Innovation in Fashion Process Visualization Based on Parameterized CAD System

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Abstract. Traditional ethnic culture is passed down through written means as a carrier and through fashion culture as an important medium of dissemination. In contemporary fashion technology teaching, traditional teaching methods only stay in the classroom, where teachers teach. Faced with students' pursuit of modern technology, this traditional teaching method is difficult to meet daily teaching activities. Therefore, with the help of computers and information technology, the innovative teaching concept of diversified visualization has begun to integrate with the discipline of fashion technology. This article studies innovative strategies for the visual teaching of fashion technology supported by parameterized CAD systems and constructs a visual teaching platform to complete the transformation of teaching methods. Firstly, in the research, we conducted an in-depth analysis of the decorative symbols, patterns, colours, and other elements in fashion craftsmanship, exploring the development process of fashion craftsmanship. Understand the development path of fashion technology teaching, use practical teaching cases as theoretical support, and provide a data basis for optimizing teaching strategies. Secondly, a detailed analysis of the reliability of parameterized CAD systems is conducted, starting from the parameterized fashion process flow, to study the effective range of parameters. They are using parameterized CAD design to optimize the teaching process of fashion craftsmanship as a mathematical model, adjusting the parameters of the element presentation in fashion craftsmanship and simplifying the learning steps of fashion craftsmanship. Finally, the parameterized CAD-optimized fashion process is incorporated into teaching, and a teaching system is constructed using visual simulation software. The research results indicate that parameterized CAD systems can optimize the fashion process flow, and the constructed visual teaching innovation model can help students master high-quality learning knowledge, improve academic performance, and promote their interest in the fashion process discipline.

Keywords: Parameterized CAD System; Fashion Craftsmanship; Visualization; 3D Model; Teaching Innovation
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1 INTRODUCTION

Traditional fashion craftsmanship has always been an important component of national culture, and fashion patterns and techniques more accurately reflect the aesthetic and economic development level of an era. Regarding the key technologies and research difficulties in 3D fashion simulation and visualization research, Choi [1] studied feature recognition of 3D human models and 3D fashion prototype modelling. Firstly, convert the processed 3D human point cloud image into a human depth image. Secondly, based on this, the SURF algorithm is used to identify human body feature points, and the identified feature points are fitted with a human body circumference curve using a cubic B-spline. Then obtain 3D human body feature lines, namely human body contour lines, and measure human body size data. On this basis, an algorithm for constructing 3D fashion prototypes using feature curves and triangulation is proposed. The 3D fashion surface is divided into sub-surfaces such as shoulders, chest, abdomen, and back for segmented modelling, and the 3D fashion pieces are unfolded into 2D fashion pieces through simple geometric calculations. Then, the 3D fashion pieces are locally edited using a harmonious parameterization algorithm to achieve a better fit between the fashion pieces and the 3D human body model. Finally, based on the performance of fashion fabrics, a particle spring model is introduced, combined with the AABB collision detection algorithm and collision response, to achieve the visualization of 3D human fashion. With the development and application of computer technology in the field of art, new design styles and contexts have continuously emerged, presenting a design approach guided by digital technology. This new design method, which combines art and technology, has gradually attracted people's attention and importance. Huang et al. [2] in the context of digital technology, expressed their creative ideas through new digital art design software to create an aesthetic style and art form with digital technology characteristics that are different from traditional design. In the fashion field, the fashion industry is facing issues of homogenization and sustainable development domestically, as well as a new situation of digital transformation and digital collection fashion art externally. The emergence of digital patterns has brought breakthroughs and solutions for fashion pattern design. The digital design of fashion patterns has been deeply integrated with computer art design software, showing a trend of combining computer-generated technology with computer-aided design. With the advancement of technology and the growth of personalized consumer demand, the fashion industry has put forward higher requirements for design efficiency and innovation. As an emerging design method, parametric design has shown great potential in fashion pattern design due to its efficient and flexible characteristics. Jin et al. [3] explored the design and research of a fashion pattern automatic generation system based on parametric design, in order to provide more convenient and efficient design tools for fashion designers. A fashion pattern automatic generation system based on parametric design, which achieves automatic generation and customization of patterns by preset a series of parameters and rules. The system mainly consists of a parameter setting module, a pattern generation module, and an output module. Designers can set parameters such as colour, shape, and size of patterns according to their needs. The system automatically generates corresponding patterns based on these parameters and outputs them to fashion design software, achieving a perfect combination of patterns and fashion. Joshi et al. [4] proposed that the primary task of constructing a robot fashion assistance framework is to collect and process relevant data. This includes collecting videos, action sequences, and sensor data of human fashion manipulation so that robots can learn human behaviour patterns and operational skills. At the same time, it is necessary to preprocess and annotate the data so that subsequent learning algorithms can effectively extract and utilize this information. Based on data collection and processing, it is necessary to develop imitation learning algorithms suitable for robot fashion assistance. These algorithms should be able to extract key behavioural features and operational rules from the data of the demonstrators and generate control strategies suitable for robots. Common imitation learning algorithms include behaviour cloning, inverse dynamics learning, and deep imitation learning, which can be selected and optimized according to specific application scenarios and needs. Kim et al. [5] sorted out the development and practice of sustainable development goals and sustainable fashion design concepts. Its analysis and summary indicate that there are differences in the sustainable cognition and focus of different roles in the industrial chain. Based on the case study of sustainable strategies for fashion-related enterprises, five key aspects of the guideline layer for sustainable design and development of fashion have been summarized. A basic framework for the analysis of sustainable design and development models and strategies for fashion was established, providing theoretical support for the construction of sustainable design and development models and strategies for knitted fashion in the following text. It compared and analyzed the digital visualization of knitted fashion design and development mode compared to traditional development mode. Based on the characteristics of the knitted fashion design and development process, a list of sustainable design and development models and strategies for knitted fashion covering the entire lifecycle was constructed based on sustainable development goals and sustainable fashion design and development guidelines. Fashion is an indispensable consumer product in people's daily lives and an important component of social culture. The rapid development of the economy and society presents personalized, integrated, high-end, and fashionable fashion, which is not only the inevitable direction of fashion development but also the inevitable trend of contemporary and future fashion industry development. The fashion industry in our country must undergo industrial upgrading, improve scientific and technological content, and produce fashion with high-tech content, in order to truly promote our fashion to the world. Li et al. [6] analyzed the current research status and 3D dynamic frontier of functional fashion. The ideas and methods of simulating and visualizing 3D digital fashion modelling have shown significant advantages in personalization, fit, artistry, and large-scale customization. This is an important development direction for modern digital fashion design. The research findings of Nugroho [7] indicate that digital pattern design requires the use of different technological media, combining computer-generated technology with computer-aided design. Realize the integrated application of digital pattern design and fashion digitization technology, gradually establishing new thinking, new paths, and new methods of digital patterns in the field of fashion design in digital technology and artistic aesthetics. The article explores the design strategy and aesthetics of combining digital technology with fashion art from the perspective of pattern design, aiming to provide reference and application of digital patterns in fashion design methods for fashion designers and other related personnel. The article has certain significance and value in developing the creative thinking of designers, exploring cross-dimensional digital fashion pattern design methods, exploring the integration and expression of digital technology and artistic aesthetics, and addressing design research obstacles in cross-domain content. Accurately predicting fashion deformation time is of great significance in improving production efficiency, optimizing product design, and meeting consumer needs in the fields of textile and fashion manufacturing. With the continuous advancement of technology, automatic prediction technology for fashion deformation time is gradually emerging, especially in the application of handling variable shapes and movements, which is particularly noteworthy. Shi et al. [8] discussed the application and importance of automatic prediction technology for fashion deformation time in the textile industry. It is necessary to understand the basic principle of automatic prediction technology for fashion deformation time. This technology is mainly based on advanced computer algorithms and models and establishes accurate prediction models by collecting and analyzing deformation data of fashion under different conditions. These models can consider the physical properties, structural characteristics, and external forces of fashion materials, thereby achieving an accurate prediction of fashion deformation time.

2 DEVELOPMENT STATUS OF PARAMETERIZED CAD TECHNOLOGY

The application of 3D scanning and CAD/CAM technology in the field of textile research is becoming increasingly widespread. The introduction of these technologies not only improves the efficiency of textile design but also promotes innovation and development in the textile industry. The application of 3D scanning technology in textile research is becoming increasingly significant. Traditional textile design often relies on manual drawing and physical modelling, which is not only inefficient but also difficult to accurately express the designer's creativity. 3D scanning technology can quickly and accurately scan the physical object, obtain its 3D data, and then modify and optimize it on the computer. This not only greatly shortens the design cycle, but also improves the accuracy and flexibility of the design. In addition, 3D scanning technology can also be used for the three-dimensional morphology analysis of textiles. By scanning textiles in 3D, Špelic [9] obtained the geometric shape, texture and other information of its surface, and then analyzed its morphological changes under different conditions. This is of great significance for studying the physical properties and wearing comfort of textiles. The emergence of computerized 3D fashion simulation technology provides new solutions for the design and development of climbing fashion. Designers can use this technology to create virtual climbing fashion models on computers and simulate their performance in various climbing scenarios. This simulation can help designers intuitively understand the deformation of fashion at different angles and forces, thus more accurately evaluating the practicality of fashion. In addition, 3D simulation technology can also be used to test the material properties of fashion. Designers can conduct experiments on different material combinations in a simulated environment to observe key indicators such as wear resistance, tear resistance, and breathability during simulated climbing. Through this approach, designers can quickly select the most suitable materials for climbing fashion and improve the overall performance of the product [10].

With the transformation and upgrading of digitalization and intelligence in the fashion industry, more and more digital visualization technologies are being applied to the textile and fashion fields. The main applications of digital visualization technology in current fashion design and development include digital design systems in the design phase, digital intelligent weaving systems in the production phase, and digital visualization display systems in the sales phase. Wang et al. [11] selected the desired organizational structure from the pattern library, combined with digital yarns, and after process settings, a simulated fashion can be presented. After the process file is formed, it can be directly connected to the island precision knitting machine for weaving. Moreover, by using a fully formed computerized flat knitting machine, whole garments can be directly woven, eliminating the need for cutting and fitting processes, optimizing the knitting design and development process, and promoting the sustainable development of the knitting fashion industry. However, the fully formed knitting technology has certain limitations on the style and yarn selection of knitted fashion. Therefore, when developing knitted fashion, various factors should be comprehensively considered and a reasonable and optimized design should be carried out. Based on theoretical analysis and case studies, Yang et al. [12] developed a digital fashion model and strategy list based on the constructed overall sustainable design of knitted fashion. Combining existing new knitting development technology, utilizing digital design and development systems such as 3D fashion modelling software and island precision knitting development system for sustainable knitting fashion design and development practice. And characterize and evaluate the sustainability of knitted products and their design and development processes through enterprise case study analysis and the construction of a diversified evaluation model. To verify the feasibility of the application of the development mode and evaluation model, and provide a preliminary practical reference for sustainable product development in knitting-related enterprises. Fashion attribute recognition, especially in unconstrained street images, is a challenging task for multimedia. The existing multitasking fashion attribute prediction methods often overlook the relationship between specific attributes and positions. However, attribute responses are always position-sensitive, meaning that different spatial positions have different contributions to attributes. Inspired by the locality of fashion attributes, Zhang et al. [13] introduced an attention mechanism that incorporates the influence of position into fashion attribute prediction, requiring only image-level annotations. However, if we directly use traditional spatial attention models for each task, the performance improvement is limited as it does not consider the impact of other tasks. On the contrary, we propose a new task-aware attention mechanism that estimates the importance of each position in different tasks.

Zhao et al. [14] explored the concept definition, artistic style, aesthetic characteristics, and development and application trends of digital patterns in fashion. Afterward, the form classification of digital patterns is summarized, and a comprehensive design method for digital patterns is constructed by combining computer-generated art and computer-aided design based on different technological media. Through research and analysis, the design application of digital patterns in fashion theme and style design. Summarized and summarized the digital design strategies and aesthetic expression of digital patterns in fashion, and explored their cutting-edge applications in the field of fashion art. Finally, the combination of digital patterns and fashion digital technology will be applied in design practice to apply the design method studied in this article. In the field of fashion design and manufacturing, the application of parametric skills is becoming increasingly widespread, greatly improving the flexibility and production efficiency of design. However, traditional parameterized skill-learning methods often require a large amount of training data and complex algorithms, which are often limited in practical applications. Therefore, how to effectively learn fashion design parameterization skills from a small number of demonstrations has become an urgent problem to be solved. Zhu et al. [15] analyzed the application of robots and automation technology in the field of fashion design. One common method in these studies is based on machine learning and computer vision technology. Firstly, the system extracts key parameters and features in fashion design through a small amount of demonstration data. Then, using machine learning algorithms, the system can automatically recognize and analyze the relationship between these parameters and features, thereby generating new fashion design schemes. This method not only reduces dependence on data volume but also improves learning efficiency and accuracy.

As a popular application method in computer-aided technology, parameterized CAD systems have played an important role in the development of various fields. CAD computer-aided design can not only improve the automation level of drawing, process production, and part design but also achieve control of finished products within a small range through parameter adjustment. As long as detailed data is known, parameterized design can calculate and modify internal data, and transfer it to the CAD system for automatic generation and design through data conversion. The United States developed parameterized CAD technology earlier and applied it to improve products and engineering solutions. Through this intelligent means, system file writing and simulation environment construction were completed. Japan has applied parametric CAD technology to simulate product configuration design, shortening production cycles, and improving product output and quality in a production-centered market environment. Meanwhile, parameterized fine-tuning technology can help them reduce process costs in the manufacturing process, become a pillar technology in the manufacturing industry, and meet customer needs. The UK uses CAD technology as an auxiliary tool for geometric modelling, combined with parametric design methods, to construct engineering models as virtual display samples. This not only completes high-quality model production but also enables the construction of auxiliary models such as surfaces and wireframes. Therefore, parameterized modifications in design and process production are important aspects that CAD systems must address, and the combination of parameterized CAD systems has brought positive changes to various fields. In the above context, we also use parameterized CAD systems to study innovative strategies for fashion manufacturing processes and visual teaching.

3 RESEARCH ON INNOVATIVE STRATEGIES FOR FASHION PROCESS DESIGN

3.1 Research on Optimization of Fashion Process Design Based on Parameterized CAD System

The elements of fashion craftsmanship are rich and colourful, and each design contains thousands of years of historical accumulation. From color to pattern, from appearance to internal structure, various traditional elements are integrated into fashion craftsmanship, allowing for a perfect combination of fashion craftsmanship and cultural elements. Endowing the design with aesthetic features enhances its internal influence. The elements of fashion craftsmanship also have unique emotional memories, which are important contents worth inheriting and developing. Therefore, the teaching of fashion craftsmanship needs to absorb nutrients from traditional craftsmanship methods and also needs to be combined with modern and fashionable elements, using intelligent methods such as information to help students better understand the characteristics of the fashion craftsmanship discipline. At present, most universities still use traditional curriculum teaching methods, the correlation between fashion craftsmanship and teaching design is poor, and the presentation of courses is relatively single. The updating of resources related to teaching content is extremely slow, and there is a significant gap with the current cutting-edge technological means.

From this, it can be seen that this situation is not conducive for students majoring in fashion technology to learn and accept the course content in a short period. In addition, fashion technology courses have strong comprehensive characteristics, which not only require students to have a good theoretical foundation but also to have correct operating techniques and practical application abilities. This puts higher demands and standards on the classroom environment and teaching methods for students during the learning process. However, in traditional teaching processes, teaching modules often lack these characteristics, which are not conducive to students' learning and development, and seriously limit their progress in the field of fashion technology. In our research, we investigated the general scope of fashion technology means. Students need to be exposed to embroidery, textiles, printing, sewing and other technologies in their study. We conducted field investigations and collected data on the difficulty evaluation of the above technical methods by students majoring in fashion technology at a certain university, and expressed it in the form of a data graph, as shown in Figure 1:

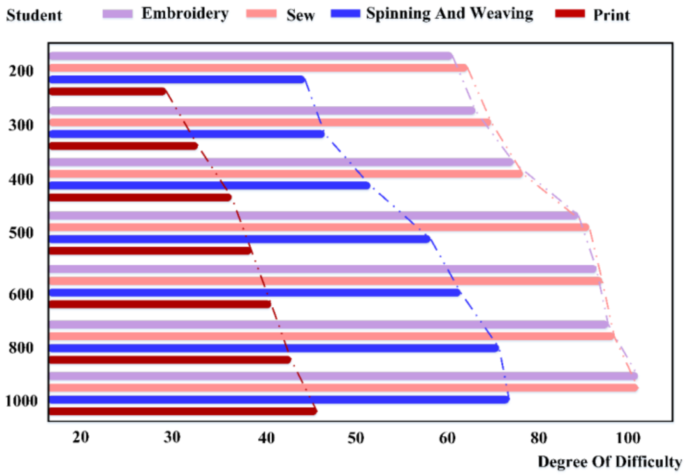

Figure 1: Evaluation data on the difficulty of fashion craftsmanship techniques.

From Figure 1, it can be seen that we randomly sampled a sample of approximately 1000 students as support in the data selection. Most students believed that sewing and embroidery were more difficult techniques. Next is textiles, and printing is a less difficult technical technique. At the same time, we also analyzed the current teaching methods of fashion craftsmanship in most universities. In the initial stage of student learning, the teacher mainly explains the forms, characteristics, and functions of fashion craftsmanship. At this stage, students focus on appreciation and understanding, with a focus on cultivating their interest in learning. In the intermediate stage, teachers focus on explaining the characteristics of craftsmanship and fashion design, operating and demonstrating the production process of different craft works, and helping students get started through material application and operation guidance. Subsequent students need to learn basic embroidery, needlework, tie-dyeing techniques, etc., in the advanced stage. At this stage, teachers focus on strengthening students' practical operations, allowing them to combine theory with practical operations and be able to actively and independently complete some creative design works. From the perspective of the teaching process of fashion technology, the teaching process of technical means has always been a difficult problem. Among them, material allocation and the use of colour patterns in fashion craft design are the main links that affect students' academic performance. We use parameterized CAD systems to optimize the design process in fashion craftsmanship, simplifying colour matching and pattern data analysis. Firstly, the research frequency of parameterized CAD systems both domestically and internationally was statistically analyzed, as shown in Figure 2.

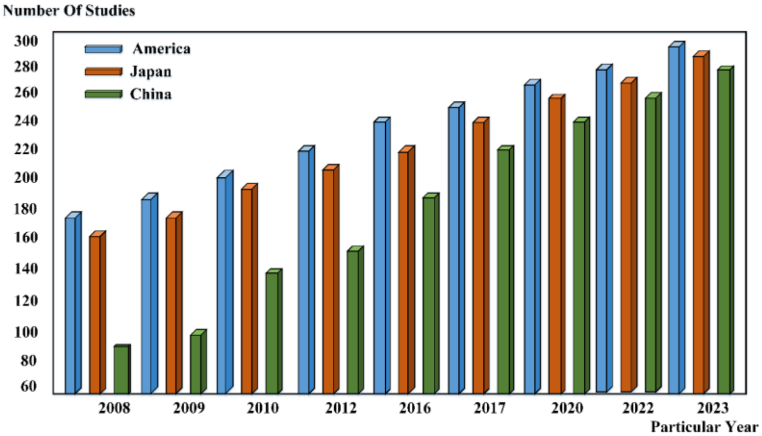

Figure 2: Research frequency changes of parameterized CAD systems at home and abroad.

From Figure 2, it can be seen that the United States and Japan have conducted earlier research on parameterized CAD systems, and they have widely applied this technology in industrial manufacturing, process design, and other fields. With the development of computer technology, China has also made progress in the research of automated and intelligent CAD systems, and the exploration of parameterized CAD systems began to increase significantly in 2010. According to the literature review, it is found that most of the products related to technology are variant design requirements, which means that modifications are made based on the original finished products according to the different needs of users. We normalize the information activities involved in the clotting process, including the analysis of geometric shapes, images, colour combinations, and other elements. Calculate the similarity of relevant reference data in fashion craftsmanship using the following formula:

$$sim_0 = \sum_{i=1}^{N} |1 - \frac{V_i - T_i}{V_i + T_i}| \tag{1}$$

$$sim = \frac{\sum_{i=1}^{N} |1 - \frac{V_i - T_i}{V_i + T_i}|}{N} \times 100\% \tag{2}$$

Among them, sim represents the similarity coefficient. There are a large number of repetitive actions in fashion process design. Simplifying these unnecessary operations in teaching can save classroom time and shift the focus to other important operations of teaching. When dealing with unconventional process requirements, we need to use iterative functions to represent various feature parameters:

$$Z_{n+1} = f(Z_n), n = 0,1,2...,+\infty \tag{3}$$

After obtaining the iteration number of initial values, represent the process feature trajectory points in the CAD system. In order to better determine the range of parameterized adjustments in fashion technology, we have added a parting image processing mechanism to the CAD system, which uses spatial measurement to obtain parameter values. The measurement space is defined as:

$$\{(F(X), h_0), (X, P)\} \tag{4}$$

Assuming the definition formula is a non-empty dataset, the adjustment size of parameters after inputting fashion image data into the process flow is determined by the following conditions:

$$A=\bigcap_{N=0}^{\infty} f_{-n}(X)=\lim W^{N(x)} \tag{5}$$

From the above formula, it can be seen that each feature value is obtained from the continuous change of spatial measurement positioning to itself, and the classification definition formula can be expressed as:

$$A=\left\{x\in X : f^{n}(X)\in X, n=1,2,3...\right\} \tag{6}$$

A represents a dataset that cannot be separated from spatial categories in parameterized calculations. In summary, the idea of classification processing is to determine the number of iterations and take similar values, combined with region selection for range localization. We will represent the simplified functions in the process steps as follows:

$$T(x)=\begin{cases} k \\ 0 \end{cases} \tag{7}$$

$$|\ f^{k}(x)|\geq R,|\ f^{i}(x)|<R, i=1,2,...,k-1,k\leq N \tag{8}$$

$$|\ f^{k}(x)|<R,|\ i=1,2,...,N \tag{9}$$

If in the formula, the function $T(x)=0$, the auxiliary simplification effect within the CAD system can achieve the expected results. We also incorporated the classic formula for calculating complex parameters from our research, which originated from American scholars and is defined as:

$$f(z)=z^{2}+c \tag{10}$$

Among them, z^2 are complex variables and constant quantities. Perform typing on the function to obtain the following iterative formula:

$$Z_{n+1}=Z^{2}+c, n=0,1,2,3,... \tag{11}$$

Due to the spatial one-to-one correspondence between the parameters that need to be adjusted in most fashion processes, we can consider this calculation process as a complex calculation. After determining the parameterized calculation function, we still need to complete debugging in the CAD system. The implementation of this three-dimensional auxiliary system requires the addition of two-dimensional data parameters into the three-dimensional space, and the use of momentum transformation to transform planar features in a natural extension manner. The formula contains a real number and several imaginary elements, defined as:

$$Q=a+bi+cj+dk \tag{12}$$

Each vector satisfies the following operational relationship:

$$j=k, jk=i, ki=j \tag{13}$$

It can be seen that there are significant differences between the 3D automated conversion of CAD systems and conventional 2D data calculations. The combined formula is as follows:

$$(ai+bj+ck)^{2}+1=0 \tag{14}$$

$$a_{i}+b_{j}+c_{k}=\lim{}_{A} \tag{15}$$

After satisfying the above formula, the complex process of fashion craftsmanship can be replaced by numerical values, combined with visualization technology to form a new teaching mode.

3.2 Innovative Strategies for Fashion Process

Fashion technology is a comprehensive course that emphasizes the combination of practical operation and theory. It is a link to achieve the transformation of fashion design from two-dimensional images to three-dimensional finished products. The teaching activities of the fashion craft course should also meet the needs of cultivating students' interest in the process and operation of the craft, allowing them to exercise hands-on and problem-solving skills. At present, most universities only use traditional methods for teaching fashion technology courses, which means that teachers conduct group presentations, provide regular explanations and demonstrations of fashion works, and then students imitate and produce them. This passive traditional teaching model limits students' thinking in process design and also limits their tendency for self-directed learning. Most students majoring in fashion craftsmanship are art majors, and when choosing a major, they hope to be influenced by this artistic course to enhance their sensitivity to fashion elements.

With the development of the digital age and information technology, teaching modes have also undergone significant changes. Traditional professional courses need to break through stereotypes, cultivate thinking, and improve teaching quality through visual teaching concepts under the guidance of teaching reform. The visual teaching mode needs to take students as the research object and use information processing and management in course construction to reconstruct the teaching mode, making the visual form an effective bridge to promote teaching and management. We use parameterized CAD systems in our research to simplify the teaching process of fashion technology, allowing teachers to optimize the process structure through data adjustment, thereby solving the problem of traditional teaching modes being obscure and difficult to understand. Firstly, we will present the process of using parameterized CAD technology to process most of the elements in fashion craftsmanship, as well as the structure of the fashion craftsmanship course, as shown in Figure 3:

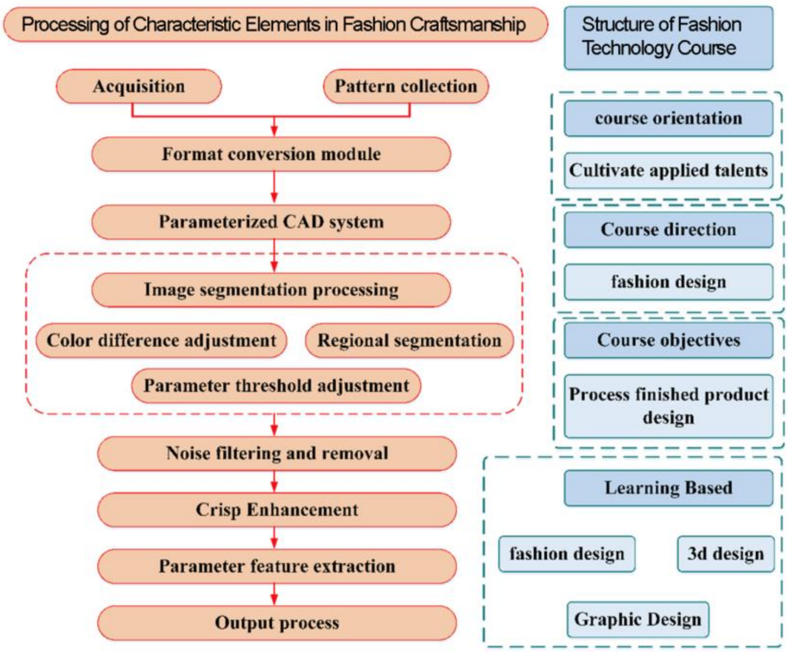

Figure 3: The optimization process of fashion craftsmanship elements and the structure of fashion craftsmanship courses.

As shown in Figure 3, parameterized CAD technology mainly faces data such as images and patterns when processing fashion process feature elements. By collecting data information and adding it to the format conversion module, two-dimensional data is converted into adjustable three-dimensional numerical values, and CAD-assisted design is used to generate image and pattern segmentation modules. Complete image colour difference adjustment and parameter threshold adjustment in segmentation processing. Finally, it is added to the noise removal, sharpening processing, and parameter feature extraction stages to output the optimized fashion process flow. In the structure of the fashion technology course, we have explained the course positioning, direction, objectives, and other modules. Based on learning, we have also provided a detailed introduction to several subject contents of the auxiliary fashion technology course. Based on the above analysis, we should build a visual teaching innovation model based on effective classrooms, and visually display the workflow and teaching results. At the same time, it enables teachers to input teaching knowledge clearly in course teaching, and students can also complete effective exercises in practical operations. The system function of the visual teaching mode for fashion craftsmanship that we generated is shown in Figure 4.

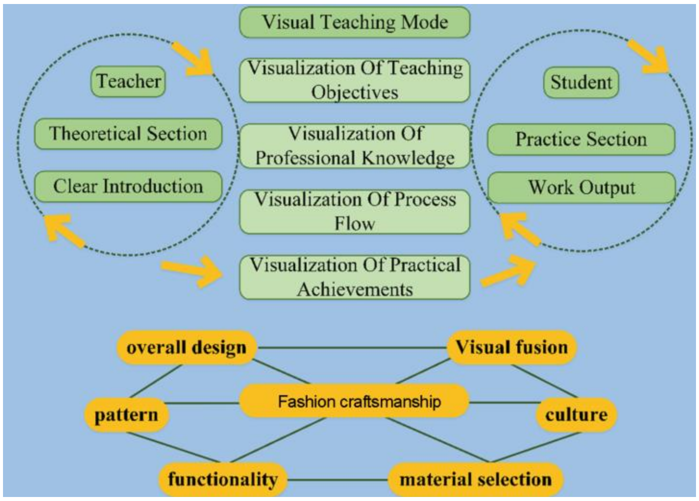

Figure 4: Visual teaching mode for fashion technology.

From Figure 4, it can be seen that in the construction of visual teaching, teachers focus on adding clear introductions to process operations in the theoretical environment, completing the visualization of teaching objectives, professional knowledge, process flow, practical results, etc. Students need to complete effective product output through practical operations. In the future, we will investigate the academic performance and future employment situation of students, and explore the practical application effect of the parameterized CAD system's fashion process visualization teaching innovation model.

4 ANALYSIS OF RESEARCH RESULTS

4.1 Analysis of Results on Optimization of Fashion Process Design

The advancement of computers and intelligent means has also led to the healthy development of parameterized CAD systems in design applications, gradually shifting from the initial focus on fashion process design ideas to aspects such as process structure and material application. Parameterized CAD-assisted technology can improve the smoothness of fashion process operations, improve the efficiency of process production and product quality, and reduce unnecessary costs and risks in fashion production. In our research, we mainly focus on optimizing the process technology of parameterized CAD systems. Based on the process operation thinking led by parameterized fine-tuning, we form a more convenient and efficient fashion process production. The traditional fashion craftsmanship process requires multiple steps such as inspiration design, initial draft drawing, and scheme qualitative analysis. Teachers need to repeatedly refine these modules in teaching to make them more in line with students' acceptance levels. These complex repetitive operations consume a lot of energy for teachers and are not conducive to the development of teaching activities. Meanwhile, if teachers need to modify some process operation details, these changes will also make the entire teaching environment more complex. We added parameterized calculations to the fashion process elements in the experiment, using CAD-assisted generation to transform the two-dimensional process flow into an operational model in three-dimensional space. This means that the 3D model can independently optimize some tasks in fashion technology teaching details, and there are changes in the quality of fashion technology design products and the efficiency of basic element creation. The detailed comparison is shown in Figure 5:

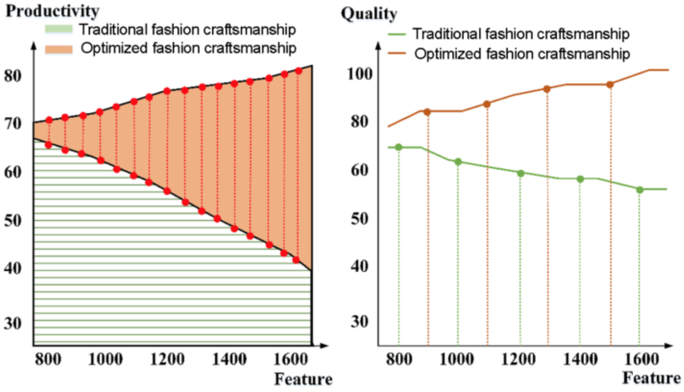

Figure 5: Comparison of two models in the quality and basic element creation efficiency of fashion craft design products.

From Figure 5, it can be seen that the efficiency of generating basic elements and the quality of designing products are relatively poor in traditional fashion process operations. When facing a large amount of feature data, the parameterized CAD system-optimized process flow has better application effects. In practical applications, parameterized CAD systems can be the first to read the design information required in the table of fashion craftsmanship. Based on the different content faced in teaching, suitable process templates can be independently selected for detailed display, greatly improving the efficiency of teacher lesson preparation.

4.2 Analysis of Research Results on Innovative Strategies for Fashion Process

The fashion craft course, as an art comprehensive discipline, not only contains rich traditional cultural knowledge but also preserves many technical means passed down by historical ancestors. By studying and appreciating fashion design, students can trace the origins of history and culture, helping them better understand the charm of Chinese culture. The rich and diverse elements of fashion craftsmanship, as well as complex and tedious techniques, enable students to recognize the importance of cultural heritage and artistic aesthetics in their learning. However, traditional teaching methods for fashion craftsmanship are relatively single, and many students are unable to combine theoretical knowledge with practical operations. Most students believe that the production process of fashion craftsmanship is difficult. This article integrates parameterized CAD systems into the optimization of fashion process teaching, constructs a visual teaching system, analyzes the fashion process flow, and enables students to understand and apply classroom knowledge in a visual environment. To verify the reliability of this study, we randomly selected 1000 students as survey data to explore their performance changes in three grade levels under traditional teaching mode and visualized teaching mode optimized by parameterized CAD system, as shown in Figure 6.

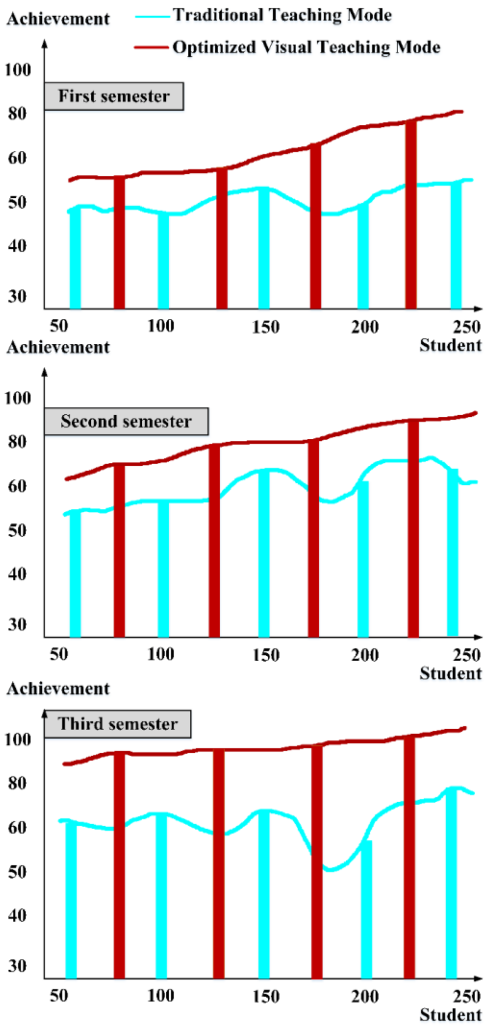

Figure 6: Comparison of performance changes in three grades under different teaching modes.

According to Figure 6, it can be seen that under the traditional teaching mode, the growth of students' grades over three academic years is highly volatile and the rate of increase is also very slow. Under the visual innovation teaching mode, students maintained mediocre or above grades in all three academic years. Next, we will apply the visualization teaching mode in practice in schools and use data collection methods to compare the employment rate of fashion technology students who graduated in the same year, as shown in Figure 7.

According to Figure 7, it can be seen that the majority of graduates in the traditional fashion technology teaching mode have a lower employment rate in the fashion industry, and most students have started to switch to other fields. Students who apply visual teaching mode for learning have been employed in corresponding fashion and craft positions after graduation, with a lower employment rate in other industries. From this, it can be seen that the innovative model of visualized teaching of fashion technology optimized by parameterized CAD systems can improve the employment chances of students in this industry and help them quickly complete their career positioning.

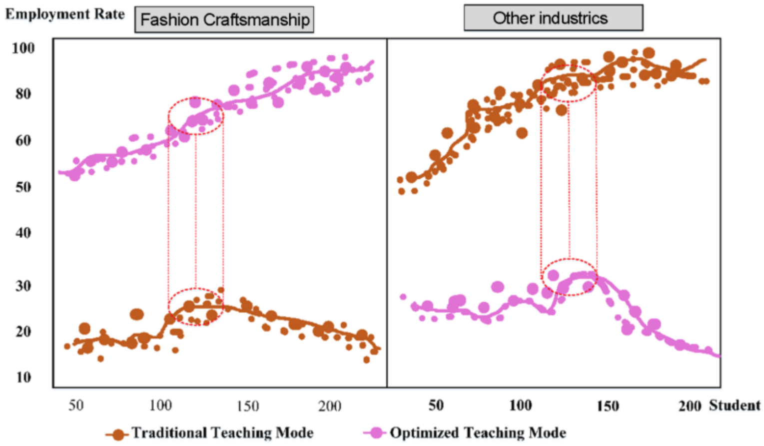

Figure 7: Employment rate of students majoring in fashion and craft.

5 CONCLUSIONS

Fashion craftsmanship is a very important resource for designing products. Through generations of inheritance, it has been continuously summarized, condensed, and sublimated to form the current complete process flow. The complexity and diversity of fashion craftsmanship have brought higher requirements for the development of this field. It is not only necessary to improve the technology and quality of fashion craftsmanship in modern fashion elements, but also to ensure the effective dissemination of fashion culture. As an important link in promoting industry development, fashion technology teaching also needs to be improved in the digital era to make the teaching mode of fashion technology more in line with the classroom needs of teachers and students. This article uses a parameterized CAD system to optimize the fashion process flow and constructs an innovative visual teaching model. Firstly, the focus was on analyzing the various elements and technical techniques involved in fashion process operations and exploring the current development and application status of parametric CAD technology. Add parameterized CAD auxiliary technology to the processing of fashion process elements, use image, pattern and other parting processing calculations to complete parameterized adjustments, and provide the parameterized calculated data to the CAD system. Transforming two-dimensional elements into three-dimensional spatial elements in CAD systems reduces the difficulty of fashion process operations and optimizes the process in a parameter-controlled manner. Finally, using data modelling and CAD systems to construct a visual teaching mode, the teaching model simplifies teaching steps in parameterized task processing and provides students with a learning mode that reduces the difficulty. Explore the changes in student academic performance and employment rates under this innovative visual teaching model. The research results indicate that parameterized CAD systems can optimize the operation process of fashion technology, achieve visual teaching effects of fashion technology, and improve the employment rate of students in this industry.

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