

Retraction

Retracted: Application of Art Activities in Colleges and Universities Based on BP Neural Network Algorithm

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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] Z. Liang, Y. Assembaiuly, and S. Akbayeva, "Application of Art Activities in Colleges and Universities Based on BP Neural Network Algorithm," *Wireless Communications and Mobile Computing*, vol. 2022, Article ID 7081645, 10 pages, 2022.

Research Article

Application of Art Activities in Colleges and Universities Based on BP Neural Network Algorithm

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College education has also widely adopted new media technology, which has changed the previous single teaching method and enriched the teaching content. Art education plays an important role in higher education and is an indispensable part of our country's quality education. The content, methods, and concepts of art education in colleges and universities are also changing with the advent of the new media era. New courses such as multimedia technology, network animation technology, and network advertising design have been added to the teaching curriculum system of colleges and universities for stimulating students' interest in learning. The online network platform represented by WeChat has had a profound impact in the field of art education. Based on the technical characteristics of art works, this paper briefly classifies the characteristics of art works; the works perform the extraction of local data (picture elements); secondly, the texture feature parameters of each picture element are extracted by using the image histogram processing technology and the gray level co-occurrence matrix statistical analysis method; finally, a relatively mature machine learning model, BP, is introduced. The neural network algorithm learns the technical style characteristics of each part of the ink and wash work, so that on the whole, it can initially achieve the artistic style learning of the entire ink and wash painting.

1. Introduction

Art can be used as the universal language of the world, and it can achieve emotional communication across the barriers of region, race, age and gender [1]. Students can learn about the cultural connotations of different ethnic groups, regions, and histories by studying art courses, broaden their horizons, and understand the diverse civilizations of the world. Art course is a humanities course, it cultivates students' independent thinking ability and is the process of students' discovery and summarization [2]. In art courses, students can acquire the ability to discover beauty, feel beauty, and appreciate beauty, so as to better create beauty, and gradually discover their own shortcomings through learning, and constantly improve themselves [3]. The value of art is not only to provide the society with professional talents of art but also to improve people's humanistic quality and artistic accomplishment, so that students can get better development in all aspects [4].

Traditional classroom teaching refers to the teaching thought and mode founded by German educator Herbart in the early 19th century and later developed by Soviet educator kaimingfu. The form of classroom teaching is the well-known "five stage teaching method" of organizing teaching, reviewing old courses, explaining new courses, consolidating new courses, and assigning homework. From a historical point of view, it has played a positive role and is not useless even today. However, from the perspective of development, it has many disadvantages. "Internet + education" has greatly satisfied the needs of the education industry, and the WeChat public platform is favored by contemporary college students for its unique convenience, diversity, and openness [5]. At present, in the teaching of basic courses of art education in colleges and universities, due to the imbalance between teaching resources and the number of students, the number of classes is large, and the number of teachers is limited. Teachers cannot teach students in accordance with their aptitude, and the teaching effect often fails

to achieve the goal, resulting in the monotonous style of students' creative works and the lack of their own ideas [6, 7]. Due to the limited time, energy, and ability, teachers cannot teach in a targeted manner according to the characteristics of each student [8]. Obviously, computer technology has its own unique advantages, and it has become an effective hub connecting students, teachers, and parents [9].

Because of the professional characteristics, art courses in colleges and universities require a lot of picture resources and practical training as the basic requirements of teaching activities [10]. For teachers, the main means of classroom teaching activities is to bring visual effects to students in the form of pictures or videos [11]. However, the quality of online resource information is mostly mixed, the distribution of high-quality resources is not concentrated, and the blurring of picture pixels in network resources leads to deviations in the color level resolution and color tendency of paintings [12]. Students face a large amount of information due to the weak professional quality discriminating ability [13]. The traditional teaching mode is limited by time and space, which will cause information lag, and students do not have a systematic grasp of professional knowledge and cannot grasp the characteristics and knowledge background of painting as a whole [14].

Aiming at the artistic style characteristics of ink painting as an art form, this paper proposes a supervised style learning method based on feedback neural network [15]. Focusing on the input sample parameters and output information of the supervised learning network, find a suitable image processing algorithm, perform image enhancement, image segmentation, and image transformation on the input ink art works, and obtain a data set that is convenient for style analysis [16]. Based on the neural network algorithm of back propagation, the core of the learning system—the feature parameter discriminator—is constructed to process the feature parameters output by the feature extractor and learn the style information of ink works [17]. Using this system, through a large number of sample input training, an effective neural network recognition mode of ink painting artistic style can be established, which can be used to identify the artistic style characteristics of ink painting, and assist the style rendering system to simulate.

2. State of the Art

2.1. The Current Situation of Art Activities in Colleges and Universities in China. In order to better integrate computer technology into college art education, it is necessary to analyze the current situation of college art education in our country. Only by deeply understanding the current situation of art education in colleges and universities in China can we promote the reform and innovation of art education [18]. At this stage, art education in colleges and universities in China is mainly divided into three disciplines: pure art majors, design majors, and other categories of majors. There are several research directions under the three majors [19]. For example, art can be divided into art history theory, art education, oil painting, Chinese painting, public art, comprehensive art painting, and other minor majors focusing

on a certain direction; design can be divided into fashion design, graphic design, landscape design, interior design, industrial design, architectural design, environmental art design, visual communication design, and other majors; other majors include calligraphy, photography, and seal cutting. As colleges and universities gradually integrate multimedia technology into the education system, some colleges and universities have added new majors in recent years, such as animation design, digital media technology, and advertising planning [20]. Art majors are the majors with a relatively large number of students enrolled in colleges and universities, with good employment prospects. After graduation, students can enter publishing houses, advertising companies, film and television companies, animation production companies, etc. Figure 1 shows the number of art students in colleges and universities in China [21]. There are many kinds of art majors in colleges and universities in China, which leads to the shortage of art teachers in colleges and universities to a certain extent. On the other hand, modern education pays more attention to the cultivation of students' comprehensive quality and the teaching plan mode of multidisciplinary infiltration, which also puts forward higher requirements for teachers' comprehensive ability. In addition, due to the particularity of art education itself, many teachers pay too much attention to the training of skills and ignore the improvement of scientific research ability. The limitations of art educators' scientific research ability are not conducive to the development of art education theory in China to a certain extent. At the same time, some art students in comprehensive universities have weak professional foundation, low art literacy, and lack of solid basic skills. In art learning, solid basic skills are more important than talent. Due to the influence of the inherent teaching mode, some colleges and universities have opened some new majors, but the content of their teaching has not changed greatly, and they still focus on the explanation of theoretical knowledge, resulting in some students lacking the necessary skills for art majors [22]. Divergent thinking affects the quality of teaching.

2.2. Problems Existing in College Art Activities. In the art education of most colleges and universities in China, there have been problems such as backward educational ideas, unreasonable curriculum, insufficient educational mechanism, insufficient investment in art education, and teaching effects that need to be further improved. To build the art education system in colleges and universities, we should reform the old educational ideas, optimize the curriculum, improve the art education system and mechanism, increase educational investment, and strengthen teaching evaluation. At present, some high school students who are studying in general choose to participate in the training of art exams in various art exam training classes, studios, etc., in order to get into the ideal university. Among them, some students lack sufficient interest in art, and they do not have enough motivation to study after entering university, which leads to their low art professional quality. This affects the quality of art education in colleges and universities to a certain extent. Fine art is free art. At this stage, in the art education of colleges and universities in China, some teachers'

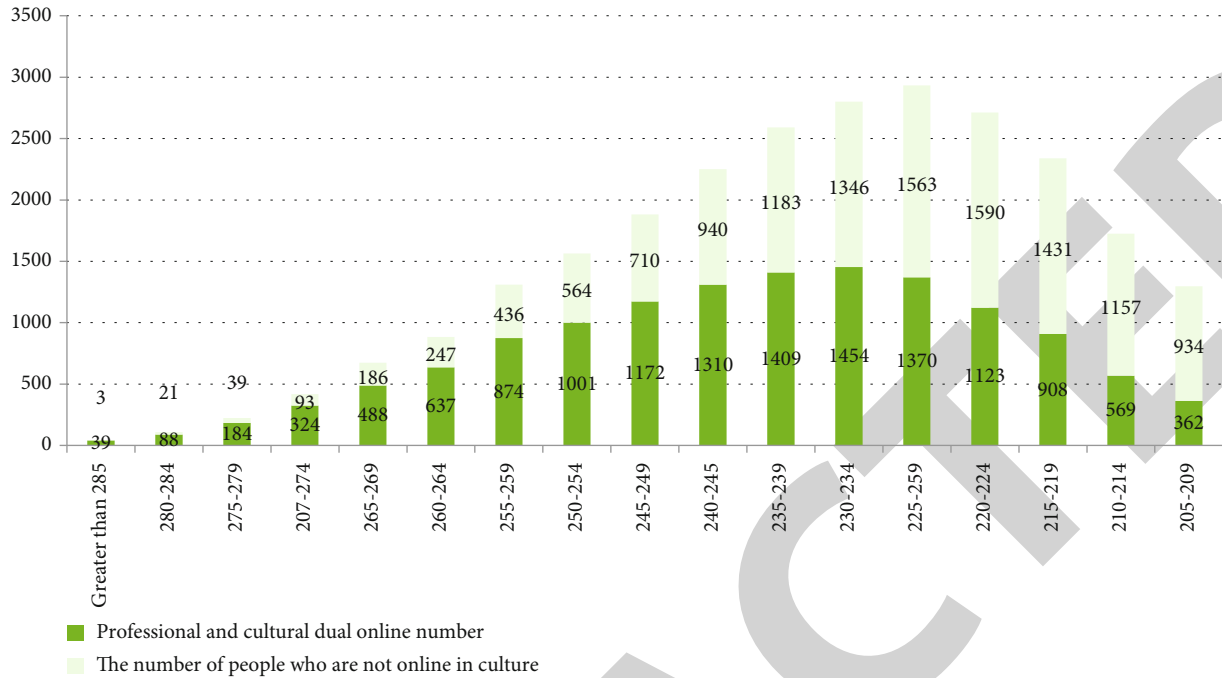


FIGURE 1: Number of students majoring in fine arts in colleges and universities in China.

educational ideas are relatively conservative, and they still use the previous teaching methods. In classroom teaching, they pay too much attention to imparting basic theoretical knowledge of art, emphasizing the training of students' art skills, imitation, and not practice. This kind of teaching method is relatively simple, and the teaching mode is relatively rigid. Students often only passively accept knowledge in their learning, which is difficult to stimulate their interest in learning, and also lack enough time to experience nature and understand life, and it is difficult to create excellent works. Some students fail to integrate their feelings into their creations, their works lack appeal, and their artistic literacy is difficult to improve. At the same time, the syllabus of some colleges and universities has not been updated in time with the development of new media, which also affects the effect of art education to a certain extent. At present, some students regard computer technology as a tool for daily life and entertainment, but they fail to combine it with learning, and do not give full play to the role of new media. Some students are even addicted to entertainment, which affects their professional learning. In addition, some teachers do not pay enough attention to the influence of new media and lack correct guidance for students, which makes students' cognition of new media misunderstood.

2.3. The Significance of Computer Technology Used in College Art Activities. The application of digital technology has transformed the inherent hand-painted education method into an electronic teaching method, which is conducive to the improvement of teaching efficiency and can make the art education system more perfect. With rich teaching resources, digital art education and teaching has become a bright spot in the reform of education and teaching in col-

leges and universities. The digital promotion of art education and teaching is not smooth sailing, and there is great resistance. On the one hand, some art teachers do not have enough understanding of the role of digitalization in classroom teaching and believe that the teaching method of digital art education deviates from the traditional education method and that students' artistic literacy can only be cultivated through pen, ink, paper and inkstone. On the other hand, some art teachers put digital education and teaching methods in opposition to cultivating students' artistic literacy and education and teaching reform and believe that the promotion of digital art teaching is not conducive to the development of art education. In fact, art education and teaching must closely follow the pace of the times. In the digital art education and teaching, the pen, ink, paper, and inkstone in traditional art education are replaced by computer software, which makes the preservation of art works easier. With the help of the Internet, works of art can be disseminated in a wider range. College art teachers should fully recognize the superiority of digital art education and teaching methods and make full use of it in daily teaching. Take the packaging course of visual communication design as an example. If we use computer software to apply technology, everything will become easier. For example, we want to teach students to draw a three-dimensional package in the course, so that students can use design software to measure and draw accurate dimensions. With accurate dimensions, the phenomenon of object scale imbalance will be reduced. At the same time, the gap between the drawn figure and the object entity is also smaller. By drawing the size map, we can use the computer 3D production software to draw the model of the object entity, realize a process from two-dimensional to three-dimensional, and finally give

materials and render the effect map. Compared with the effect drawn by hand, the effect drawn by using computer software application technology is more three-dimensional and realistic and also closer to the real object.

3. Methodology

3.1. Image Preprocessing System. Image preprocessing is to analyze the image, strengthen the potential features of the image, make the features of the image easier to be extracted by the subsequent feature extraction methods, and reduce the misjudgment of the subsequent feature extraction methods. The function of the image preprocessing system is, for the input image, after its processing, and the output is the processed result data (here are called primitives; in fact, the output primitives are organically combined into "objects"). This module separates the area of interest in the image, then performs segmentation, fusion, skeleton extraction, and other processing, and finally outputs the primitive information. The image preprocessing system is the first processing module of the whole project design. If the image data processing flow from the image preprocessing system to the stylized rendering system is regarded as an image data processing process, then the preprocessing system, like every other subsystem, has related input and output data. Figure 2 clearly draws the changes in the data processed by the subject in the entire processing flow.

3.1.1. Image Segmentation. The classic method of image segmentation is to convert a color image into a gray image for processing. Although Chinese ink paintings are mostly black and white, there are also a considerable number of coloring art works. Since the system needs to use the segmented regions as the input of the feature extraction module of the artistic style learning system, the spatial information and color information must be integrated to obtain a more reasonable segmentation effect and to generate more reasonable primitives. In view of this, this system will use the color image segmentation algorithm. Color image segmentation methods are generally divided into four categories: neighborhood-based methods, histogram thresholding methods, color clustering methods, and methods incorporating specific theoretical tools. Considering that due to the interaction between brush and paper and ink, as well as the characteristics of brush shape, physical properties, and ink color diffusion in ink works, each stroke that finally constitutes the entire ink work presents block or slender area characteristics. Therefore, based on the adjacent, the segmentation method of the domain has become the preferred method for the segmentation of ink works. Taking into account the segmentation effect and the complexity of realization, the method of regional growth is finally selected to segment the ink works. According to schematic diagram of Figure 2, it can be found that the system not only needs to extract each primitive of the original image but also organically combines the discrete primitives into different "objects." An object is a collection of primitives that are relatively close in the spatial and color domains. From the perspective of the whole system, combining primitives

into objects is the process of extracting objects of different ink styles from ink works. So, our image segmentation algorithm consists of two parts, region growing and object extraction (region merging).

(1) *Regional Growth.* Region growing is the process of aggregating pixels or seed regions into large regions according to predefined criteria. The basic approach is to start with a set of "seed" points that will be similar in properties to the seed (such as a specific range of gray levels or colors). Neighboring pixels are appended to each seed of the growing region, terminating when no pixels meet the conditions for joining a region. The interregion similarity measure employed during growth is based on the region-averaged color distance. The obtained color space distance, since the images processed by this system are mainly stored in RGB color format, we need to know the conversion formula between the two. To make the conversion easier, we first introduce the CIEXYZ space as a transition space. The formula for converting RGB color space to CIEXYZ space is as follows:

$$\begin{pmatrix} X \\ Y \\ Z \end{pmatrix} = 100 \cdot \begin{pmatrix} f\left(\frac{R}{255}\right) \\ f\left(\frac{G}{255}\right) \\ f\left(\frac{B}{255}\right) \end{pmatrix} \quad (1)$$

Among them,

$$f(t) = \begin{cases} \left(\frac{t + 0.055}{1.055}\right)^{2.4}, & t > 0.04045 \\ t, & \text{others} \end{cases} \quad (2)$$

The conversion formula from CIEXYZ space to CIE1976L *a*b* space is as follows:

$$\begin{aligned} L &= 116 \cdot g\left(\frac{Y}{Y_0}\right) - 16, \\ a &= 500 \cdot \left(g\left(\frac{X}{X_0}\right) - g\left(\frac{Y}{Y_0}\right)\right), \\ b &= 200 \cdot \left(g\left(\frac{Y}{Y_0}\right) - g\left(\frac{Z}{Z_0}\right)\right). \end{aligned} \quad (3)$$

Among the above three formulas are

$$g(t) = \begin{cases} t^{1/3}, & t > 0.008856 \\ 7.787t + 16/116, & \text{other} \end{cases} \quad (4)$$

X, Y, and Z are the tristimulus values of the sample color, and X_0 , Y_0 , and Z_0 are the tristimulus values of the CIE standard illuminator, which are constants under the

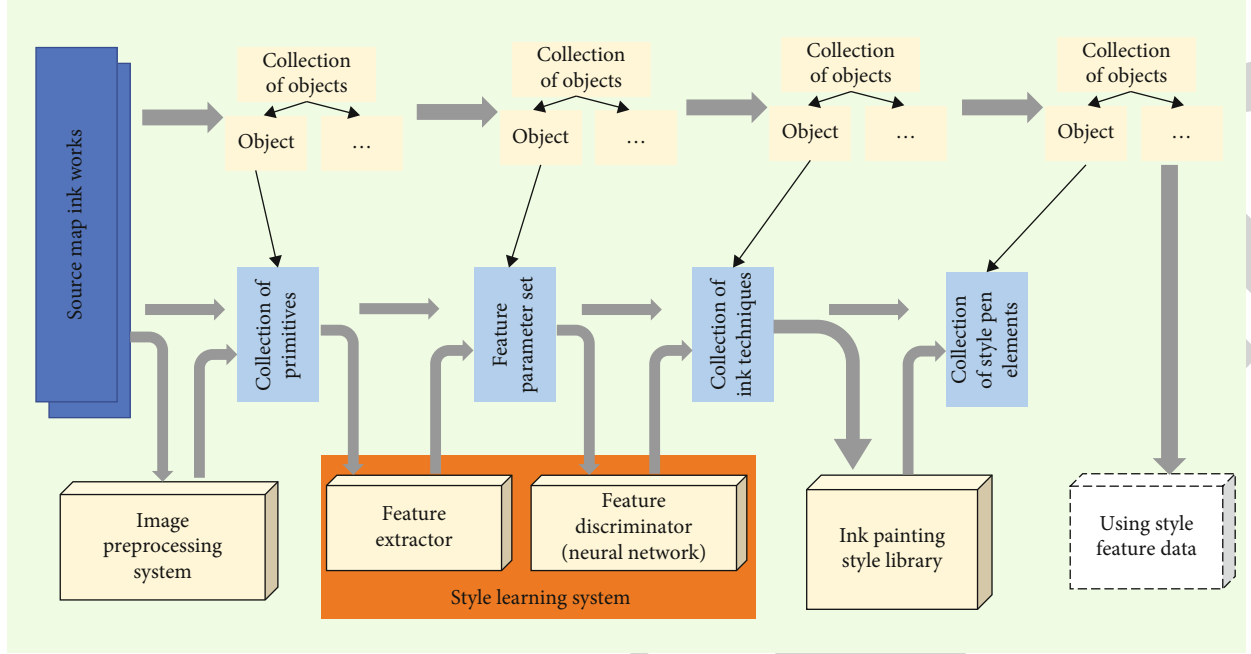


FIGURE 2: Schematic diagram of data object flow.

condition of specifying the standard illuminator. Here, take D65 light source lighting conditions, and then

$$X_0 = 95.047, Y_0 = 100.00, Z_0 = 108.883. \quad (5)$$

In the CIE1976L *a*b* space, the color difference between two colors (L_1, a_1, b_1) and (L_2, a_2, b_2) is defined as the Euclidean distance D_{lab} between the two in this space:

$$D_{lab} = \sqrt{(L_1 - L_2)^2 + (a_1 - a_2)^2 + (b_1 - b_2)^2}. \quad (6)$$

(2) *Regional Growth Process*. On the basis of the above seed selection method and the definition of similarity measure, the algorithm of the “kernelless” region growing method for image segmentation: for an input image, the region to which the lower left corner pixel $P(0, 0)$ belongs is marked as 0. The following marking process is performed on each pixel $P(i, j)$ sequentially from left to right and from bottom to top along the scan line to divide it into a certain area. Let the area to which the left pixel $P(i, j - 1)$ of $P(i, j)$ belongs is RL, and the area to which the lower pixel $P(i - 1, j)$ belongs is RD.

3.1.2. *Skeleton Extraction*. Skeletons, also known as regional centerlines, are a way to express the structure of a target shape. From the section on the definition of primitives, we can see that the skeleton expresses the extension direction of a primitive texture to a large extent, and at the technical level, it also reflects the path and direction of the painter’s strokes when depicting objects. In addition, the texture features of the primitive itself are usually generated along this path, and the average width of the texture that the system

needs to calculate also needs to be calculated based on the skeleton information. In general, skeletons have three main properties: continuity, a minimum width of 1, and centrality. The traditional technique for extracting the skeleton of a region is the mid-axis transformation.

First, mark the known target point as 1 and mark the background point as 0; consider the 8-neighborhood with the boundary point as the center, denote the center point as P , and mark the 8 points of its neighborhood counter-clockwise around the center point as PO, respectively, P1, P2, P3, P4, P5, P6, and P7, where PO is to the right of P .

Then, proceed to the second big step and apply the following four basic steps successively to the boundary points on the entire area set in the first step:

- (1) Mark the boundary points that satisfy both of the following conditions:

$N_8(P)$ is the number of nonzero neighbors in the eight-neighborhood of P , namely,

$$N_8(P) = \sum_{i=0}^7 P_i. \quad (7)$$

$S(P)$ is called the intersection number of point P , which is the number of changes from 0 to 1 when the order of PO, P1, ..., P7, PO is rotated, namely,

$$S(P) = \sum_{k=1}^8 (P_k - P_{k-1}). \quad (8)$$

The subscript k takes the remainder of 8.

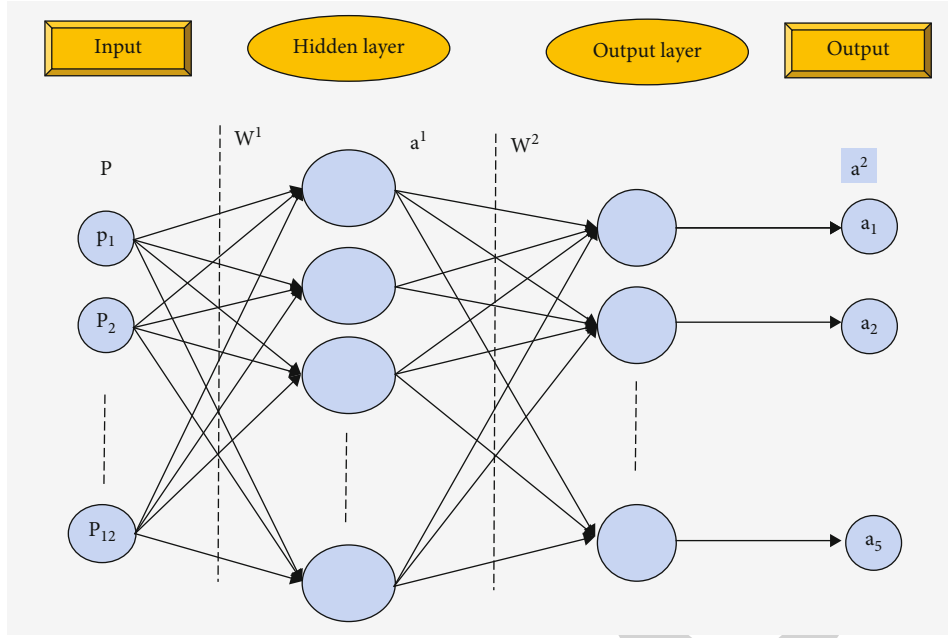


FIGURE 3: Forward propagation of BP neural network.

- (2) After checking all boundary points, delete all marked points
- (3) Mark the boundary points that satisfy the following conditions at the same time
- (4) After checking all boundary points, delete all marked points. Repeat steps 1 to 4 above until no boundary points are marked, and the algorithm ends

3.1.3. *Extraction of Primitive Information.* Through the above two sections, we have completed the core processing of generating primitives: in the process of image segmentation, and the algorithm obtains multiple pixel regions, which can be considered as the prototype of the primitive texture; in the skeleton calculation, we get the pixel region: the shape description of which guarantees the extraction of other information of primitives in this section.

(1) *Primitive Geometric Region (MGR) Extraction.* The geometric area here refers to the size of the smallest rectangular bounding box of the pixel area representing the primitive itself and its coordinate position in the original image. Here, the coordinates of the lower left corner are (x_0, y_0) , the coordinates of the upper right corner are (x_1, y_1) , and the geometric area of the primitive is Rg , which contains four components, which represent the position coordinates and width and height dimensions of the geometric area in the original image, respectively. The calculation formula is

$$\begin{aligned} Rg \cdot x &= x_0, \\ Rg \cdot y &= y_0. \end{aligned} \quad (9)$$

(2) *Primitive Texture (MT) Extraction.* The primitive texture is the pixel area that represents the primitive itself. From the

algorithm for extracting the primitive geometric area, it can be known that in the image segmentation stage, a large number of pixel areas have been obtained, and each pixel area here naturally represents a primitive itself: pixel area.

(3) *Element Ink Color Density (MGS) Extraction.* Primitive ink density represents the average gray level of the primitive texture. In this system, we normalize the average gray level of the primitives to $[0, 1]$ to facilitate ink color analysis.

(4) *Primitive Main Color (MMC) Extraction.* Through the definition of MMC, we can find that MMC is actually the average color information of statistical primitives. Since this information will be used for color recovery of grayscale primitive textures, we should consider extracting the average color information of the primitives instead of simple RGB color values.

This process is actually to convert the average RGB value calculated in the previous step into an HSI value. Gonzalez gave a detailed conversion formula as follows:

$$H = \begin{cases} \theta, & B \leq G, \\ 360 - \theta, & B > G. \end{cases} \quad (10)$$

Among them, R , G , and B are the red, green, and blue components, respectively. The value of saturation S is given by

$$S = 1 - \frac{3}{(R + G + B)} \min(R, G, B). \quad (11)$$

In the above three evaluation formulas, if the R , G , and B values are normalized to be in the range of $[0, 1]$, then

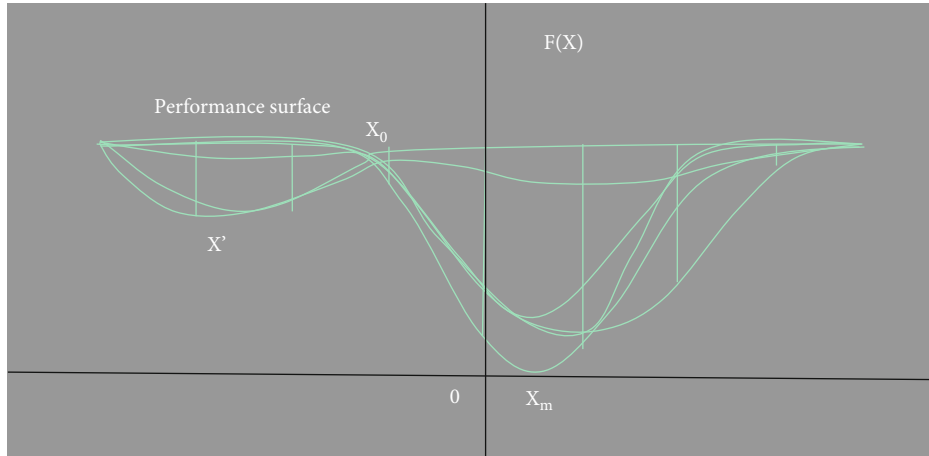


FIGURE 4: Finding the optimal state of the performance surface.

the calculated S value is also in the range of $[0, 1]$ and the resulting H value, since the hue angle is represented in the HIS model, and it only needs to be set to 360, which can be normalized to $[0, 1]$.

(5) *Element Mean Width (MMW) Statistics.* The average width of the primitive is the average of the lengths of the vertical segments at all points on the skeleton line (the vertical segments are marked by red lines) and is calculated as follows:

$$W_{\text{avg}} = \int_0^1 W_p(u) du. \quad (12)$$

Among them, W_{avg} is the average width of the primitive, and $W_p(u)$ is the length of the vertical line segment at the point of the skeleton line u .

3.2. *BP Neural Network.* As an intelligent information processing system, the core of artificial neural network is algorithm. BP neural network is a multilayer feedforward network trained according to error back propagation (error back propagation for short). Its algorithm is called the BP algorithm. Its basic idea is the gradient descent method, which uses gradient search technology to minimize the error mean square deviation of the actual output value and expected output value of the network. We have already discussed that neural networks are trained to approximate the desired decision function. It has been shown that a two-layer network using a sigmoid transfer function in the hidden layer and a linear transfer function in the output layer can approximate almost any function of interest with arbitrary precision, as long as enough units are available in the hidden layer. Therefore, this subject chooses the BP neural network model of the two-layer network. A proper transfer function can help the propagation of BP neural network to improve performance. The BP propagation algorithm includes two processes: the first is forward propagation, and the neural network calculates an output; then, the error

TABLE 1: The relationship between the number of hidden layer nodes and the training result data.

Number of hidden layer	Training error	Testing error
2	1.2566	1.1275
3	0.7977	1.0156
4	0.6318	0.9021
5	0.5702	0.8012
6	0.5528	0.8823
7	0.4451	0.7901
8	0.3855	0.6497
9	0.2596	0.7812
10	0.1857	0.6644
11	0.1838	0.6729
12	0.1685	0.5110
13	0.1123	0.3217
14	0.1134	0.5571
15	0.1006	0.6671
16	0.1087	0.7001
17	0.1205	0.6978
18	0.1087	0.7004
19	0.1023	0.6763
20	0.1102	0.6892

is back propagated according to the error between the output and the theoretical output. Figure 3 shows the forward propagation structure of the BP neural network.

The performance evaluation function, also known as the performance surface, is used to evaluate the learning effect of the neural network. Neural networks are designed to approximate a desired ideal decision function. The better the performance of the neural network, the more accurate its judgment, and the smaller the error between its output and the expected output. An ideal BP neural network can gradually optimize the connection weights W_i of each neural layer in the training process to achieve the effect of approximating the desired decision function. Obviously, it

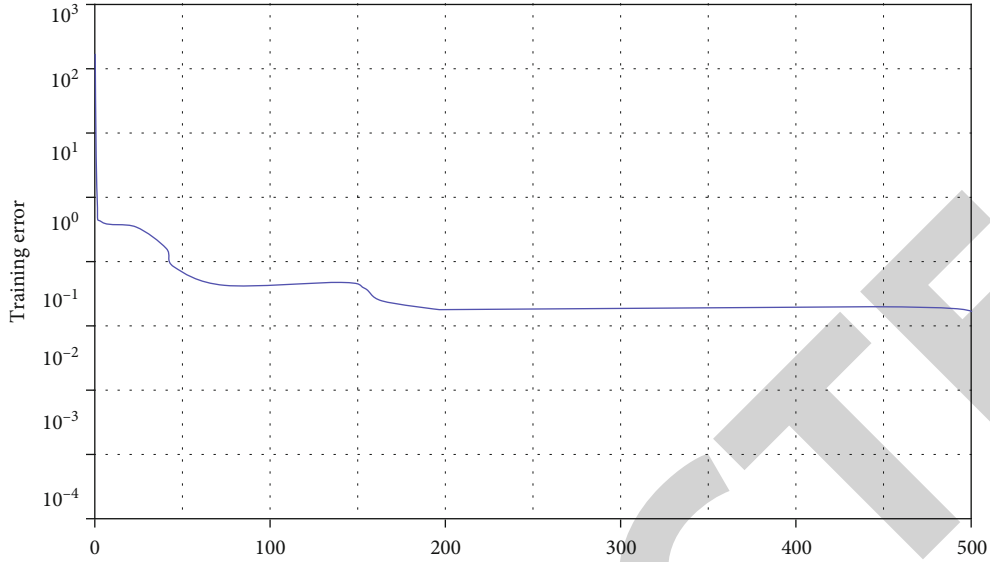


FIGURE 5: The training process of unnormalized input data.

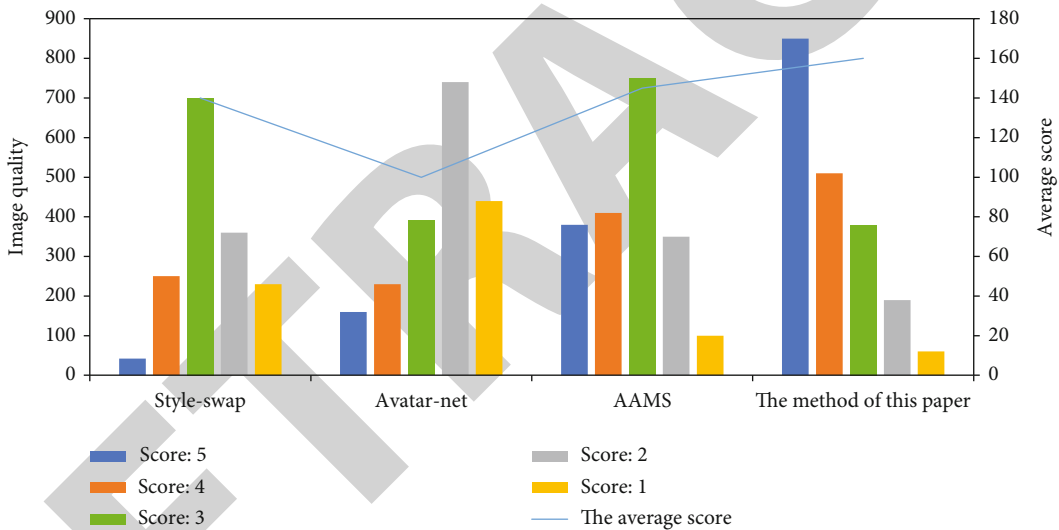


FIGURE 6: Comparison of HVPA scoring results.

is a relatively complex multidimensional performance surface, and there may be multiple minima. As a performance evaluation function given in Figure 4, its performance surface has two minimum points, where X' is just a saddle point (i.e., a local minimum point), and x_m is the real global minimum point; that is, we hope to obtain the optimal state of the neural network.

4. Result Analysis and Discussion

4.1. Experimental Data Training. Considering the problem of selecting the number of hidden layer nodes of the network, we also constructed 20 neural networks with 3~22 hidden layer nodes for training. The training samples come from a collection of graphic elements (about 500 samples) after analyzing 35 ink works with different styles and techniques. Using the human-computer interaction training

interface designed above, the program uses the 500 samples and the target output judged by humans as the training data of the network to train these 20 neural networks at the same time. The training results are shown in Table 1 (all data are accurate to four decimal places).

It can be seen from the above table that increasing the number of hidden layer nodes can reduce the training error, but the test error will fluctuate after more than 14; that is, the generalization ability will change. Comprehensively compare the training error and test error of each neural network and decide to choose 14 for the number of hidden layer nodes.

4.2. Experimental Results and Analysis. In order to specifically examine the neural network with 14 hidden layer nodes, through the visualization of the training process (Figure 5), it can be found that both the training error and the test error are large, and the convergence speed is

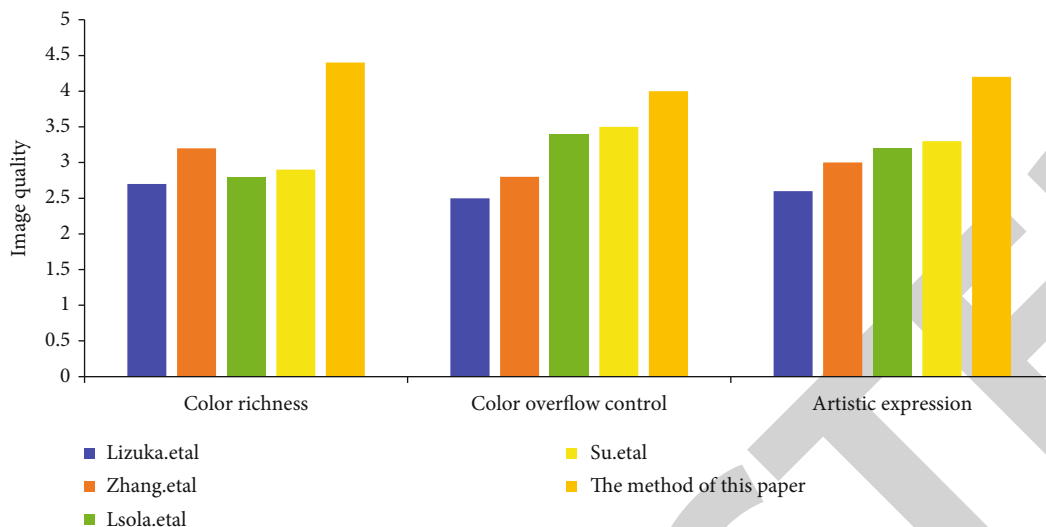


FIGURE 7: Comparison of subjective evaluation of colorization methods.

extremely slow. This problem can be solved by normalizing the output. According to the range of input and output of the sigmoid transfer function, the input variables are not normalized, but only the output variables are normalized. This is because when the output data is required to be normalized, the input data is also normalized. If it is normalized, the interpretability of the weights will be even worse.

Figure 6 shows the stylization effects of our method and several benchmark methods scored by professional painters using the HVPA evaluation method proposed in Section 4.2. The left ordinate represents the total number of images for which different scores were obtained, and the right ordinate represents the value of the average score φ for each method. It can be seen that the number of images with the highest score obtained by the method in this paper is the largest, and the average score φ is also the highest. It can be confirmed that the stylization effect of our method is better than other benchmark methods.

In terms of subjective evaluation, this paper evaluates various colorization methods using the way human visual perception perceives. The colorized images are scored from three aspects, namely, color richness, color overflow control, and artistic expression, that is, the artistic level of the image in the eyes of the observer. 50 colored images and corresponding real images were selected to be scored by 20 art professionals. Finally, 1000 scores were obtained for each index of each method and averaged. Figure 7 shows various methods. It can be seen that the colorized images obtained by the method in this chapter are better than the comparison methods in all indicators, with rich colors, better control of color overflow, and more artistic images than other methods.

5. Conclusion

The class hours and educational resources of art education in colleges and universities are limited, and it is required to consider a series of contradictions in traditional art classroom teaching while ensuring teaching efficiency and effec-

tiveness, such as shortened class hours and content expansion, teacher-teaching and student-learning, teaching depth and breadth, and audience differentiation. We need holistic reflection, rather than simply filling in the content. New courses such as multimedia technology, network animation technology, and network advertising design have been added to the teaching curriculum system of colleges and universities for stimulating students' interest in learning. The online network platform represented by WeChat has had a profound impact in the field of art education. Through the observation of a large number of ink paintings as a form of fine art, the research on the painting techniques of many ink works, and the analysis of their brushstroke characteristics, the present relatively mature machine learning technology is introduced, and combined with traditional classic image processing technology, it preliminarily solves the problem of defining and distinguishing characteristics of the local style of Chinese ink painting, thus gives a new idea for learning the style of art works, and develops a new idea to better promote the interest of college students in art activities. We design a scalable BP neural network to build the discriminator required by the system. In order for this neural network to be able to judge the local style of ink works well, we performed image preprocessing and texture feature extraction on 35 ink works and obtained more than 500 sample primitives for training the BP network. In the process of neural network learning function gradually "mature," the discriminant function simulated inside it is also closer to the needs of mapping data from primitive space to pen element space. The subjective evaluation of HVPA scoring and colorization method also proves the feasibility of the BP neural network algorithm in college art education activities.

Data Availability

The figures and tables used to support the findings of this study are included in the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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