (C) graph denotes the image of the woman is done some processes of tone, change the tone of picture, it shows the color of light green; (D) graph denotes, the image of the woman is is done some processes of light, the woman's face is illuminated and the surrounding area is darkened.

CorelDraw software is a drawing software, the software provides different shapes of graphics, provides different types of brushes, paint sprayers, it should be noted that the software can make subtle changes to the shape of any object, as shown in figure 5. In Figure 5, eye drawing, eye drawing mainly be included eyebrows, eyelashes and eyes, they are initially the shapes of rectangular, the software install full of torque points around the rectangle, by adjusting the torque points, the graphics can be locally adjusted, therefore, it can draw a realistic eye.

4. Digital Implementation of Bamboo-Rattan Packaging
Bamboo-rattan packaging digital process, is not the realization of hand-painted, but the sublimation of bamboo-rattan knitting art, in this process, the addition of digital technology, make bamboo-rattan packaging be more creative, designers can make their designs in according with their own ideas, design a number of options for the choosing of consumers. We need to analyze the digital process of bamboo-rattan packaging, clear our design ideas, so as to improve design efficiency.

4.1. The Design Process of Bamboo-Rattan Packaging
(1)We need to do some maket position of packaging, that is, what kind of consumers the packaging is for, we can prepare questionnaires to obtain consumer opinions on bamboo-rattan packaging. By collecting the opinions of consumers, we sort out the design ideas, do early planning for bamboo-rattan packaging.

(2)Design elements can be extracted by digital cameras and scanners, and logos of enterprises, product names and advertising slogans can be collected. In this process, many graphic elements are flat elements, and some of them need accurate size. Architecture needs to be indicated the length, wall's thickness, floor's height, CorelDraw software can be used for design, based on this software, we can modify the shape of the object.

(3)Bamboo-rattan's packaging needs to be considered the shape of packaging, the style of packaging, and the design of pattern. The use of products is different, the size of them will be different, and the way of using will also be different, we need to combine the aesthetics of product packaging with the function of product. We need to use 2D software and 3D software, using planar software for analyzing the design of style, get the production parameters of product, and then do 3D processing for the product, so that we can observe the shape of product from different angles. If the shape of product is too large or too small, the overall appearance of product can be adjusted, and the modified parameters can be recorded.
(4) Bamboo-rattan packaging needs to be added text description, that is, consumers can feel the flavor of bamboo-rattan culture by these words. Designers can adjust the spacing of fonts according to the size of product, they can also adopt artistic fonts to make the expression of fonts more attractive. At the same time, designers need to consider the distance between textures and the size of text, typesetting of text can not be blocked the packaging texture.

4.2. Assistant Graphic Design and Production of Bamboo-Rattan Packaging
Aided graphics of packaging can be used for the background of packaging, can be mascots, can also be decorative graphics, our aided graphics can be used in the background of bamboo-rattan packaging, therefore, in the visual, these graphics should have a certain rule. In the design process, aided graphics is composed of some basic graphics, we design the auxiliary graphics as follows:

![Figure 6. Basic graphics of auxiliary graphic](image)

In Figure 6, we can see that aided graphics are consists of a small square, an equilateral triangle and a shape of heart. In the process of drawing, we set the size of square as 5mm×5mm, select the square, press the combination key of Ctrl+C, and then press the combination key of Ctrl+V; copy the square, select the object, press the combination key of Ctrl+T, the object will generate force-columns, adjust any side of force-column, make it close to the middle, so as to get an equilateral triangle; select path tool, select the path of heart-shaped, and then select the "path transforms into the choosing scope" tool, which adds selection of path, and then select the edge tool to add the lines for the choosing scope.

We can take the aided graphics as a whole, link all the layers of aided graphics, copy them, change the angle of graphics, recombine them, and get different shadings, as shown in Figure 7:

![Figure 7. Combination of basic graphics](image)

In Figure 7, we take aided graphics as the basic unit, combine the graphics and generate five different sets of graphics, of which, (a) graph denotes two basic units, the direction is up and down, they are done the connection of top; (b) graph denotes three basic units of graphics, the direction of two are down, the direction of one is up, they are done the connection of top; (c) graph denotes two
basic units of graphics, they have the same direction, they are done the connection of top; (d) graph
denotes the four basic units of graphics, two of them can be as a group, they are done the connection
of end, and then arrange them together; (e) graph denotes five basic units of graphics, they have the
same direction, they are done the connection of top.

In the combination of these basic graphics, we choose (e) pattern as an aided pattern, do a
lot of replications, which be taken as a shading pattern of bamboo-rattan packaging, as shown
in figure (8).

In figure 8, shading pattern can adopt different colors, the designer can choose different
colors from color library, and match the pattern.

5. Conclusion
With the improvement of people's aesthetic concept, simple bamboo-rattan knitting technology has
been unable to meet the people's design requirements for fur fabric, people hope that fur products have
a sense of fashion, artistry and personalized characteristics. We study the traditional packaging
methods of bamboo-rattan fur knitting, it includes adding text labels, adding the elements of green
design, and apply them to daily necessities. In order to improve the efficiency and accuracy of
bamboo-rattan fur weaving, we introduced digital technology. We compared the technology with
hand-painted technology, compared the texture of bamboo-rattan with other textures, and put forward
the digital strategy of bamboo-rattan packaging.

In the implementation part, we put forward the digital process of bamboo-rattan packaging, which
includes market positioning, the selection of design elements, appearance design and text description.
We further designed the aided graphics of bamboo-rattan packaging, and explain the design steps in
detail, therefore, we confirm that the digital technology can be used for bamboo-rattan packaging, it
can improve the efficiency of designers and meet the needs of people for bamboo-rattan fur knitted
products.

6. Acknowledgments
This work was supported by Hunan Province Colleges and Universities Teaching Reform Research
Project "research and practice of application-oriented talents training of computer major in local
colleges and Universities Based on the perspective of subject competition" (xiangjiaotong [2017]
No.452, 449), and Xiangnan University Laboratory Open Project "Computer Application and
Software Development" (Xiangnan University xiao fa [2018] No.159,12).
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