Design and Implementation of Aerospace Arisa Fashion Design CAD System Based on Deep Convolution Neural Network

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Abstract. The application of garment computer aided design (CAD) technology is not only a sign reflecting the scale and benefit of garment enterprises, but also a technical guarantee for garment enterprises to improve their competitiveness. Its basic principle is to construct a multi-level exploratory neural network model, use the image data represented by existing classification to supervise the network model in advance, and to achieve the function of accurately identifying unknown types of images. In this text, a multi-feature fusion image feature extraction method based on Deep learning (DL) is proposed. The DCNN model based on GA optimization is used to extract clothing style information from clothing images, and the multi-features obtained from DCNN model with transfer learning are combined with image texture features, and then input into XGBoost framework for learning, so as to improve the accuracy of clothing layout method. The experimental results show that the model accuracy of our method is more accurate than traditional neural networks, and the modeling accuracy is obviously improved. The algorithm uses artificial neural network technology to simulate the experience and technology of pattern designers, and provides support for the design and implementation of aerospace Arisa fashion design CAD system.

Keywords: Fashion Design; CAD; Deep Learning; Deep Convolution Neural Network; Feature Extraction
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1 INTRODUCTION

Clothing CAD, as an important branch of CAD technology, is the result of the infiltration of computers into all aspects of the clothing industry. Clothing layout refers to the scientific arrangement of all garment pieces of various specifications within a certain fabric width under the condition of meeting the requirements of garment production technology, with the aim of maximizing the utilization rate of fabric, reducing the product cost and providing feasible basis for bed separation, cutting and other processes. It is an important means to realize image mining by using computer technology to accurately and efficiently identify and understand image data and dig out the important information contained in it. The application of garment CAD technology is not only a sign reflecting the scale and benefit of garment enterprises, but also a technical guarantee for garment enterprises to improve their competitiveness. Clothing layout is that under the software system that has been put in place, the operator provides all the garment pieces graphics, necessary process requirements and data to the computer, so that the computer can identify and layout within the specified time, thus achieving the highest area utilization rate. The extraction of image feature information is the core task in the stage of clothing layout. Traditional image feature extraction methods are generally based on shallow structure algorithms, and these shallow learning algorithms need to extract complex features manually. This artificial feature design method has some problems, such as poor generalization performance, insufficient feature extraction and insufficient computing power, which leads to poor classification effect in large-scale image data sets.

The advantage of clothing layout is that the complexity of manual layout is greatly reduced by computer automatic layout and manual interactive layout, which improves the layout speed and provides scientific guidance for purchasing fabrics and accessories in the early stage of clothing production. In the stage of clothing image feature extraction, because image features contain various visual information such as pixels, colors, shapes and textures, when classifying images, different classification information is emphasized, image feature selection is also different, and the final result will be different because of the angle selection. DL is a hierarchical processing of image information through bio-neural bionic system, and it is an effective method for image data representation learning in machine learning. DCNN is an important model to realize image detection and intelligent control in machine learning, which solves many problems of image and speech recognition and classification. DCNN is a kind of neural network model with multi-level structure. Its basic principle is to construct a multi-level sounding neural network model, use the image data represented by existing classification to supervise the network model in advance. In this text, a multi-feature fusion image feature extraction method based on DL is proposed. DCNN technology is used to simulate the experience and technology of pattern designers, which provides technical support for the design and implementation of aerospace Arisa fashion design CAD system.

Building a clothing style design and layout system based on DL and CAD has become a new model to meet the diversified needs and personalization of the current clothing industry. In the traditional task of image feature extraction, the problem of high-dimensional feature space may lead to inefficient learning process. The main problem is that a large part of the input data may have nothing to do with the results, so it is necessary to preprocess the data to filter out the information fragments that have nothing to do with the characteristics. The image feature extraction stage of multi-agent reinforcement learning consists of an interactive image environment, in which multiple homogeneous agents cooperate to perform classification tasks. Each agent makes a partial observation of the environment. In this text, the application of DL algorithm in aerospace Arisa clothing style design CAD system is studied, and its main contributions are as follows:

(1) In this study, the DCNN model optimized based on genetic algorithm (GA) is used to extract the clothing style information from the clothing image, and the multi-features obtained after learning the DCNN model with transfer learning are combined with the image texture features, and then input into XGBoost framework for learning, so as to improve the accuracy of the clothing layout method.

(2) In this model, the DCNN is used to establish the agent's perception of image sequence, form the understanding and classification of local images, and the multi-agent reinforcement learning algorithm based on value decomposition network is used to train the agent's strategy network, so as to improve clothing feature extraction and layout decision.

In this text, the function of garment design CAD system is analyzed firstly, and then the image feature extraction and fusion model of garment CAD system based on DCNN is constructed, and the modeling performance of this model is tested. The results show that this method can effectively use artificial neural network technology to simulate the experience and technology of pattern designers to improve the garment CAD design process, and its application in aerospace Arisa garment design CAD system is feasible.

2 RELATED WORK

Brunton et al. [1] utilized data-driven approaches in machine learning for multi-objective constraints and optimization. Integrating deep learning and other methods into the perspective of machine learning technology in aerospace engineering. Fan et al. [2] established a clothing style rule matching library based on the edge feature points of the image. Using a seed algorithm, it annotates the features of the segmented clothing style matching recognition and line segment set. Computer virtual reality systems have received great attention in the field of commercial clothing. Fathi et al. [3] conducted a virtual clothing model construction method for 3D clothing matching. The virtual representation of 3D space transformation is carried out by using the Mannequin capture of 3D point cloud. The continuous development of intelligent aesthetics in modern clothing art has led to the same changes in different artistic media. Han et al. [4] analyzed the design process of digital status clothing products against Sexual network style. It transfers the process style through an intelligent clothing pattern design, reducing computational process costs. Kassah et al. [5] studied and analyzed CAD applications for clothing development. A cross-sectional survey design was used to perform multi feature fusion image feature extraction analysis on design objects in the clothing industry. The results indicate that the majority of students are not competent in the CAD application of clothing development.

Kim and Kim [6] conducted model analysis of time and image features, using standard model can significantly reduce errors in bone image and strategy trading. Lee et al. [7] analyzed the risk management of flight factors in commercial aviation under machine learning. It introduces an optimization model for time-of-flight data cleaning and safety correlation analysis that can monitor Data and information visualization. By conducting conceptual model analysis of relevant parameters on heterogeneous datasets, the preliminary guidance of machine learning is ensured. Li et al. [8] constructed a local information model in the multi-level feature extraction of image spatial position perception. The hierarchical feature analysis of the segmentation network is carried out using the aggregation of geometric features of adjacent points in the coordinate system and the perception of spatial positions independently. Liu et al. [9] conducted spatial feature analysis of image pixel propagation for graphic encoders. In order to reduce the spatial problem of irregular image spatial feature model pixels, it analyzed the edge weights of edge data. And propose a model where CNN and GCN can collaborate in a single network. Compared with other state-of-the-art methods, the proposed method is competitive in training dissemination. Marjanovi ć Et al. [10] analyzed the model design of a computer textile pattern for a complex sleeve form of clothing. By using computer-aided technology to analyze the three-dimensional simulation characteristics of clothing sleeves, the relationship between the physical and mechanical properties of 3D materials was optimized in actual manufacturing. Developed computer designed 3D models for color and fabric pattern changes, achieving realistic visualization of clothing series design.

Murota et al. [11] conducted development simulations of geometrically complex clothing designs. The geometric shape of a three-dimensional clothing model was constructed using computer CAD technology. Its establishment of data analysis helps to model the transfer of detailed moisture and heat values in the central area of clothing. In traditional printing pattern design, complete marking and floating must be carried out according to the contour of the pattern. Avoid incomplete contour boundaries in non-floating areas. Panneerselvam et al. [12] analyzed the development and design of corner pixel graphics algorithm programs under pixel graphics. The system analyzed the pattern algorithm options for binding, weaving, and marking the color contours. Rashid et al. [13] analyzed the visual monitoring performance of intelligent robots. This method extracts features through feature vector fusion with maximum covariance. The results indicate that the ensemble function dataset based on spatial discrimination has high accuracy. In order to carry out stable image recognition under light conditions, Sun et al. [14] analyzed Big data video Gesture recognition technology under the development of artificial intelligence. By using a Convolutional neural network algorithm with multi-level fusion features, it improves the fusion accuracy of multi-level features of image gesture. Tan et al. [15] conducted Analysis of algorithms of image classification in the clothing industry, which constructed the learning characteristics of the network Activation function of exponential linear units, improved the anti-interference ability of the network of training image data sets, and reduced the problem of over fitting in the module layer. Tian and Li [16] constructed an intensity analysis of heat transfer fluid motion in three-dimensional clothing of the human body. The heat transfer patterns of clothing vents and microclimates under different fire intensities were studied through CAD assisted experiments. Zhou et al. [17] conducted a Supervised learning type data marker analysis with non-overlapping targets. It proposes an unsupervised multi feature graph range learning model, which optimizes the adaptive multi feature graph learning convergence of the final goal by classifying the model's feature descriptions.

3 THE FUNCTION OF CAD SYSTEM FOR CLOTHING STYLE DESIGN

The clothing style design CAD system mainly provides three functions: 1 Renderings/Style Module: Designers can directly use the drawing function provided by the system to render renderings, or use the graphic editing function provided by the system to adjust existing renderings, thereby completing the design of renderings. In addition, this module also provides Mannequin and special tools for style design to help designers complete rendering design. 2. Paper pattern design module: This module provides various design methods such as prototype method and proportion method, making it convenient and flexible to make patterns. At the same time, it has high-precision rendering ability and strong collaborative design ability, which helps to improve query and retrieval efficiency, facilitate sample management, and also save costs. 3. Paper sample scaling module: This module provides three methods: point scaling, line scaling, and rule scaling to ensure the accuracy of paper sample scaling. In addition, it greatly shortens the design and production cycle, improves the company's rapid response ability, and saves manpower. The specific functions may vary depending on different clothing style design CAD systems.

The computer style design system also has the functions of image acquisition, image editing and a large amount of information storage. A large number of clothing information materials are input through scanners and cameras, and various materials are classified and built into a database for designers to consult, refer to, select, track fashion trends and inspire design inspiration. Clothing CAD style design system provides designers with powerful design tools and brand-new design means, and its importance lies in freeing designers from repetitive and boring clothing painting processes, reducing labor intensity and putting more time and energy into creation. In clothing style design, the processing of graphics and images is the most basic and commonly used function. In other words, clothing design through clothing CAD style design system is actually the stage of processing graphics and images. Image feature extraction is the stage of extracting data that can express image characteristics from images by computer technology, and generating non-image representations of images that can be understood by computers based on processing and analysis. The task of intensive image description generation needs to locate the semantic areas in the image and describe each target area with natural language phrases or sentences. The existing work has made outstanding progress in intensive image description tasks, but these algorithms will encounter many difficulties in language description based on the visual characteristics of target areas due to the lack of contextual information interaction between targets.

Clothing categories can be easily identified by global features, but it is even more difficult to quantify the subjective style. Therefore, when completing difficult recognition tasks, relying solely on global features sometimes can't achieve the expected results at all. At each time step, agents collect some observation results of the environment at the current position from the environment and process the observation results locally. Then the agents choose specific actions to change their positions according to the observation results. The common goal of agents is to identify the key features of images from a limited number of categories and classify images in a limited time step. Traditional feature extraction methods can't make full use of the advantages, so the number of feature internal parameters is relatively small. However, DL can learn features from massive data, including tens of thousands of parameters, so the feature expression effect extracted by this method is more significant. Therefore, it is necessary to increase training samples in the stage of image feature extraction using DL model. Clothing designers can start by drawing basic geometric figures as the outline of clothing and finish the design of the whole clothing style.

4 IMAGE RECOGNITION BASED ON DCNN

In DL, DCNN is the most commonly used DCNN to deal with computer vision tasks. It is the most widely used model in DL and visual recognition, and has made great breakthroughs in image feature extraction and detection. DCNN is widely used in DCNN, or to compress and transform the image. Kavukcuoglu and others used unsupervised method to learn multi-layer sparse convolution features for image recognition. Different from the method of using linear decoder to reconstruct images from sparse features, this method trains an effective feedforward encoder to predict quasi-sparse features from the input. DL technology enables machines to automatically learn the multi-level abstraction and representation of objective objects, so as to understand the internal meanings of images, sounds and texts.

The traditional image feature extraction method is to extract the features of the image first, and describe the image information by using some salient features, that is, to transform unstructured image data into structured data to represent features, and then input these structured features into the classifier model for training, and finally obtain the classification results. However, the accuracy of this pattern classification method depends on the effectiveness of the extracted features. Some inefficient features without recognition will have a negative impact on classification performance. Therefore, image feature extraction focuses on feature learning and hopes to automatically learn significant features from images. Huang et al. select the same style of clothing based on joint segmentation, and effectively solve the cross-domain retrieval problem of fashion clothing images by extracting the bottom features such as edges and colors of clothing areas. In this text, the original segmentation branch is realized by cascade, so that more diverse data samples can be used to train the segmentation branch. For the mask branch, as shown in Figure 1, the main body of the model uses the classical full convolution network (FCN). The result produced by the previous mask branch is passed to the mask branch of the next stage after Maxpolling, and connected with RoIs, and then used as the input of the next stage.

The motives for using deep structures are as follows: the expressive ability of shallow structures is limited. DCNN can independently learn the deep features from the bottom to the high level from massive images, avoiding the tedious feature extraction process, and input the features learned from the images into the neural network, and realize the effective classification of images by adjusting the network parameters. Theoretically, DL network can fit any complex function, showing a strong ability to learn sample features. DL model can not only perform unsupervised clustering tasks, but also perform supervised recognition and retrieval. Compared with traditional methods, DL does not need to design features manually, and can automatically extract the feature information of the target, which shows strong recognition ability in many tasks.

$$y = x * w \in R^{u \times v} \tag{1}$$

The size of the extracted features:

$$u = \left[\frac{n - s + 2 \cdot Zeropadding}{Stride} \right] + 1 \tag{2}$$

$$v = \left[\frac{m - k + 2 \cdot Zeropadding}{Stride} \right] + 1 \tag{3}$$

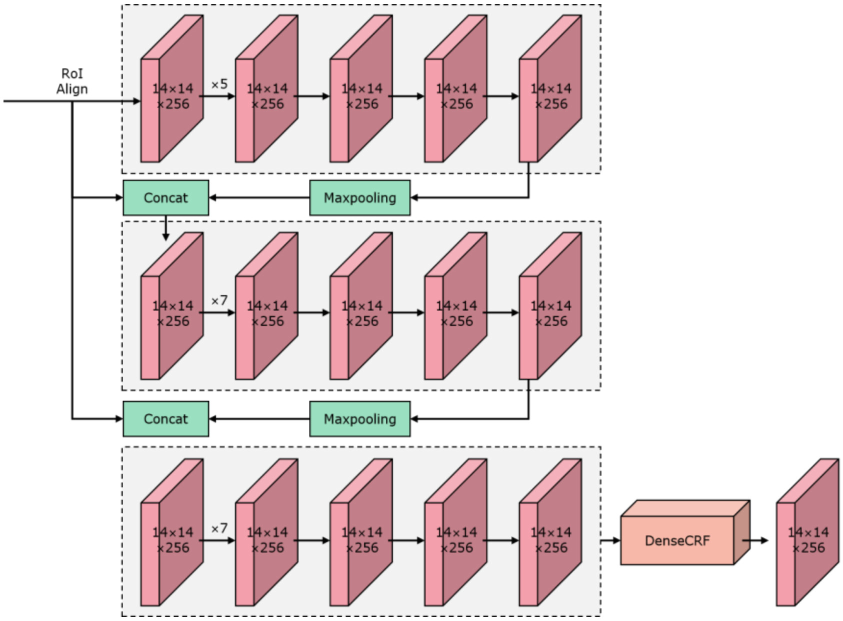

Figure 1: Segmentation branch structure of multi-threshold probability model of clothing image.

When two feature vectors are perpendicular to each other in different dimensions and their importance is equal, the distance between the two feature vectors can be expressed by Euclidean distance. Mahalanobis distance is expressed as follows:

$$D(a,b) = (f_a - f_b)^T A^{-1} (f_a - f_b) \tag{4}$$

Where A represents the difference matrix of eigenvectors. The Mingshi distance is expressed as follows:

$$D(a,b) = \left[\sum_{i=0}^{N-1} | f_a(i) - f_b(i) |^{\lambda} \right]^{\frac{1}{\lambda}} \tag{5}$$

Among them, $\lambda = 1{,}2 \; and \propto$. When $\lambda = 2$, its form is Euclidean distance.

Multi-layer neural network structure can learn complex nonlinear functional mapping and can be effectively used as a image detection tool in intelligent application scenarios. Artificial neural network consists of many interconnected simple functional layers or neurons, and each layer works in parallel to solve classification or regression problems. Each network layer completes a specific task, and they are orderly combined into an end-to-end DL model to complete various classification or regression tasks. Different networks can be constructed by different combinations of these network layers. The convolution stage of clothing image feature extraction is shown in Figure 2.

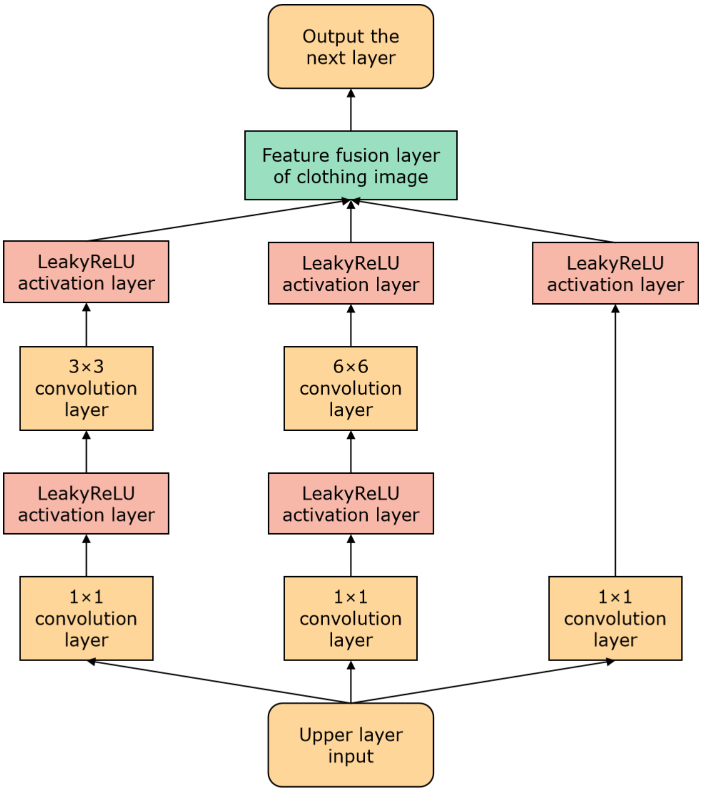

Figure 2: Convolution stage of clothing image feature extraction.

When the shape features of clothes and images are extracted, the extracted information range can be divided into contour features and regional features. Texture features in clothing images can truly reflect clothing texture or fabric and other related information. In the problem of automatic layout, the purpose of layout is not only to save materials, but also to make the layout time as short as possible, thus shortening the production cycle and improving the labor production efficiency. The garment pieces are wrapped into rectangles and then automatically laid out. Firstly, the calculation time of transforming garment pieces into polygons is saved. In addition, the automatic laying out of rectangular pieces does not need to calculate the cycle judgment of polygon intersection. Thereby greatly saving the time of automatic discharging. Different from the traditional clothing image recognition method, the clothing image recognition and classification method based on DL combines feature extraction with classifier input, and extracts and classifies features with a model. As the last layer of the model, the classifier is behind the whole feature extraction process.

5 IMAGE FEATURE EXTRACTION AND FUSION OF CLOTHING CAD SYSTEM

The training of DCNN is also facing difficulties. When training neural network models, a lot of labeled data are often needed to train the models to support the accuracy of the models. The traditional single-channel DCNN convolution kernel is single, and its feature extraction ability is insufficient. Justin and others proposed a multi-channel DCNN architecture to improve the classification ability of the model. In order to solve the problem of labeling data and training time, we can consider using transfer learning. The goal of transfer learning is to make the knowledge or model trained in a certain research field or a certain problem suitable for a different but related new field or problem through appropriate fine-tuning, that is, while retaining all the parameters of the previous convolution layer. In order to generate more vivid and rich natural language description text, the generation stage of natural language description will become a process from rough to fine.

In the genetic operation of clothing CAD model, because it includes 3D parts splicing, constraint processing and 3D presentation, it corresponds to the operation of points, lines, surfaces and their topological information of clothing CAD model parts, so binary coding is difficult to be applied to the genetic operation of complex 3D operations. For chromosome k with fitness f_k, its selection probability s_k is calculated as follows:

$$s_k = \frac{r_k}{\sum_{i=1}^{pop\_size} f_i} \quad (6)$$

Then sum the fitness values of all chromosomes in the population:

$$F = \sum_{i=1}^{pop\_size} f_i \quad (7)$$

For each chromosome, calculate the selection probability c_k:

$$s_k = \frac{r_k}{F} \quad (8)$$

For each chromosome, calculate the cumulative probability t_k:

$$t_k = \sum_{i=1}^{pop\_size} s_i \quad (9)$$

The purpose of adding Dropout to the network hierarchy is to reduce the degree of network over-fitting, which can effectively reduce the phenomenon of network over-fitting caused by insufficient training samples to some extent. In the stage of network training, the Dropout layer changes the output value of the activation function of the neuron nodes in the hidden layer to zero with a certain probability, which means that some networks are disconnected with a certain probability. Therefore, when updating the network parameters, these nodes connected with disconnected nodes will not be updated.

The risk function of the clothing design style feature fusion model is as follows:

$$\theta^* = \arg\min_{\theta} \frac{1}{N} \sum_{i=1}^{N} L(y_i, f(x_i;\theta)) + \lambda \Phi(\theta) \quad (10)$$

$$L(Y, P(Y|X)) = -\log P(Y|X) = -\frac{1}{N} \sum_{i=1}^{N} \sum_{j=1}^{M} y_{ij} \log(p_{ij}) \quad (11)$$

$$I_{Truth} = \begin{cases} 1 & if \ I_D \geq s \\ 0 & otherwise \end{cases} \quad (12)$$

$$L_{\mathrm{Mask}} = -\frac{1}{C} \sum_{i=0}^{C-1} \left(\alpha \cdot y_i \ln(y_i^{'}) + \beta \cdot (1-y_i) \ln(1-y_i^{'})\right) \quad (13)$$

When the parameters in the network are updated by the input samples of each iterative training, the neuron nodes in the hidden layer are randomly activated with a certain probability. Every iteration of the hidden layer neuron node can't determine whether it is activated, so the update of network parameters is random and does not depend on the joint action of the hidden layer neuron nodes with a certain relationship. Dropout can be regarded as an average model, because the network needs to update the network parameters during each iterative training, so the network structures corresponding to the training samples input to the network are different in each training, but these different network structures can share the parameters of the neuron nodes in the hidden layer. The stage of clothing image segmentation is shown in Figure 3.

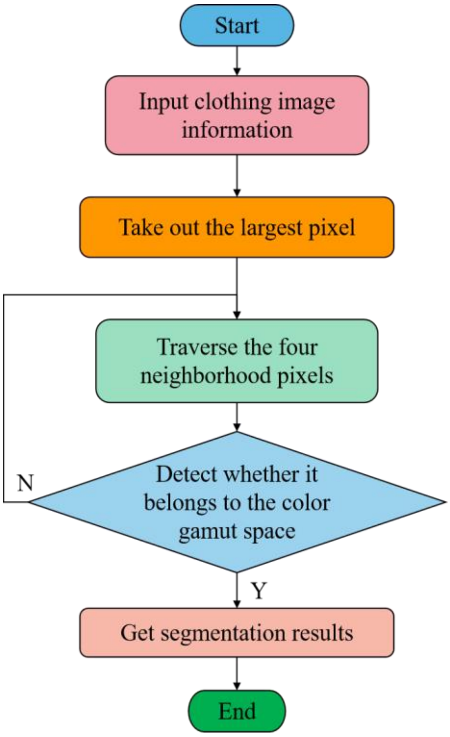

Figure 3: Clothing image segmentation process.

DCNN is extremely vulnerable to interference from confrontation samples. The so-called countermeasure sample is to add some small disturbances to the original clean sample. Although these disturbances are imperceptible to human eyes, they can induce DCNN to produce wrong output, that is, malicious attacks on the network. By training multi-layer neural networks, high-dimensional input vectors are reconstructed in the middle layer of smaller dimensions, and high-dimensional data are transformed into low-dimensional space. Firstly, multiple hidden layers of the neural network are pre-trained by unsupervised method, and then the weights in the "automatic encoder" network are accurately adjusted by gradient descent. The dynamic fusion method of clothing image features based on DCNN is shown in Figure 4.

The dynamic fusion of clothing image features refers to extracting clothing features from different images and combining them through fusion algorithms to generate a new image. This new image can contain all clothing features from the original image, but they will be combined in a new way to produce some interesting effects. For example, if we extract the features of two shirt images with different colors and patterns and perform dynamic fusion, we may obtain a mixed shirt image with two colors and patterns. Similarly, we can also fuse the features of pants images with different styles, colors, and materials to generate a brand new and unusual pair of pants.

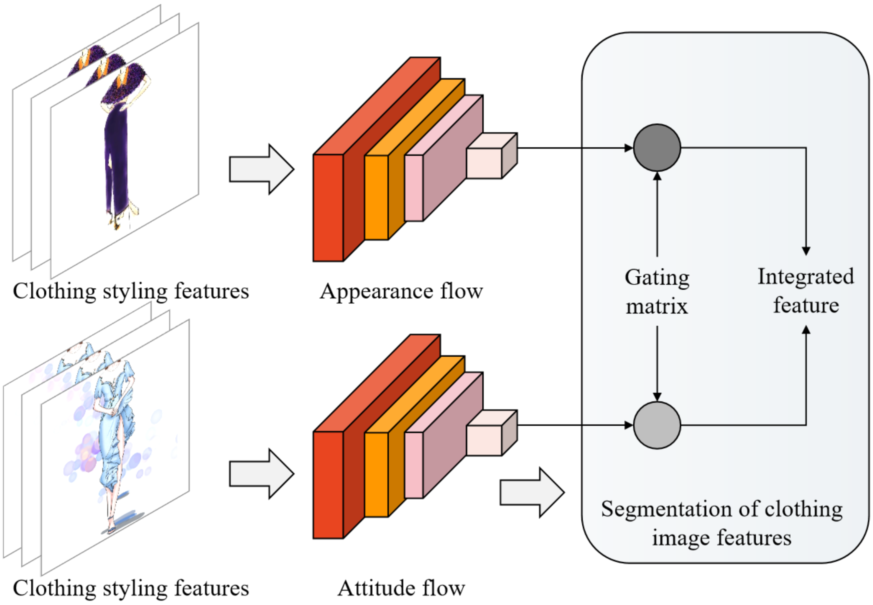

Figure 4: Dynamic fusion of clothing image features.

In order to generate fine-grained visual content, the model also needs to preserve the semantic details of the input text and the differences between different texts. In the semantic parsing generation network, the traditional batch normalization layer is further optimized by using individual text semantic information, so that semantic information can be better integrated into the generation stage of visual content. Algorithms for dynamically integrating clothing image features typically use computer vision and machine learning techniques. Firstly, image processing algorithms need to be used to extract the clothing features of each image, such as color, texture, shape, etc. Then, a fusion algorithm is used to combine these features to generate a new image. These algorithms can operate based on pixel level or higher-level features. The dynamic fusion of clothing image features can be used in many application fields, such as personalized clothing design and rapid prototyping. It can provide a new way to explore and create new clothing designs, and provide designers and consumers with more choices and creativity.

6 MODEL TESTING AND SIMULATION

The optimization of Arisa clothing style design system must combine the characteristics of clothing industry, and increase or strengthen the fabric processing function and pattern processing function. In terms of fabric treatment, we should be able to complete the design of woven and knitted fabrics, including the appearance design and organizational structure design of fabrics, and we should be able to control the texture of fabrics. The charm of simulation and design of aerospace Arisa garment design CAD system lies in that it does not need to spend a lot of manpower, material resources and time in factory operation. Through garment design CAD technology, it can freely convert 3D and 2D in the stage of garment structure design, and realize the 3D display of various parts of garment through computer. The accuracy of image feature extraction of different algorithms in clothing CAD modeling is shown in Figure 5 and Figure 6.

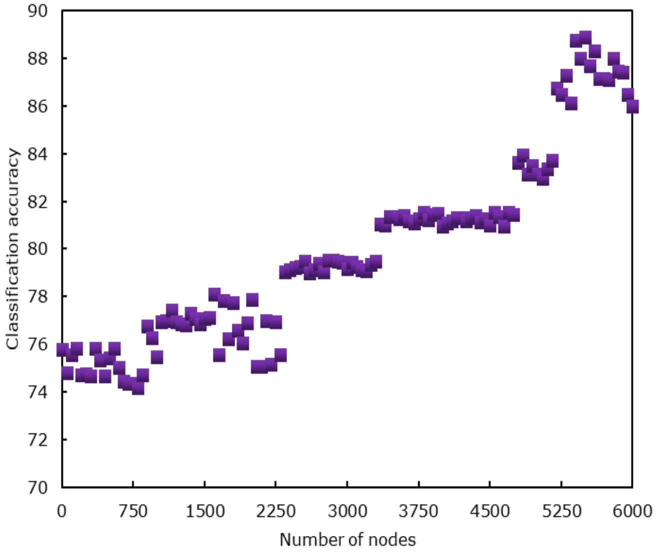

Figure 5: DCNN feature extraction accuracy.

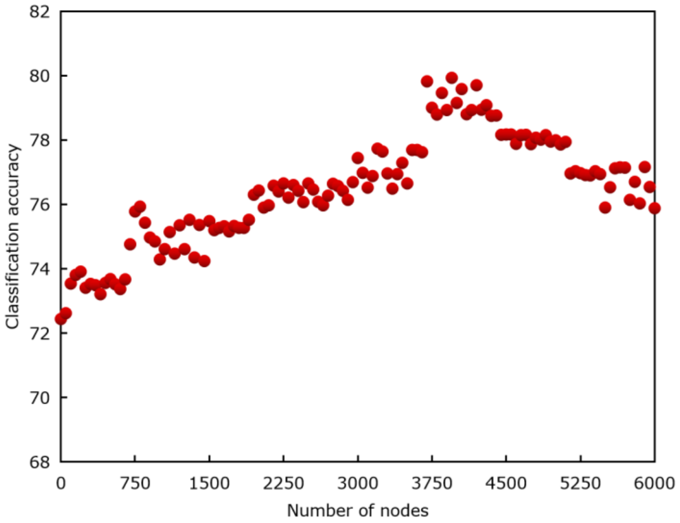

Figure 6: Accuracy of traditional RNN feature extraction.

The output of the model is determined by the sample set, so the selection of sample sampling method is a key issue. Generally speaking, the description text of the same picture contains the same semantic information because the content is basically the same, but the description text of any two different pictures contains different semantic information.

The purpose of batch normalization of semantic conditions is to strengthen the embedding of visual fish in the feature map of the generator. Based on the semantic information of the text, the visual feature map will be scaled and negative. These operations enable the detailed information of each individual's language text to directly affect the image feature map. The higher the threshold, the more accurate the prediction result is, but too high a threshold will lead to a sharp decrease in the number of positive samples, which will lead to the over-fitting phenomenon of the model; If the threshold is too low, the samples will contain more redundant results, which makes it difficult for the detector to distinguish between positive and negative samples and affects the training effect. The DCNN method is compared with the traditional RNN method, and the recall and MAE simulation results are shown in Figures 7 and 8.

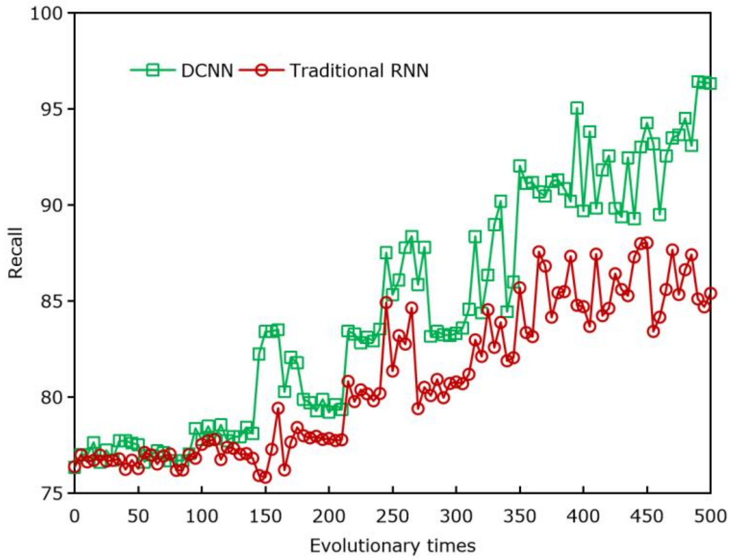

Figure 7: Comparison of recall.

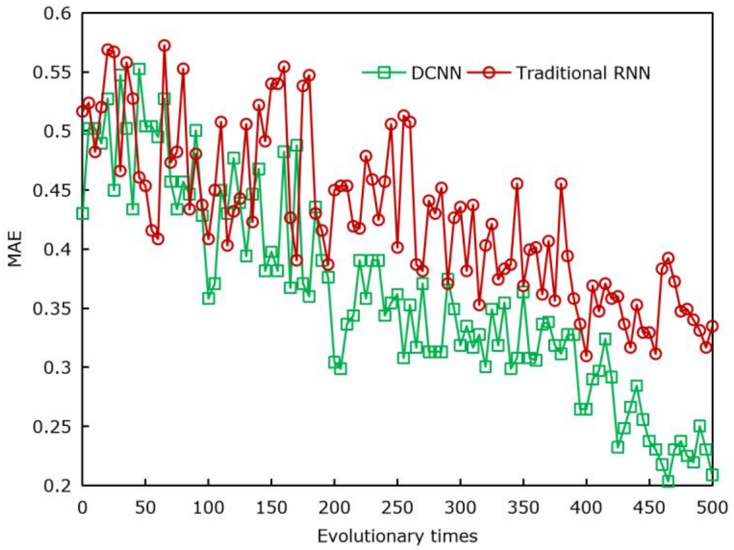

Figure 8: Comparison of MAE.

As can be seen from Figure 7 and Figure 8, through repeated iterations, the modeling accuracy of this method is higher than that of conventional RNN by ninety-seven percent, and the modeling accuracy is obviously improved. This method can accelerate the convergence of DCNN model parameters and improve the modeling accuracy of the model. The system focuses on the fashion design of clothing, making different clothing elements into unit parts, and changing the design stage of clothing into a simple assembly process, thus greatly simplifying and accelerating the design stage of clothing, and achieving good results. Designers express their unique feelings about the shape, color and material of clothing in an ideal form, and mastering the language of clothing painting is the premise and foundation for designers to design freely. With the rapid update of information and materials, traditional clothing painting methods can no longer meet the requirements of designers to express their design creativity, but clothing painting with rich performance effects can make designers get unexpected new play.

7 CONCLUSION

Clothing CAD, as an important branch of CAD technology, is the result of the infiltration of computers into all aspects of the clothing industry. The application of garment CAD technology is not only a sign reflecting the scale and benefit of garment enterprises, but also a technical guarantee for garment enterprises to improve their competitiveness. In the stage of clothing image feature extraction, because the image features include various visual information such as pixels, colors, shapes and textures of the image, when classifying the image features, different classification information is emphasized, and image feature selection is also different. The general layout algorithm is not specific to the clothing layout algorithm, but widely aimed at the layout of two-dimensional objects, so the technical requirements of clothing layout and the application of manual experience are not considered in detail. In this text, a feature extraction method of multi-feature fusion image based on DL is proposed. Using DCNN technology to simulate the experience and technology of pattern designers can be effectively applied to the design and implementation of aerospace Arisa clothing design CAD system. Through repeated iterations, the modeling accuracy of this method is significantly superior to that of conventional RNN, and it can effectively improve the overall artistic style and detail feature processing effect of the image.

In the next work, the method of obtaining many details of clothing by image recognition in aerospace Arisa clothing design CAD system is further studied experimentally, and the similarity of the text in the field of clothing products is studied to improve the quality of the generated clothing feature description.

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