Research on the application of CLO3D technology in the structure design of national costume

Yuanzixuan Cao[1], Shi Wang[2]

[1]Dalian Polytechnic University

[2]Dalian Polytechnic University

mordred321@163.com

Abstract. Compared with the traditional artificial clothing design mode, the structure design of national clothing with digital technology as the core has unique economic and technological advantages. Especially in the era of artificial intelligence, the application of AI and virtual reality technology in the fashion design industry has accelerated the pace of digital transformation of the design system. A large number of technical software such as digital clothing and AI fitting have emerged in the market, and the fashion industry has truly realized leapfrog development with the help of networking and intelligent technology. Therefore, on the basis of understanding the research status of national costume structure design in the new era, according to the application characteristics and unique advantages of CLO3D technology, this paper mainly studies how to use CLO3D software technology to realize the design of national costume structure. The final result shows that the content presented by this design scheme is more clear and intuitive, and the later modification is more convenient, which can effectively reduce the cost.

Keywords: CLO3D technology; Clothing structure; Virtual reality technology; National costume; digitization.

1. Introducion

As early as the 1980s, researchers began to use the virtual reality technology theory to improve the clothing design process and technical software. On the basis of mastering the traditional clothing sample design and sample production process, virtual reality and digital simulation technology were integrated to build three-dimensional clothing virtual fitting technology. At present, this technology has been widely used in various fields of social construction and development. It provides a new way of thinking for the creative expression of fashion designers. In essence, virtual design technology changes the limitations of traditional design painting. Instead of re-painting because of clothing style or color adjustment, designers can directly conceive and adjust clothing structure in the computer, so as to improve the quality and time of final production of clothing. Create a digital fashion design system based on modern digital fashion design technology, integrate information and digital technology into all links of fashion style design, efficiently process fashion design elements with the help of computer cartographic design software, comprehensively consider market demand and practical experience, and constantly introduce advanced digital design mode to design 3D simulation of clothing production process. More clothing design inspiration and elements will be recorded in the information platform, and finally generate real and effective 3D renderings to reduce the production cost and time of sample clothing, comprehensively protect the intellectual property rights of enterprises, and effectively avoid trademark and patent disputes.[1-3]

Nowadays, the application research in the field of fashion design is more professional, and the most common design software can be divided into two types. On the one hand, it refers to professional auxiliary drawing software, such as CAD drawing software, which has strong computing power and integration characteristics, and can play an important role in the adjustment of sample scale, clothing design, simulation fitting and other links. It can effectively control the application cost and design accuracy, and comprehensively reduce the probability of manual error in the past manual drawing. On the other hand, it refers to the multi-dimensional image processing software, which has the overall image processing function and color rendering function. It belongs

to the extension of CAD drawing function. It usually plays an important role in the late design pattern, coloring and upper body effect, display and so on, such as CLO3D, Photoshop and so on.

To add traditional ethnic characteristics to the costume structure design, it is necessary to collect a large number of folk elements in the early stage of design, integrate the study of regional characteristics and traditional Han patterns, and also use the unique history, culture and ethnic characteristics of each ethnic group to design a new type of art collocation, which can not only reflect the rich inspiration of designers, but also present more high-quality ethnic clothing. CLO3D, as a digital virtual design platform widely used in the field of clothing, builds 3D human body model according to the actual body type data of the target population, and then real-time view and adjust the clothing presentation effect, and finally get 3D CAD structure diagram. In addition, 3D fitting test can also be used to analyze the suitability of clothing, and finally render the static or dynamic clothing display effect. Therefore, after understanding the platform structure of CLO3D technology software, this paper mainly discusses the system content of national costume structure design, and then combined with practical cases to verify the application advantages of CLO3D technology in national costume structure design, in order to provide effective basis for the innovation and development of clothing industry in the new era.[4-7]

2. Method

2.1 CLO3D platform design process

First, create a mannequin on the platform. Choose skin color, gender, style and posture according to the design requirements. After creating parametric human models, designers can scientifically adjust the clothing size according to the actual situation; Secondly, virtual clothing is transformed from two-dimensional space to three-dimensional space. The first draft of two-dimensional clothing template is optimized by using the template editing tool, and the cut piece stitching is completed by using the positioning ball function of three-dimensional design window, so as to obtain three-dimensional virtual clothing sample. At the same time, personalized style design should use auxiliary module to realize optimization processing; Thirdly, it should test and analyze the fabric, pattern, collocation, quality and other contents of virtual clothing, pay attention to editing clothing fabric from the appearance and physical properties, and then repeatedly modify, analyze and test the beauty and comfort of virtual clothing, and ultimately fundamentally guarantee the overall quality of virtual clothing design. Finally, after the completion of the virtual clothing design, it is necessary to choose static display or dynamic display, and directly present to users or designers.

From the perspective of the overall application, CLO3D technology is the use of 3D modeling form to show the structure of clothing, designers can directly on the computer platform using virtual design to present a realistic clothing pattern and structure, but also can freely change the type of clothing fabric, soft and hard degree, pendant sense, scientific adjustment of all kinds of design process and presentation structure, Create the background picture and environment GIF of the model in the three-dimensional space to truly realize the effect of the virtual clothing show.[8-10]

2.2 Intelligent clothing style design system

At the initial stage of the system design, scholars in various fields put forward three schemes according to the knowledge of clothing style design. The first is the design scheme based on style prototype, the second is the design scheme based on image thinking description, and the last is the design scheme based on parameterization of style elements.

From the perspective of practical application, the design scheme based on style prototype is to use image retrieval technology to find the content matching user requirements in the typical style library. After generating the initial style prototype, designers should work together through the rule library, style library and database on this basis to realize human-computer interaction according to certain stitching laws, and finally output the modified result. The overall system design is shown in Figure 1 below:
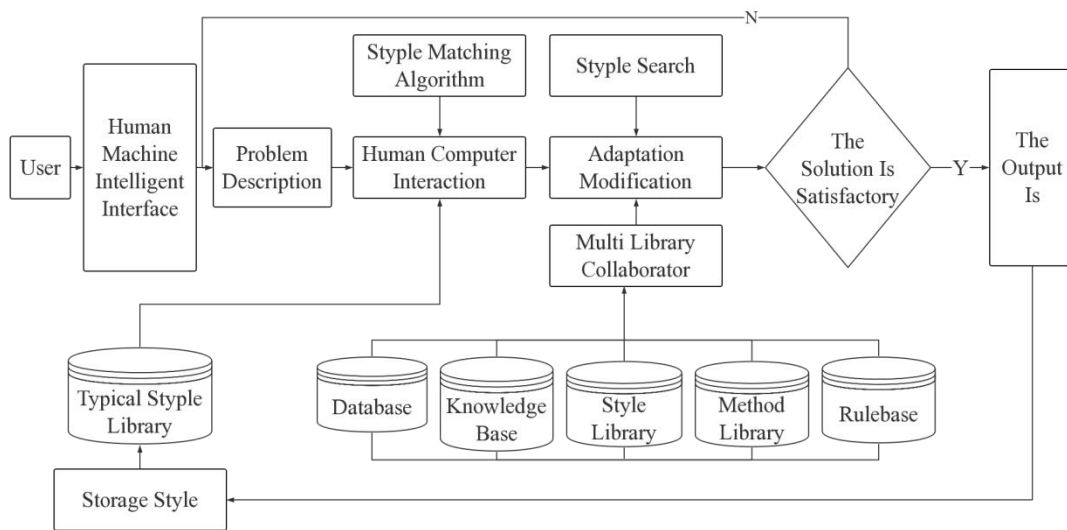
Figure 1 Design structure drawing based on style circle

From the actual situation of style design, the design scheme based on image thinking description refers to a creative thinking process, which contains a large number of designers' image thinking or design inspiration, and can automatically generate clothing styles in the process of describing users' image thinking. In the process of system operation, the user requirements are regarded as the style elements matching the description content of the knowledge base, and then the initial style prototype is formed through comprehensive application. After the rules modified by the style composition, the style judged by the user is submitted. If the user is satisfied, it can be output directly; if the user is not satisfied, it needs to re-associate the analogy, as shown in Figure 2 below:
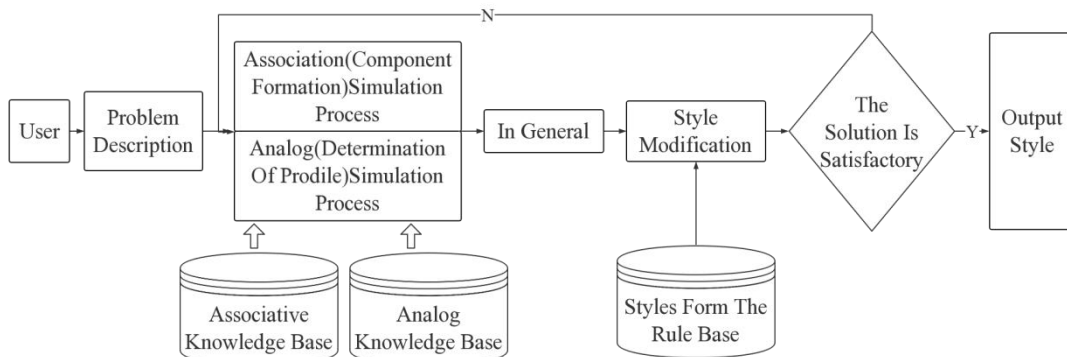

Figure 2 Design structure diagram based on image thinking description

The design scheme based on the parameterization of style elements will parameterize all the parts and decorative parts of the clothing style, and complete the clothing design on the basis of building the parameter library of style parts. After the user input requirements, the system can automatically generate style parts and realize automatic stitching through the access to the stitching rule base. The overall design is shown in Figure 3 below:[11-13]
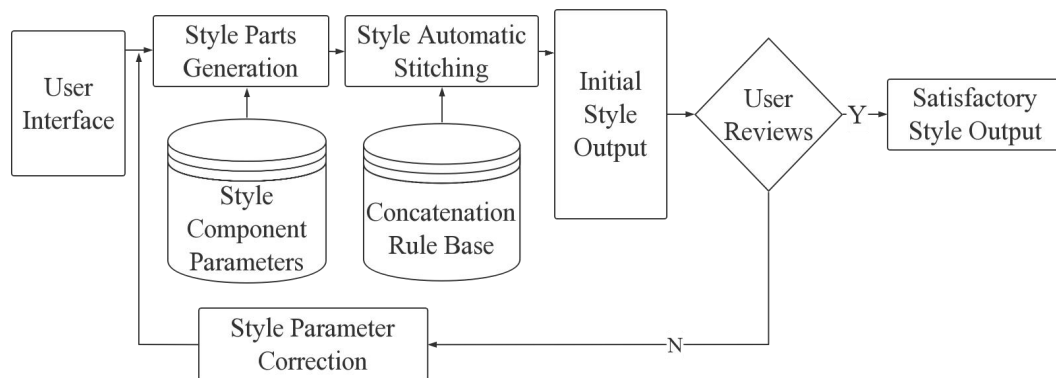
Figure 3 Design structure diagram based on parameterized style elements

2.3 System Composition

Agent theory was put forward in the 1980s. It refers to a kind of agent who has certain knowledge and can effectively apply knowledge to solve problems for specific goals. It mainly has the following attributes: Firstly, autonomy. Agent can work automatically without guidance and has the ability to control its own and internal conditions. Secondly, social. Can cooperate with other agents through a communication language; Third, stress. Can perceive the surrounding world environment, timely enjoyment of the environment to change their own behavior; Finally, rationality. Move as far as possible in the direction of the goal, and avoid actions that hinder the completion of the goal. The Agent-based system consists of user interface Agent, style information collection Agent, style element parameter extraction Agent, style component parameter library, etc., as shown in Figure 4 below:
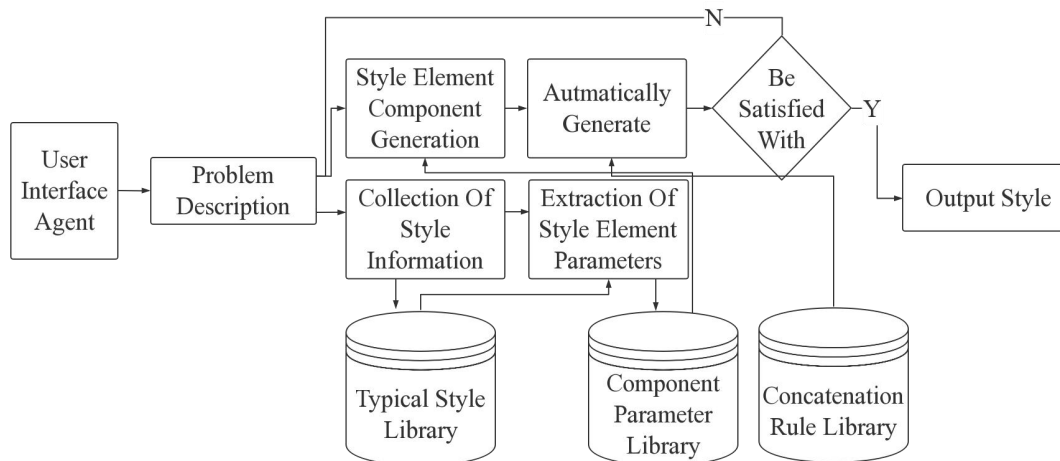

Figure 4 System structure based on Agent

3. Result analysis

By applying the system structure and CLO3D technology studied in this paper to the design of national costume structure, the three-dimensional virtual human body as shown in Table 1 below is created, which can be used to rotate, zoom in and out, move and other all-round display by dragging the mouse, so as to provide an effective basis for costume structure design.[14-15]

Table 1 Parameters of 3D virtual human body

position	height	cervical height	Height of cervical spine in sitting position	total arm length	waist height	chest measurement	neck circumference	across shoulder	waistline	hipline

numerical value	160	136.0	62.5	50.5	98.0	84	33.6	39.4	68	90

From the final rendering effect, CLO3D technology application advantages are very unique. In the traditional plan-based clothing structure design, all parameter changes require a large number of repeated drawing operations, and the use of blank cloth for verification and analysis, the overall operation takes a long time. But the use of CLO3D technology design, on the one hand can be based on the plane CAD software to achieve parameter changes, on the other hand can be realized in the technology of three-dimensional fitting verification, the overall operation time is short, the final verification results can be intuitively reflected by static or dynamic two ways, can effectively improve the transparency of clothing fabric, It is convenient for designers to accurately judge the gap between clothing and human body.

Taking the sample sample of national clothing as an example, the application of prototype structure design method means that according to the basic size of human body, different loose amounts are added at different positions, and the basic structure diagram of clothing is constructed by using the calculation formula, and then the garment sample design operation is completed. In CLO3D, the imported sample piece is first presented in a two-dimensional window and placed in the appropriate position according to the human body projection, and then the prototype sample piece is placed in the appropriate position according to the model body in the 3D model window. Meanwhile, virtual sewing tools are used to connect the front and back two corresponding shoulder lines, side stitches and other clean edges together in the two-dimensional window, and finally the synchronization command is executed. The prototype piece can be worn on the human body in the 3D model window. In addition, according to CLO3D's garment pressure test command, designers can accurately compare and analyze prototype darts for garment pressure.

Take the sleeve structure of national costume as an example. As a key and difficult point in the design of costume plane structure, the plane sleeve template will be virtually sewn onto the clothing body by using virtual technology, which has the characteristics of real-time and multi-angle change. Compared with the traditional sleeve structure design, both the operation structure and data parameters are more effective. Therefore, in the rapid development of social economy and science and technology in the future, the clothing industry should continue to explore the application advantages of CLO3D technology software, pay attention to the combination of the basic requirements and main characteristics of national clothing structure design thinking, based on intelligent digital technology to achieve three-dimensional display of clothing, while controlling the cost of clothing design, improve the efficiency of national clothing design and development. In order to get the recognition and support of customers, reduce the enterprise product risk rate and inventory pressure, improve the enterprise's comprehensive competition level.

4. Conclusion

To sum up, although automatic design based on style is the core content discussed by scholars at home and abroad, it has not mastered a relatively mature technical system, because the characteristics of design determine the difficulty of knowledge expression and multiple possibilities of technical routes. Therefore, on the basis of mastering CLO3D technology means, this paper has achieved excellent results in the application of national costume structure design, which not only changes the traditional national costume structure design mode, but also provides a new idea for designers. I believe that with the continuous improvement of science and technology level, CLO3D technology will show a broader prospect for development.

References

[1] Xin Chen,Ling Yin,Lihong Ren, et al. Research on Virtual Simulation of Costume Costume Based on CLO3D Technology -- Taking Pleats as an example [J]. Silk, 2022(005):059.

[2]   Jiaqi Hu,Ying Song. Research on Dressing effect evaluation of Cheongsam based on CLO3D virtual fitting technology [J]. Silk, 2021, 58(12):7.

[3]   Long Tan. Analysis on the Application of 3d Simulation in the Teaching of Garment Structure Design in Secondary Vocational Schools [J]. Scientific Advice, 2021, 000(019):247-248.]

[4]   Xiaoqin Peng,Hailun Yin. The application of information teaching in the course of Style Design [J]. China Science & Technology Economic News Database Education, 2022(6):4.

[5]   Ying Huang. Application of CLO3D Clothing Virtual Software in Higher Vocational Clothing Design Major [J]. Chemical Fiber and Textile Technology, 2022(002):051.

[6]   Jiannan Gao. Research on the application of CLO3D Virtual Fitting in Clothing Private Customization [J]. Tomorrow's Fashion: Late, 2021(7):0133-0134.

[7]   Yukun Shang. Application of digital 3D virtual technology in fashion design [J]. Chemical Fiber & Textile Technology, 2022, 51(4):3.

[8]   Hongge Wang,Xiaowan Sun. Analysis of thinning effect of black and white Stripes under CLO3D Virtual Technology [J]. Woolen Textile Science and Technology, 2022(006):050.

[9]   Ting Duan,Hui Shi, Jia Liu, et al. Analysis on Virtual Modeling of Mongolian Wrestling Clothing Based on CLO3D [J]. Fashion Designer, 2023(2):8.

[10] Wenping Huang. Research on Modular Virtual Design of Cheongsam based on CLO3D Platform [J]. Popular Arts and Arts: Academic Edition, 2021(23):3.

[11] Ying Song, Xiangxiang Man,Zhizhi Sun. Garment Reverse Flow Optimization Design based on Virtual Simulation technology [J]. Silk, 2022(004):059.

[12] Fengxian Hou, Xiaofen Ji. Experimental research on Virtual Sewing Process Optimization of Shift Dress Based on CLO3D [J]. Chemical Fiber & Textile Technology, 2021(011):050. (in Chinese)

[13] Xinyao Yu,Jun Xu, Ruiping Zheng, et al. Design and application of sleeve base structure based on CLO3D [J]. Woolen Textile Science and Technology, 2021, 49(10):6.

[14] Xiang Liu, Yifan Bai. Research on the Construction of Chinese Traditional Clothing Virtual Simulation Design Resources Based on CLO3D [J]. Western Leather, 2022(003):044.

[15] Xiuwen Zhang,Kai Ma. Research on Virtual representation of embroidery texture based on SD and CLO3D software. Journal of Beijing Institute of Fashion Technology: Natural Science, 2022, 42(3):7.