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*Retraction*

# Retracted: Intelligent Garment Graphic Design System for Artificial Intelligence and 3D Image Analysis

**Mobile Information Systems**

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

## References

[1] J. Yang, W. Xia, and Y. Hong, "Intelligent Garment Graphic Design System for Artificial Intelligence and 3D Image Analysis," *Mobile Information Systems*, vol. 2022, Article ID 3856762, 11 pages, 2022.

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*Research Article*

# Intelligent Garment Graphic Design System for Artificial Intelligence and 3D Image Analysis

**Jia Yang,[1] Wei Xia,[1] and Ying Hong[2]**

[1]*College of Arts and Design, Nanchang Jiaotong Institute, Nanchang 330100, Jiangxi, China*
[2]*College of Civil Engineering and Architecture, Nanchang Jiaotong Institute, Nanchang 330100, Jiangxi, China*

Correspondence should be addressed to Ying Hong; 01011@ncjti.edu.cn

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The application of artificial intelligence technology not only realizes the transformation of people's production and lifestyle but also promotes the transformation of the clothing industry. At present, the proportion of artificial intelligence in the clothing industry is becoming larger and larger. Using its advanced methods and technologies of information display and data analysis, this study is worth transforming and optimizing the clothing graphic design system under the artificial intelligence environment, so as to promote the intelligent development of the clothing industry. This study proposes to use three-dimensional image analysis algorithm technology to guide the integration of garment graphic design process and computer network, which is helpful to analyze and solve the imbalance between the singularity of traditional garment pattern design and people's aesthetic appreciation at present. Using the technology and principle of artificial intelligence for reference, the intelligent clothing graphic design system is constructed and analyzed. In the analysis of the clothing graphic design system of a group, the group applied artificial intelligence technology to the customized clothing in the production workshop of the company. Although the efficiency of the adjustment system is not as good as that of mass production, it eliminates inventory, and its net profit can reach 20–30%, which is much higher than that of traditional clothing. In contrast, the industry reported a net profit of 12% of the highest level. Therefore, it is urgent to analyze the intelligent garment graphic design system through artificial intelligence technology.



## 1. Introduction

With the continuous development and change in the social economy, people begin to pay attention to the quality and diversity of life. People hope that the clothes they wear are suitable for their own body shape and taste, and have unique characteristics. The appearance of high-quality and artificial intelligence clothing consumption mode makes the artificial intelligence customization-oriented clothing production mode emerge as the times require. The garment production mode for artificial intelligence customization is to use artificial intelligence technology, case-based reasoning technology, and computer technology to organically combine the fabric selection, style matching, garment design, board drawing, and garment production in garment production, so as to realize the development of modern garment textile industry with the goal of informatization and intelligence and improve the internationalization and market-oriented competitiveness of enterprises.

This study aims to improve the competitiveness of products and increase the income of enterprises. In artificial intelligence clothing customization, consumers can participate in all aspects of clothing design as designers. Clothing design is customized according to customers' requirements, so consumers must be satisfied; It can satisfy consumers' comfortable wearing experience and has less substitutability in the market. Therefore, it has strong competitiveness and can be sold at a higher price, so as to improve the income of the enterprise. And this study combines case-based reasoning technology, multi-data fusion technology, image registration technology, and actual production design, and effectively applies advanced technology to practice.

At present, a new round of technological revolution represented by artificial intelligence is rapidly promoting the development of the garment industry with the passage of time. Among them, Park and Koo reviewed the emerging trend of 3D technology used in garment design research and product development for rapid prototyping and effective evaluation of product performance [1]. Jiang et al. aim to propose a method to automatically adjust 2D clothing patterns and quickly generate custom clothing styles for a given manikin [2]. Kaoru focuses on virtual bodies installed in 3D-CAD of personal corresponding clothing [3]. Jang and Chen aim to use body shape analysis to develop a 3D virtual human body formation and deformation model that can accurately express size and shape [4]. Uestuenkaya discusses how AI technology is used in the fashion industry and discusses the relationship between programming and function [5]. However, the above technologies are only in the theoretical stage at present, and cannot be widely promoted in the society.

It is very important to use artificial intelligence technology to optimize people's clothing, food, housing, and transportation. As an industry that people attach great importance to, many scholars are studying the clothing industry. Among them, Jiang and Rens proposed that without changing the sensor material, the comfort and accuracy of clothing can be improved, the comfort reduced by the proximity of the sensor to the skin can be eliminated, and the inaccurate measurement can be transformed into accurate measurement [6]. Zou et al. aim to propose the foCo system and build it in four steps to bridge this gap [7]. Weller proposed that artificial intelligence can be recommended by achieving safer cars, more efficient houses, more intelligent investment, and artificial intelligence in all aspects from news to clothing [8]. Maity aims to explore whether artificial intelligence (at) can lead the organization's training and development process in the next few years. He personally interviewed 27 human resources and training professionals from eight organizations in the FMCG, oil and gas, and clothing and clothing industries [9]. Li et al. investigated users' subjective attitudes towards artificial intelligence (AI) recommendation services (such as acceptance and perceived ease of use), and compared them with human expert recommendation services before and after use [10]. However, the current research on garment pattern design still does not get rid of the traditional artificial design and lacks in-depth analysis and Discussion on the functionality of artificial intelligence, which also hinders the high combination and advantages of artificial intelligence and the garment industry.

This study presents a local pattern design system based on real-time style transfer, which realizes the intelligent design of local patterns. Aiming at the problem that the current clothing decoration design mainly depends on the designer's experience and inspiration, and lacks the end-to-end intelligent local decoration aided design scheme, this study creatively proposes to use the improved real-time style migration network to intelligently generate new fashion patterns, and then apply them to the style-less clothing to realize the end-to-end intelligent design of clothing local patterns. In this study, the normalization method and loss function of the real-time style migration network is improved to make the generated local patterns more realistic. Finally, through experiments, it is proved that the clothing design system based on artificial intelligence studied in this study can generate clearer and more realistic images than the classical style migration and real-time style migration algorithms, and the effect of applying it to the local pattern design of clothing is better [11, 12]. Digital design is mainly based on the feedback data of business and e-commerce, 3D technology, and artificial intelligence large database to improve design efficiency and implement novel and unique product planning [13]. Large-scale database construction, intelligent design, and artificial intelligence adaptability have been continuously improved; Supply chain digitalization mainly focuses on various online and Taihua resources, such as designers, textile accessories, manufacturing and foundry workers, as well as internal and resource realization to help brands and manufacturers quickly and efficiently connect resources. Intelligent manufacturing uses a number of innovative industrial software and hardware to improve production efficiency and improve the ability of flexible production, small, simple, and fast. The results show that the group applies artificial intelligence technology to customized clothing in the production workshop of the company.

## 2. Design of Garment Generation System Based on 3D Algorithm

Based on the analysis of the process elements of artificial intelligence garment customization and the research on the method of automatic generation of the garment production process based on case-based reasoning, this chapter expounds on the research on the system overall design and database design of the automatic generation system of the garment production process of artificial intelligence customization [14].

*2.1. System Architecture.* The system architecture of the automatic generation system for the garment graphic design process is shown in Figure 1.

It can be seen from Figure 1 that the system receives browser/server mode (B/S). Customers can use the browser to use it. The system architecture receives the object-oriented three-layer architecture design pattern, which is divided into the DB data layer, BLL business logic, and the interactive layer of the user interface [15]. The bottom layer is a database data layer, which contains various information about clothing data and customer management information, which is of high business value to the company. The database of the system accepts the pairing structure model of the point to receive TCP/IP networks suitable for local areas and with good security.

*2.2. Functional Design.* The system consists of four modules: process information management, process sheet generation, customer information management and system data management, as shown in Figure 2.

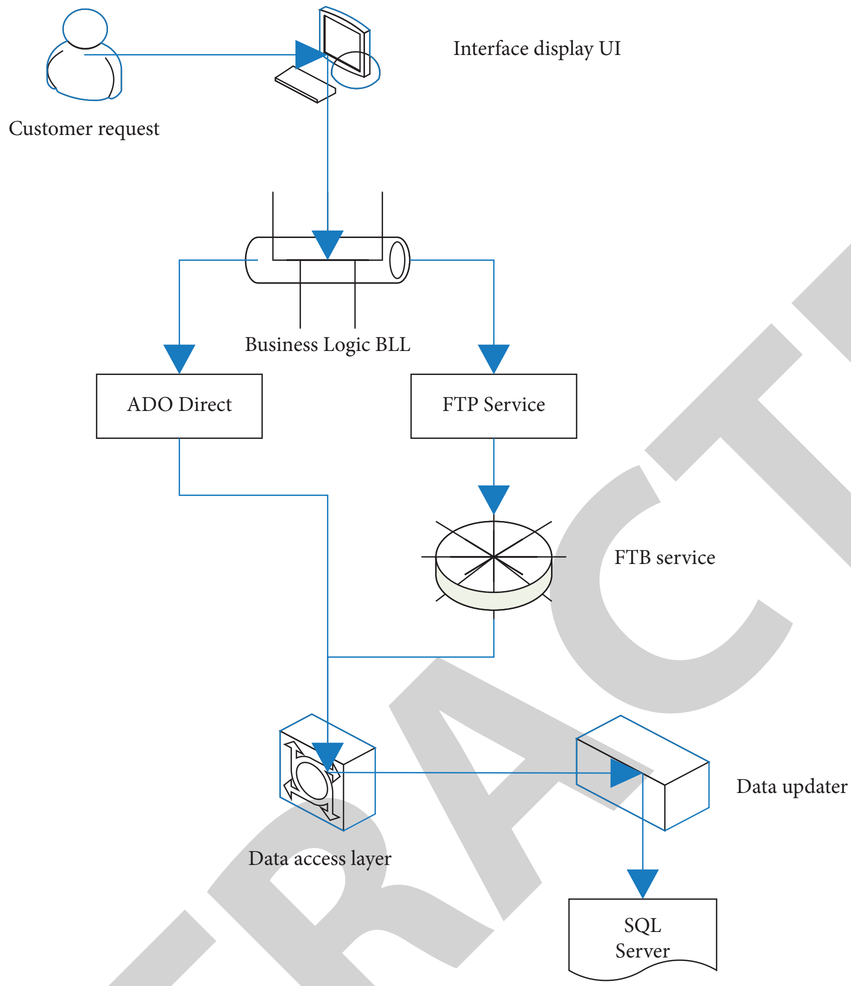



FIGURE 1: System architecture design.

It can be seen from Figure 2 that the process information management includes: customization, query, deletion, and modification of process information such as garment style, sewing, bonding, specification, shrinkage, and identification card; Process sheet generation includes: automatic generation of process sheet, contract summary sheet and packaging process sheet for garment production; Customer information management includes: maintenance of basic customer information and management of customer order information; System data management includes: enterprise employee information management, system customer information management, customer authority setting, clothing data dictionary maintenance, and clothing standard library management [16].

Clothing style view: According to the permission, query the clothing style information of all styles, including style information, template information, process information, and corresponding process sheets. See Table 1 for the hierarchy of clothing styles.

*2.3. Source Data Sharing Interface Design.* In the actual production design, because each attribute element of the garment design process comes from the database of fabric library, style library, model library, process dictionary library, and so on, these data are the key elements of garment artificial intelligence customization, but there are differences in the attributes, formats and data types of these data elements [17, 18]. In order to provide a unified data interface to the upper layer on the premise of ensuring the integrity of the data content, shield the difference of underlying data and meet the real-time data access, as shown in Figure 3

As can be seen from Figure 3, taking the fabric library data table as an example, due to the company's own reasons, the enterprise has a clothing display database, a large-scale fabric database, and an artificial intelligence clothing customization process database [19]. In the above databases, there are fabric library data tables, i.e., GarmentT_mlkxxb table, T_mlkxxb table, and basic fabric table Fabrictb table as shown in Tables 2 and 3.

It is obvious from Tables 2 and 3 that there are differences between database tables and different system types. In order to obtain information about the data from the database to display the clothing and database with large commodity fabrics, the artificial intelligence clothing process can be used automatically. Traditional queries on different databases through SQL commands and how to set query result settings to delete duplicate data [20].

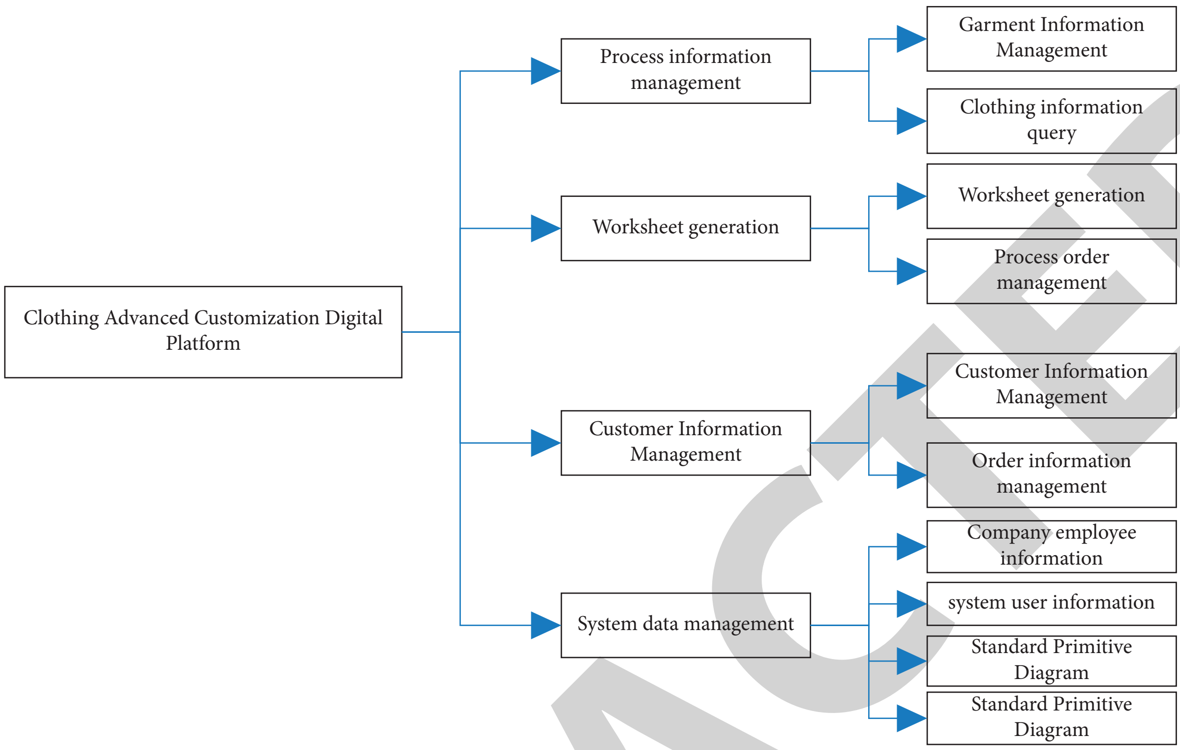



Figure 2: Functional design flow chart.



Table 1: Clothing style view table.

| Serial number | Primary key | Category | Content |
|---|---|---|---|
| 1 | Global features | Clothing | Product type, apparel category, country, brand, year, gender |
| 2 | Main feature | Tops | Silhouette, lapel, placket, slit, shoulder, towel pocket |
| 3 | Assist feature | Bottoms | Front pleats, front pockets, waist, back darts, back pockets |

*2.4. Process Picture Identification and Splicing Method Design.* In the original clothing production process design, the clothing production process design pictures are usually drawn and punched manually by the craftsmen. Due to different enterprise standards or departments, the pictures for process design often have different sizes, different sizes, reversed positions, etc. If these pictures are not screened and modified, they will seriously affect the design of the clothing production process map, and then affect the production of clothing orders by the clothing producers. It has a serious impact on the production process, production quality, and production progress of garment enterprises and reduces the overall efficiency and profits of enterprises [21] as shown in Figure 4.

*2.5. Artificial Intelligence-Based Garment Generation Algorithm.* In this study, the reference point set is used to generate the vertex coordinates of the initial 3D garment model to ensure that the scale and zoom are maintained. Gradient constraint is applied to iteratively adjust the vertex position of the 3D garment model to achieve shape, adaptability, and relative position maintenance. Collision detection and smoothing are required in the iterative process [22].

*2.5.1. Selection of Reference Point Set.* When the number of mesh points of the manikin changes, the Euler distance calculation formula is used:

$$D = \left\| P_g - P_m \right\|. \tag{1}$$

Obtain the bone points closest to every 3 skin points and define the equation as follows:

$$P_g = \lambda_{mi1}\left(P_{mi1} - P_{bi}\right) + \lambda_{mi2}\left(P_{mi2} - P_{bi}\right) + \lambda_{mi3}\left(P_{mi3} - P_{bi}\right). \tag{2}$$

For points on the grid, the reference point set and parameters are expressed as

$$P_g \longrightarrow \left(P_{m11}, P_{m12}, P_{m13}, P_{b1}\right), \left(\lambda_{m11}, \lambda_{m12}, \lambda_{m13}\right). \tag{3}$$

The above correspondence can be directly simplified as

$$P_g \longrightarrow \left(m_{21}, m_{22}, m_{23}, b_2\right), \left(\lambda_{m21}, \lambda_{m22}, \lambda_{m23}\right). \tag{4}$$

When calculating the new $P_g$, the index is directly used to obtain the corresponding 3D point coordinates of the target manikin for calculation.

*2.5.2. Initial Generation of 3D Garment Model.* After the source manikin point set corresponding to the grid points of the source 3D garment model has been obtained, the

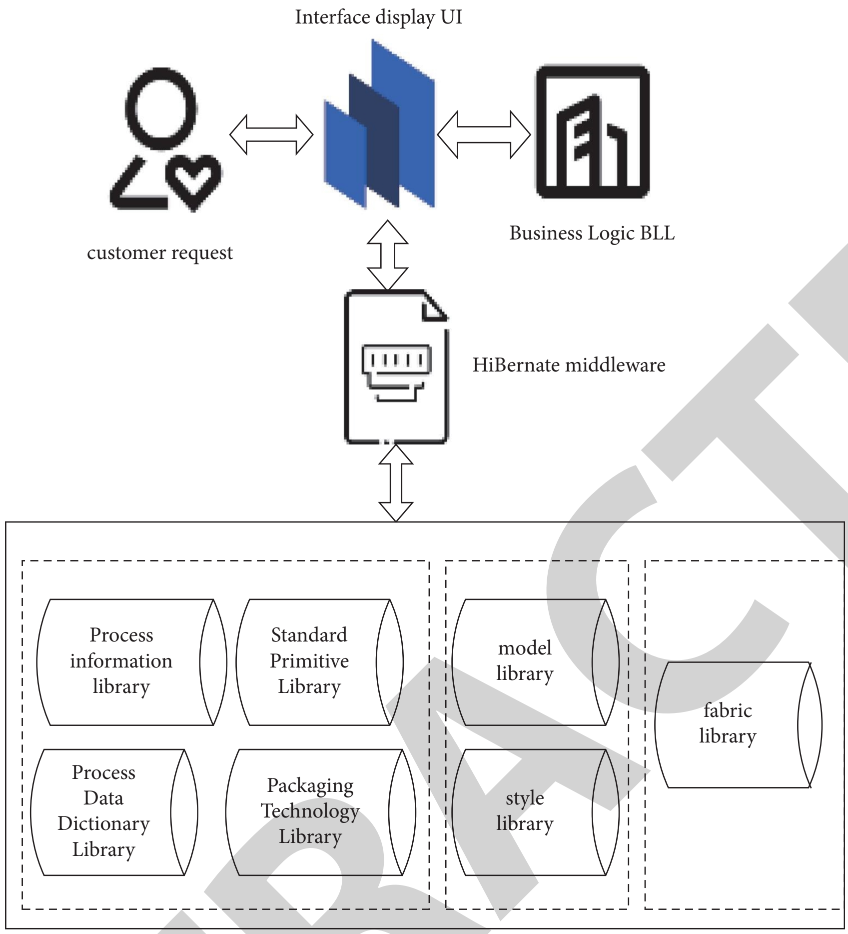



Figure 3: Multi database sharing technology.

Table 2: Fabric table database.

| Code | Name | Type |
|---|---|---|
| pin_no | Fabric number | char(20) |
| hxms | Pattern number (fabric category) | varchar(10) |
| zf image | Fabric diagram | Image |

Table 3: Automatically generate system database fabric database data table fabric table.

| Code | Name | Typechar(20) |
|---|---|---|
| pin_no | Fabric number | varchar(20) |
| hxms | Flower pattern | varchar(100) |
| Composition | Element | varchar(200) |
| Description | Illustrate | typechar(20) |

corresponding relationship can be used to calculate the initial coordinates of the grid points of the 3D garment model to be generated [23]. The formula is as follows:

$$P_{gnew_i} = \lambda_{mi1}\left(P_{tmi1} - P_{tbi}\right) + \lambda_{mi2}\left(P_{tmi2} - P_{tbi}\right) + \lambda_{mi3}\left(P_{tmi3} - P_{tbi}\right). \tag{5}$$

Take the average value.

$$P_{gnew} = \frac{1}{k}\sum_{i}^{k} P_{gnew}. \tag{6}$$

From the average value formula to the initial coordinates of each point on the target 3D clothing grid. The number of patches and their vertex indexes remains consistent with the input 3D garment model.

*2.5.3. Maintenance of Shape, Adaptability, and Relative Position.* At present, the initial 3D garment model generated above only meets the maintenance of scale and scaling, and needs iteration to maintain the shape, adaptability, and relative position [24]. Local structure after sheet deformation. In this way, the maintenance of all triangle patch vectors on the 3D garment model can be converted to the minimization value of the following formula:

$$E_{\text{shape}} = \sum_{t}\left\|\tilde{p}^{t}\left(p^{t}\right)^{-1} - T^{t}\right\|_{F}^{2}. \tag{7}$$

It can be seen from the above that $T^t$ is calculated in the following way: first, use the normal vector reference $n^t$ of the triangular patch points on the source 3D garment model to project each triangular patch to the corresponding plane:

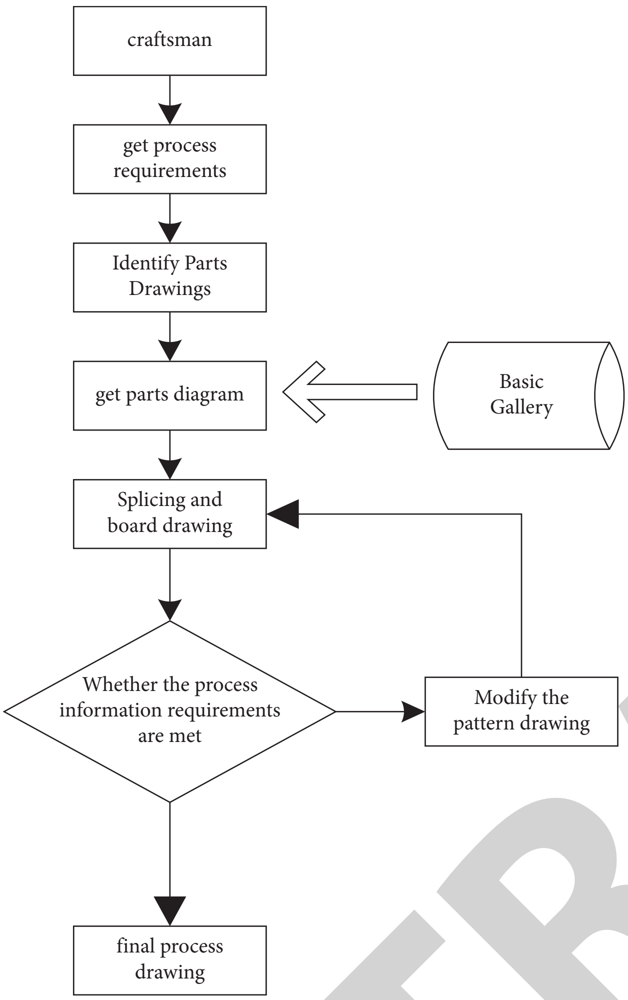



Figure 4: Process drawing process.

$$p_i^{\prime t} = \tilde{p}_i^t - \langle \tilde{p}_i^t, n^t \rangle n^t. \quad (8)$$

Get local structure:

$$P^{\prime t} = (p_4 - p_1, p_4 - p_2, p_4 - p_3). \quad (9)$$

Set up

$$Tt = p^{\prime t} \left(p^t\right)^{-1}. \quad (10)$$

The next step is to ensure that the value of the optimization function is not increased. The same is true for vertex calculation, which ensures that the optimization process is finally convergent. To enhance the relative position maintenance, use the following formula:

$$E_{r1} = \sum_p a_p \left( \langle \tilde{p} - \hat{p}, d_b \rangle 2 + \langle \tilde{p} - \hat{p}, d_t \rangle^2 \right). \quad (11)$$

The sum of the two parts is calculated to prevent the mesh of the 3D garment model from being distorted or misaligned relative to the skeleton. In order to enhance the adaptive maintenance of the loose area, it is also necessary to add an increment of the adaptive maintenance item to constrain the distance change between the manikin features and the three-dimensional clothing model:

$$E_{\text{fit}} = \beta \sum_{t \in F} \sum_{p \in t} \langle \left( \tilde{p} - \hat{p}, d_p \right) \rangle^2. \quad (12)$$

In the formula of adding relative position maintenance item, there are

$$E = E_{\text{shape}} + E_{r1} + E_{\text{fit}}. \quad (13)$$

Set $P$ as the initial point position generated based on the reference point set, and solve it according to the above two-step alternating iterative process until the formula converges at the minimum value, and update the position of the vertex of the target 3D garment mesh. Collision detection and processing are also required before and during the iteration [25].

*2.5.4. Smoothing.* After the 3D garment model of the target is generated, the uneven effect may occur due to the difference in human models, which needs to be smoothly adjusted. The basic Laplacian smoothing is first introduced as follows:

$$\delta_i = V_i - \sum_{j \in N(i)} w_{ij} V_j. \quad (14)$$

However, ordinary Laplacian smoothing will lead to the phenomenon that the three-dimensional model shrinks continuously, and the accuracy is low, so it is necessary to deform the Laplacian coordinate calculation formula. When $\text{weigh}_{ij}$ is used to represent the weight measurement of vertex $V_j$ when vertex $V_t$ is used as adjacency, the calculation formula is

$$weighi_j = \frac{1}{\left| V_i - V_j \right|}. \quad (15)$$

Then, there are

$$w_{ij} = \frac{weigh_{ij}}{\sum_{k \in N(i)} weigh_{ik}}. \quad (16)$$

To control the smoothing rate, $\lambda$ parameter is introduced, including

$$V_i = (1 - \lambda) V_i + \lambda \left( v_i - \delta_i \right). \quad (17)$$

The smoothing method is applied to the interactive modeling based on single image in the next chapter. For smooth adjustment based on curvature, the adjustment direction shall be considered when recalculating the weight. Generally, the normal direction of the vertex shall be selected as the moving direction, and the weight in Laplace smoothing shall be appropriately selected, taking

$$weigh_{ij} = \frac{\cot a_{ij} + \cos \beta_{ij}}{2}. \quad (18)$$

*2.6. Interactive Garment Modeling Based on Single Image.* Since a single image can provide less information, in addition to analyzing the image to obtain as much three-dimensional clothing model information as possible, such as image segmentation area, depth, etc., some information still needs to be specified by the user, such as clothing contour, sewing line, skeleton joint point information, etc. [26]. When designing user interaction, we should try our best to be concise and applicable.

The formula for calculating the color distance between pixels is

$$d_c = \sqrt{\left(l_j - l_i\right)^2 + \left(a_j - a_i\right)^2 + \left(b_j - b_i\right)^2}. \tag{19}$$

$d_s$ represents the spatial distance between pixels, and the calculation formula is

$$d_s = \sqrt{\left(x_j - x_i\right)^2 + \left(y_j - y_i\right)^2}. \tag{20}$$

Then, the distance measurement $D$ can be obtained by the following formula:

$$D = \sqrt{\left(\frac{\mathrm{dc}}{m}\right)^2 + \left(\frac{\mathrm{d}_s}{S}\right)^2}, \tag{21}$$

where $m$ represents the maximum color distance, but it is not only related to the image color space, different images contain different color spaces, but also related to the clustering calculation rules. This chapter mainly completes the interactive garment modeling of a single image. The whole process includes analyzing the image, cutting it into different parts, selecting the garment area, adjusting the garment contour line and the connection point of the garment area, generating the initial two-dimensional garment piece, specifying the suture line and specifying the bone joint point, calculating the initial depth information and relative depth information, smoothing and adjusting the initial depth information, Generate the final 3D garment model [27]. For the search area, in order to improve the efficiency of the algorithm, the $2\,\mathrm{S} \times 2\,\mathrm{S}$ area centered on the current pixel is generally selected instead of the whole image, as shown in Figure 5.

It can be seen from Figure 5 that since the search area of each pixel in the iteration process is designated as $2\,\mathrm{S} \times 2\,\mathrm{S}$, there are at most 8 cluster centers in the search area, and the number of iterations is generally about 10. This means that the SLIC super-pixel segmentation algorithm has O(N) time complexity, and N represents the total number of image pixels, that is, its complexity is linear in the number of image pixels, which is also the reason why this algorithm is called linear iterative clustering.

This chapter mainly completes the interactive garment modeling of a single image. The whole process includes analyzing the image, cutting it into different parts, selecting the garment area, adjusting the garment contour line and the connection point of the garment area, generating the initial two-dimensional garment piece, specifying the suture line, and specifying the bone joint point, calculating the initial depth information and relative depth information, smoothing and adjusting the initial depth information, Generate the final 3D garment model.

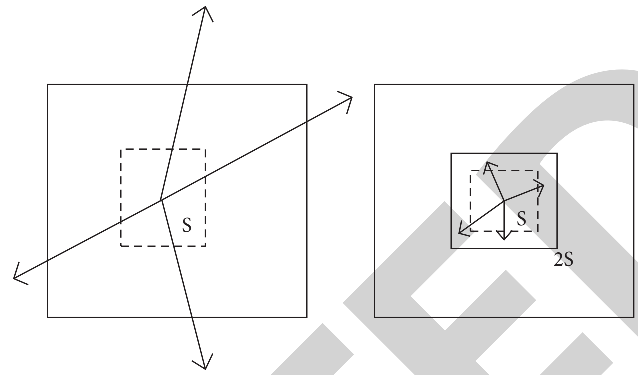



Figure 5: Selection area of seed pixels.

## 3. Design System Analysis of Apparel Graphics

In analyzing the apparel graphic design system, this study first conducted a sample statistical analysis of the CP-VTON dataset. The sample size statistics and division are shown in Figure 6.

From Figure 6, it can be found that there is a serious sample imbalance in the training sample. To address this problem, this study first uses data enhancement the data to alleviate the sample imbalance. In addition to this, corresponding improvements are also made in the loss function.

*3.1. Comparison of Normalization Methods.* In this section, we analyze the advantages of the AdaIN normalization approach in terms of the convergence process of the loss and the generation effect. The loss aspect is shown in Figure 7.

It can be seen from Figure 7 that after 700000 iterations, the loss value of the BN-based clothing style migration network is 0.78, IN-based clothing style migration network is 0.66, and AdalN-based style migration network is 0.48. Thus, it can be seen that AdalN-based style migration network training has the smallest loss value, and the loss value is reduced by 0.18 compared to the style migration network using IN and 0.30 compared to BN. The loss value is reduced by 0.18 compared to BN and 0.30 compared to BN. It shows that under the same conditions, the generation results of the style migration network based on adain have less error with the real label, and the image generation effect is more realistic. This provides a basic guarantee for the next step to paste the generated pictures on the clothing base map to realize the clothing local pattern design. In terms of generating results, the candy style and wave style are illustrated as an example and the style graph is shown in Figure 8.

It can be seen from Figure 8 that the local patterns generated by the design system in this study will retain more details, and the patterns will be clearer and more natural after being integrated into the garment base map. The goal is to transfer the specific style to the local pattern of the garment, and generate the new pattern while retaining the details of the original.

*3.2. Comparison with Other Networks.* At present, most of the researches on style transfer focus on the effect of style transfer and do not pay much attention to the engineering process of garment image fusion. Therefore, in order to fairly prove the

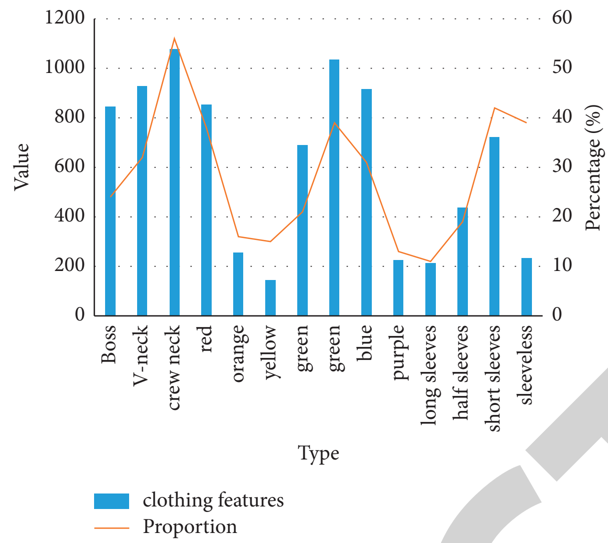



Figure 6: Sample survey statistics.

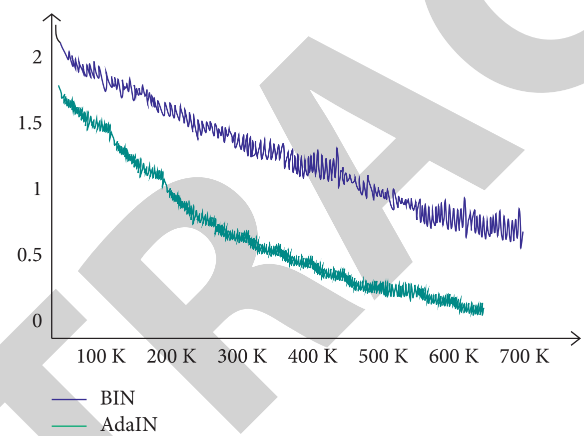


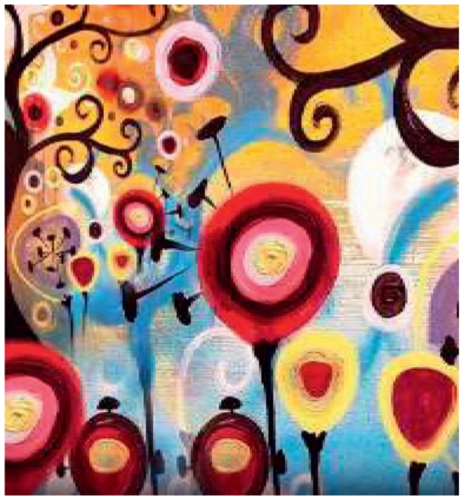

Figure 7: Network training variation graph.



advantages of the proposed network applied to clothing local pattern design, this study compares the pattern style migration effect of the improved algorithm with the classic style migration algorithm and the real-time style migration algorithm. Then the pattern results generated by the three algorithms are fused with the garment base image using the same fusion algorithm, and then the effect of local pattern design is compared. After completing the training of the above three algorithms, this study counts the training results of the three algorithms. In terms of the loss function, the loss convergence process of the three networks is shown in Figure 9.

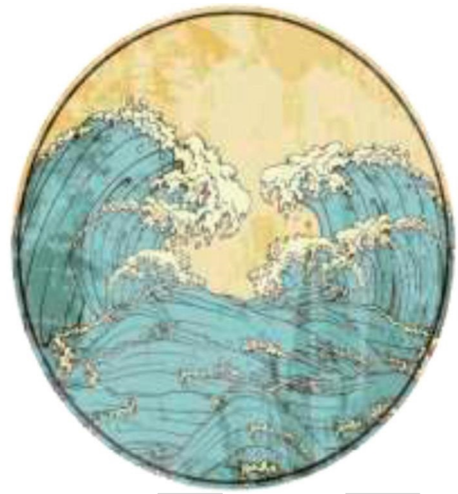
As can be seen from Figure 9, after training convergence, the loss value of the classic style migration network is 1.23, that of the real-time style migration network is 0.79, and that of the improved algorithm in this study is 0.48. It can be seen that the training loss value of the proposed algorithm is the smallest, which is 0.75 less than that of the classic style migration network and 0.31 less than that of BN. It shows that under the same conditions, the error between the generated result of the improved network and the real label is less, and the generated effect is more realistic.

*3.3. Experimental Verification.* The computer hardware and software configuration adopt Ubuntu 64 bit system, with i78700k processor, 24 g memory, and a 1070ti graphics card. The software environment is pytorch 1.4. The data set adopts the open source deep fashion data set of HKUST, which contains 289222 images. Each image has I category annotation. This study selects the following 20 attributes as the categories of clothing style migration: coat, shirt, cardigan, coat, dress, Hoodie, jacket, jeans, jogging suit, one-piece suit, kimono, tight pants, one-piece pants, shorts, skirt, sweater, sports pants, back heart, T-shirt, top. The parameters used in the training are as follows: the initial learning rate is 0.0002, the image input size is $32 \times 32$, and the number of iterations is 40000. In order to compare and analyze the style migration effect of the improved algorithm in this chapter with that of the original dcgan, the style migration experiments of dcgan and the improved algorithm in this study are carried out under the same experimental environment. The PR curve before and after experimental improvement is shown in Figure 10.



Candy style

(a)



Spray style

(b)

Figure 8: Style picture example. (a) Candy style (b) spray style.

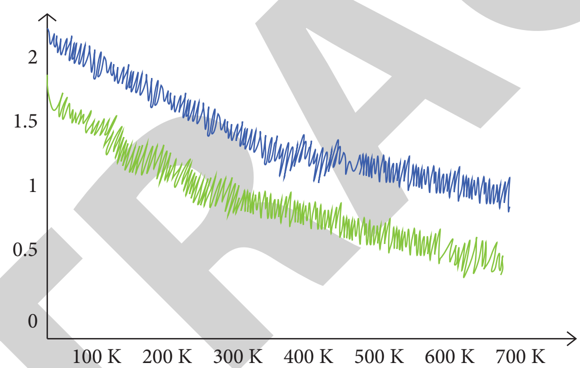
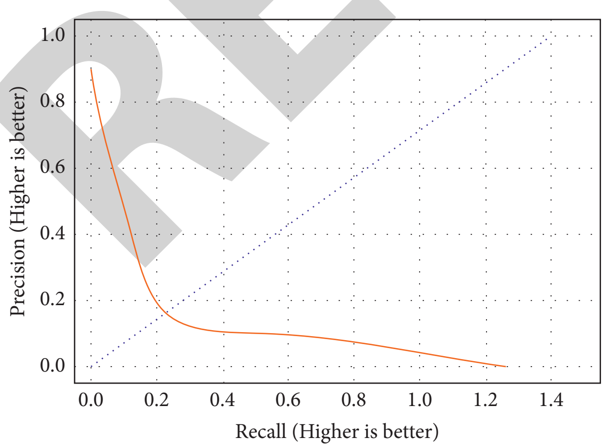
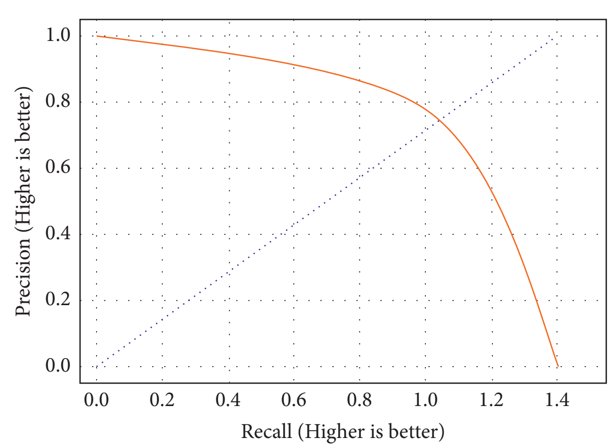



Figure 9: Training convergence graphs of two kinds of networks.




(a)




(b)

Figure 10: PR curve before and after experimental improvement. (a). Before improvement. (b). After improvement.

From Figure 10(a), it can be found that after the iteration convergence of the model, the recall rate of dcgan is increased, and the accuracy is significantly reduced, indicating that the feature extraction ability of the model is too weak, resulting in poor overall style migration. As can be seen from Figure 10(b), after the improved algorithm in this study uses the deep feature extraction network for improvement, the feature extraction ability is significantly enhanced, the generated style migration effect is good, and it can maintain high recall and high precision.

## 4. Conclusions

Aiming at the problems of garment modeling in a 3D garment pattern design system, this study improves and implements two garment modeling algorithms based on the existing related research. In view of the problem that the current fashion pattern design relies heavily on the designer's experience and inspiration, and lacks of intelligent generation scheme, this study proposes to use the real-time style migration network to intelligently generate new fashion patterns, and then seamlessly attach them to the styleless clothing, so as to realize the end-to-end intelligent design of clothing local patterns. This study has studied many aspects of clothing appearance intelligence, but considering the complexity of real design, there are still some improvements in this system: (1) in terms of clothing local attribute editing, due to the limitations of the data set, this study modifies the collar, sleeve length, color and other attributes of the clothing collected in the training data set. And the effect of modifying the relevant attributes of any garment. If a more comprehensive data set can be collected for training, the generated results can be improved. (2) In terms of local pattern design, there is still room for optimization of the fit between the generated pattern and the garment base map. At present, the fitting position is specified, but in fact, the fitting at unconventional positions sometimes has a more design sense. In the future, we can study the influence of different position relationships between garment pattern and garment base map on the final effect of garment. (3) In terms of the overall style migration of clothing, the migration of any style can not be realized at present. In the next step, the migration of any style can be realized by expanding the style type of the data set and modifying the training loss function.

## Data Availability

This article does not cover data research. No data were used to support this study.

## Conflicts of Interest

The authors declare that they have no conflicts of interest.

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