Hindawi
Journal of Sensors
Volume 2023, Article ID 9821587, 1 page
https://doi.org/10.1155/2023/9821587

Retraction

Retracted: Research on Intelligent Scoring and Style of Calligraphy Post Based on Machine Vision

Journal of Sensors

Received 8 August 2023; Accepted 8 August 2023; Published 9 August 2023

This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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. Zhigao, Z. Jie, and L. Zhuo, "Research on Intelligent Scoring and Style of Calligraphy Post Based on Machine Vision," *Journal of Sensors*, vol. 2022, Article ID 6398101, 13 pages, 2022.

Hindawi
Journal of Sensors
Volume 2022, Article ID 6398101, 13 pages
https://doi.org/10.1155/2022/6398101

Research Article

Research on Intelligent Scoring and Style of Calligraphy Post Based on Machine Vision

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Received 3 June 2022; Revised 28 July 2022; Accepted 8 August 2022; Published 9 September 2022

Academic Editor: Yaxiang Fan

Machine vision is a noncontact measurement method. In some jobs that are not suitable for artificial work environment or artificial vision, machine vision is usually used to replace artificial vision to meet the traditional requirements. Therefore, this paper quotes machine vision into the intelligent scoring and style research of calligraphy post. Firstly, it briefly introduces the related concepts and steps of calligraphy post and briefly explains the style of calligraphy post. Then for the third part of the machine vision localization research algorithm, the correlation function algorithm was proposed in the research field to explain and analyze. Finally, by comparing other research methods of machine vision, it shows that machine vision is more conducive to the study of calligraphy style intelligent scoring, through the experimental study of people on the calligraphy style and calligraphy style of people on the intelligent score. At the end, it is proposed that machine vision can greatly promote the study of intelligent scoring and style of calligraphy and also reflect the accuracy and usability of intelligent scoring for calligraphy style. On-contact test of machine vision refers to not touching the tested object, so as to obtain the test result. It is a three-dimensional testing technology. Among them, the test system of machine vision is relatively simple. It is easy to move and easy to collect data, and the cost of this noncontact test is low. It has more accurate testing technology. A plurality of test quantities can be simultaneously tested by image laser detection of the test quantity without touching the object.

1. Introduction

Machine vision is to study related things from the perspective of neutral and objective technology, and it is also the result of continuous training process that directly depends on technology (understood as the technical surface of inscription). From this point of view, machine vision is always a mature technology. Similarly, in an era of increasing machine learning technology, we can talk not only about machine vision but also about mechanical imagination and mechanical unconsciousness [1]. Machine vision has exploded in recent years. Large-scale, high-quality images and calligraphy impressions greatly support the learning-based machine vision model. However, in the actual situation of limited transmission or storage, images and calligraphy are usually rectified before machine vision analysis, which leads to obvious performance loss of machine vision model. In this work, the paper extensively studies the influence of image and calligraphy on machine vision performance [2]. Machine vision provides a good solution for intelligent score detection of calligraphy posts through appropriate algorithms. With the development of feature extraction technology of calligraphy post, machine vision can effectively score calligraphy post accurately and intelligently, and at the same time, it also reflects the objectivity and accuracy of machine vision method [3]. Combining machine vision method with calligraphy design, it is used for automatic calculation of strain. On this basis, a numerical calculation method based on machine vision is proposed. In this new method, several calligraphy posts are written on the finite element model. It eliminates the limitations of machine vision method, including its sensitivity to vibration, which is the most important advantage of this machine vision model [4]. These related research methods are

combined with machine learning technology in machine vision methods, which deal with colors, shapes, textures, and font sizes from calligraphy. Although there are many applications of different machine learning techniques, due to the wide application of machine learning, this paper introduces the application of statistical machine learning technology and machine vision system in calligraphy scoring. This paper summarizes the application status of machine vision technology in calligraphy imitating system and analyzes the potential of machine vision technology in specific applications [5]. Calligraphy style is considered as the visual attribute of calligraphy character images randomly sampled from "works" created by a single artist. Calligraphy style is independent of page layout or text content. In this paper, an experimental design is designed to study the extent to which the sources of a single or several pairs of character images can be assigned to the same work or two different works. Experiments show that when each pair has many different class pairs, the accuracy is almost the same when using the same characteristics [6]. Calligraphy is an abstract line art, and good calligraphy is vivid. How to have a good calligraphy post, perseverance, clever method, and attention to charm and affection are the most important. It is necessary to grasp the form, spirit, and expression of the author's situation of calligraphy. Only in this way can we write a good calligraphy post and show the high-quality score of calligraphy post style [7]. The artistic style of calligraphy is the best expression of absolute aesthetic concept through the perceptual practice and behavior of the subject of calligraphy. In terms of concept and connotation, the style of calligraphy is not purely material, but different art disciplines and materials disciplines may have an impact on the formation of calligraphy style. Calligraphy post is not an arbitrary behavior of calligraphy subject; it also needs to include the aesthetic concept of the subject. Enjoy the highest pursuit in aesthetic concept, which makes it not only have the universality of the subject but also have the creativity of the subject. Influenced by Chinese classical philosophy, the artistic style of calligraphy post can become an important part of calligraphy post, showing masculine beauty, feminine beauty, and neutral beauty, which is supported by the theory of calligraphy history and calligraphy aesthetic history [8]. In order to improve the effect of calligraphy works, this paper combines intelligent machine learning and reader scoring standard factors to build an intelligent evaluation model and proposes a related algorithm based on machine vision. Finally, it shows that the evaluation model of calligraphy works based on machine vision and intelligent machine evaluation has certain promotion effect on calligraphy post [9]. Intelligent scoring plays a certain role in the study of calligraphy style. In order to study calligraphy style, this paper puts forward the related algorithm of machine vision. The intelligent scoring recognition technology of machine vision is used to score calligraphy posts accurately. And the related machine vision performance algorithm is explained [10]. Intelligent scoring is an indispensable and key part of many evaluation processes, and any development of it can reduce huge potential losses. The evaluation of model performance is different, because different performance measures are adopted for different data sets with different properties in different situations. Therefore, on six real-world intelligent data sets, combined with ten representative performance standards, this study adopts six famous intelligent evaluation classification methods for comprehensive evaluation [11]. In order to study related things, a comprehensive intelligent scoring model is established, which considers various additional variable groups, which increase the accuracy of the model. In order to establish such a model, machine vision technology is proposed as one of the methods of data mining. Finally, it shows that intelligence score has a great positive effect on related research things. It promotes the research of correlation analysis based on machine vision [12]. Style research model is used in most related calligraphy research, and the basic elements of style research model are compared and contrasted. Comparison shows that the study of style is an important issue in artistic aesthetics. Calligraphy is the most aesthetic personality, so art regards the formation of style as a symbol of artistic maturity. As calligraphy is an art, it has its particularity and universality as an art. For calligraphy, style research is the embodiment of his aesthetic personality in the style of his works [13]. Using machine vision and intelligent evaluation in the study of calligraphy style, the purpose is to find out the relationship between calligraphy impressions and related elements. Using machine vision method, 7 items and 25 categories of calligraphy elements are established. In the synthesis step, the relationship between the two elements is studied and quantified. Through regression analysis, some useful parameters are obtained, which are used to explain the reliability of regression and the influence of various categories and elements on calligraphy style research [14]. In the aspect of style research and design, we find that this field is mainly applied to calligraphy-related fields. In the aspect of data analysis and style research, traditional methods are mainly used, and more advanced and novel methods have not yet penetrated into the field of cognitive style. Suggestions and enlightenment are put forward for future research. This is the first review of the practice of cognitive style research methods and represents an important step in the progress of this field [15].

2. Related Concepts of Calligraphy Post and Style Research

2.1. Common Sense of Calligraphy Post. To learn calligraphy, we must start with the works that are posted. This is the only way to learn calligraphy. Pro and Mu are two different methods, each with its own characteristics. The former is the work of famous people with ink shapes or glyph outlines, or the shape is covered on transparent paper with strokes. The ancients said: Linshu is easy to lose the position of the ancients, but there are ancient brushstrokes; Linshu is easy to get the inheritance of the ancients, but most of them are the brushwork of the ancients. Therefore, calligraphy teaching must be combined with copying, learning from each other's strengths, in order to shorten the learning process and achieve the expected results. In addition, scholars must choose exquisite works from the original version (not copies

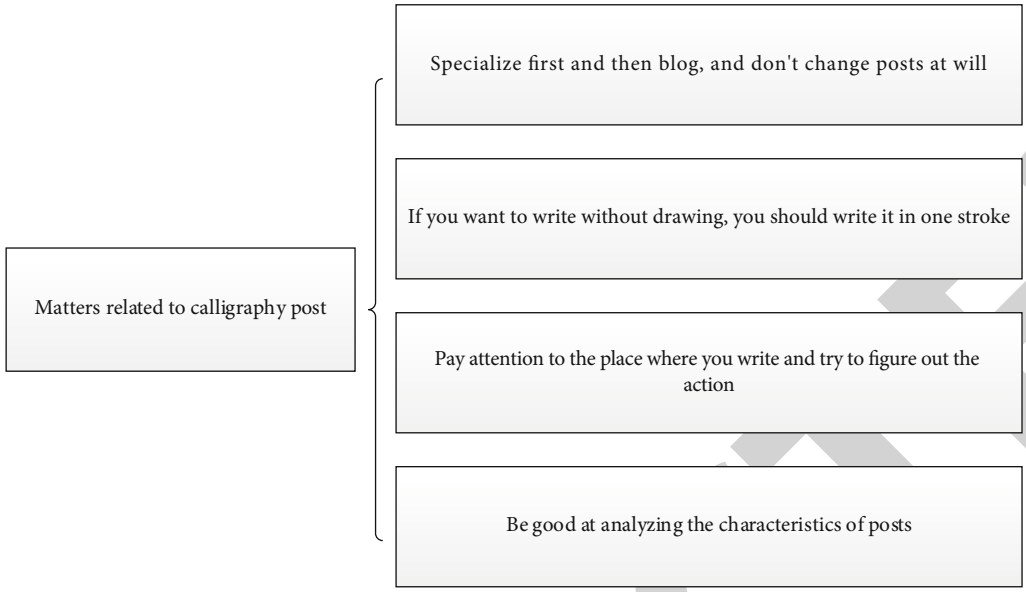

Figure 1: Matters needing attention in calligraphy posting.

of later generations). Then, the basic steps of calligraphy learning and calligraphy creation are reading posts-temporary posts-proofreading posts-silent posts. Reading posts means learning ancient calligraphy and carefully checking what to write. The more carefully you read the post, the stronger the purpose and the better the effect. Beginners tend to ignore this step and use replication instead, especially focusing on results. Generally speaking, "throughout reading" has the following points: pen, character style, chapter, and charm and momentum of the whole article. In addition, for some damaged points in ancient works, pay attention to analysis, find the original state, and do not blindly post at will. Therefore, when posting, the damaged parts are mistakenly used as part of the dot shape, and they are drawn in the same way. Presentation is a long process. After studying all night, you must persevere and write repeatedly in order to get good grades. Proofreading means checking carefully with samples after writing. Through the comparative analysis of calligraphy, find out the shortcomings, and correct the following deficiencies in post writing. Time and time again, I can narrow the gap between myself and the model in this way. Silent post refers to repeated modifications after posting and dictation of fonts in posting. The matters needing attention in the post are shown in Figure 1.

2.2. Methods of Calligraphy Posting. Calligraphy is a bright pearl in the treasure house of Chinese traditional culture and art. Inheriting and continuing this ancient oriental art requires training a large number of successors. Calligraphy teaching is an important way to cultivate learners' aesthetic quality and plays an irreplaceable role in other art disciplines. The priority of learning calligraphy is also a very important step on the road of learning calligraphy. Through temporary posts, we can understand the writing rules of predecessors, Chinese characters and strokes, and their writing methods and structural rules and appreciate the fine traditions of Chinese culture for 5,000 years. As an important part of calligraphy education, the status of calligraphy can affect the level of calligraphy learners. Learning correct methods will greatly improve learners' calligraphy level. We can teach learners to understand the meaning of their calligraphy while writing. When it comes to posting, we must constantly analyze and improve the text and strive to use the text as a legal post. As time goes by, you can develop a good habit of posting. This function has no learning paragraphs and functional structures. We must make progress in this field. When writing a post, find the strokes and good structure, and pay attention to narrowing the gap in the next post. In the long run, the progress will be greater, and the behavior of copying posts will be solved. For example, when a pen is written and then written, the pen has a walking line in the air. For example, when the pen is written and then written, the pen has a circular line in the air, forming the next counter trend. Therefore, we should first read two or three strokes in the process of posting and then write two or three strokes in succession, until we can post a complete word at one time. The problems encountered in the book method are shown in Figure 2.

2.3. The Realm of Calligraphy. In the realm of calligraphy, there are three realms of calligraphy: "eye," "hand," and "heart." The concepts of the last two realms are relatively vague. If there is no clear concept, it will affect the level of future creation. At this stage, the main solution is to improve the observation ability and see the subtleties of posts. Many learners have to be careless, which is basically similar to the original post, but in subtle ways, it is no different from copying. The subtle place of predecessors' calligraphy is often such a stroke by stroke inadvertently, being adept, in order to be slow. In practice, among many calligraphy learners, there are not many people who can completely reach this

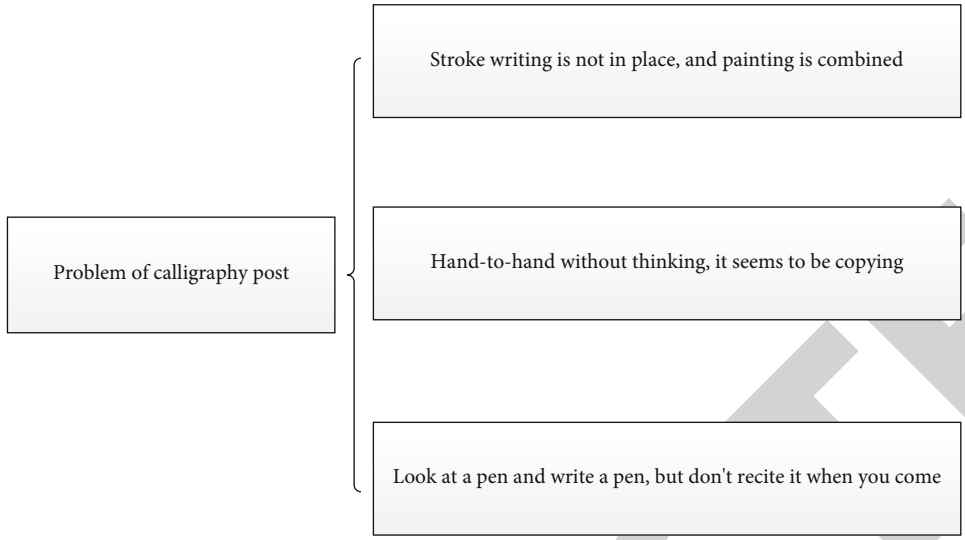

Figure 2: Common problems related to calligraphy posts.

realm. The main reasons are as follows: first, the degree of "eye to brain" could not be reached at the beginning of the study. Secondly, the mentality is impetuous, and Kung Fu is not refined. At present, many scholars are vague about the concept of "those who imitate it are expensive." The meaning of the word "like" is much simpler than imagined. Concept refers to the realm. On the one hand, we should consider the higher requirements for service. On the other hand, when many contemporary calligraphy creators talk about their posters, the articles they say are often more contemporary than the articles. But in their work, it is difficult to see how much essence they absorb. Although this is a calligraphy work, it can be required as the highest standard. However, it is enough to show that technology is not only a skill but also of great cultural significance. That is, when learning the calligraphy tradition of predecessors, we must have technical support, so as to understand it at the spiritual level. The so-called heart-to-heart refers to reaching consistency with the spiritual level of predecessors when posting. Seeing this level means that the pen, structure, and composition of the characters in the French post should be carefully examined, and it is necessary to grasp the stroke form statically and understand the echo relationship between stippling dynamically. Hand to finger is similar in shape, and it is necessary to be similar in spirit. To achieve similar situation, it is natural to write slowly, but to write with an air, it is not skilled and rapid (relatively speaking). Getting to this level is the most basic link in the process of posting. The so-called likeness of form and spirit is just a profound understanding of the external form of pen and ink, although it is very rare to achieve this step. Heart-to-heart refers to the profound spiritual influence on creation and touches the heartstrings of predecessors who stirred their spirits when they waved their brushstrokes.

2.4. Research on the Style of Calligraphy Post. Calligraphy is an art in Chinese calligraphy. It is not only a visual art that can satisfy people visually but also an abstract art, so some people compare calligraphy to a meaningful form. From the perspective of modeling, the ever-changing image is formed through the combination of stippling and painting, which shows people's cognition of various forms of aesthetics such as balance and wandering, coordination and conflict, unity and change, cleanliness and communication, and evacuation and proximity. From the perspective of ideology, the author's emotional connotation and personality culture are expressed by the flow of lines. Since then, stylistic theory has become an important topic in artistic creation and research, which has attracted the attention of western artists and art theorists. Therefore, various good ideas about stylistic have emerged one after another. As calligraphy is an art, it has its own particularity and universality as an art. As for the theory of calligraphy style, it can be said that writers have generally created distinct characteristics and creative personality. It is a relatively stable artistic style formed by writers in calligraphy practice. The unity of the creative subject and his works is a symbol of the maturity of calligraphy and an important standard and scale to measure the success or failure of calligraphy works in art. Specifically, it is the main connotation of calligraphy style theory; first of all, it refers to the nature of calligraphy works. Secondly, it refers to the style of calligraphy. In addition, it also mentions the general characteristics of calligraphy works from content to form, which is the concrete embodiment of calligraphy creation personality in the works. When studying calligraphy style, we should also pay attention to the naming and classification of calligraphy style. Compared with other artistic styles, calligraphy style is usually very good. The determination of the type is helpful to understand and grasp the historical changes of the connotation and extension of the concept of calligraphy style and to describe calligraphy works according to certain style concepts, thus further promoting the diversified development of calligraphy. From a macro point of view, the style of calligraphy art can be divided into two systems: group and individual. As a large system, group calligraphy style refers to the overall style of cluster formed

by more objective factors. As the second category, the individual style of calligraphy art refers to the individual style of calligraphy works. This colorful personalized style is also formed by history, and it also has rich aesthetic connotation, which is the most important factor. Individual style is the foundation of group style, and each individual style has a brand of group style more or less. Group style is composed of different and various personalized styles, which are expressed in personalized style, but it is by no means a simple supplement to personalized style. Calligraphy works with similar thoughts, artistic tendencies, and creative styles form a certain genre. The mutual promotion of the two is conducive to the prosperity and development of calligraphy art creation. Therefore, in the study of calligraphy art creation, we should not only consider calligraphy style and calligraphy genre. From a small point of view, there is a personal style and a special calligraphy style. In the aspect of artistic creation, work style can be said to be the lowest style concept, which refers to different calligraphy styles expressed by specific works created by calligraphy in different time, space, region, and conditions. This style varies widely, but through the comparison, analysis, and research of calligraphy, calligraphy works, and calligraphy works styles, we find that there are similarities and differences among different periods, different regions, and different writers. The calligraphy styles of these groups and individual calligraphy styles are expressed by "works." Today, the desire to form one's own unique style is the pursuit of the life of books. In the long run, this situation is extremely unfavorable to the development and prosperity of calligraphers. The study of calligraphy art must be multiangle and omnidirectional. It is important to pay attention to historical materials, but we cannot do research. Although there are many difficulties in the study of calligraphy style, we cannot avoid this very important problem in calligraphy art because of difficulties. The artistic style of calligraphy is shown in Figure 3: The style of calligraphy is the symbol of the maturity of calligraphy art, and it is the highest realm that calligraphers beg for. A very important historical reason why Chinese calligraphy can be sublimated into an advanced art is that it has reached the ideal realm of aesthetic style, which can compete with the noblest efforts of mankind. Therefore, the study on the style of calligraphy is of great significance to the prosperity of calligraphy art.

3. Correlation Function and Algorithm of Machine Vision

3.1. Location Algorithm of Machine Vision. In the actual positioning of machine vision, sample migration will be cheaper. Therefore, we should use machine vision to detect, so as to avoid the error caused by machine vision in the process of image recognition. It also needs the positioning function of machine vision, which locates the image according to the offset angle of the positioning image, determines the position of the detection area, and makes rotation correction. Therefore, the requirements for positioning features of observable images are quite different. In this paper, two location functions with observed images are given. Rapid image localization based on machine vision is to locate the characters in the target image accurately, and these characters can locate the detected position accurately. In this paper, the correlation coefficient comparison method in machine vision is selected as the matching method in the process of fast positioning and accurate positioning. The fuzzy number set matrix is obtained in the correlation coefficient algorithm of machine vision. The correlation coefficient calculation formula of machine vision positioning is obtained as follows:

$$\rho(x,y) = \frac{\sigma\left(S_{x,y}, g\right)}{\sqrt{D_{x,y} \times D}}, \tag{1}$$

$$D_{x,y} = \frac{1}{mn}\sum_{i=1}^{m}\sum_{j=1}^{n}\left(S_{x,y}(i,j) - \bar{S}_{x,y}\right)^2. \tag{2}$$

Using machine vision to locate the image to determine the image region to be detected, if the location fails, the phenomenon of using completely different image regions for recognition and detection may appear, which directly affects the quality of subsequent detection results of the algorithm. The machine visual correlation coefficient will not be calculated. Therefore, to calculate the correlation coefficient, it is necessary to locate successfully in the actual detection process of machine vision, and the detection image is captured by industrial cameras in real time. If the machine vision positioning operation takes too much time, it will directly affect the correlation coefficient of the whole detection algorithm and the performance of the real-time detection system. Where D is the variance of G, the formula can be obtained:

$$D = \frac{1}{mn}\sum_{i=1}^{m}\sum_{j=1}^{n}\left(g(i,j) - \bar{g}\right)^2. \tag{3}$$

When formula (3) and formula (2) are brought into formula (1), the correlation coefficient relationship of machine vision can be obtained as follows:

$$\rho(x,y) = \frac{1/mn\sum_{i=1}^{m}\sum_{j=1}^{n}\left(S_{x,y}(i,j) - \bar{S}_{x,y}\right)\left(g(i,g) - \bar{g}\right)}{\sqrt{1/mn\sum_{i=1}^{m}\sum_{j=1}^{n}\left(S_{x,y}(i,j) - \bar{S}_{x,y}\right)^2 \times \sqrt{1/mn\sum_{i=1}^{m}\sum_{j=1}^{n}\left(g(i,j) - \bar{g}\right)^2}}}. \tag{4}$$

The most important problem of machine vision model matching is how to determine the model image and the matching standard image and match them. Therefore, establishing a good rule matching model in computer vision is the key to improve the matching accuracy. The formula for calculating the sum of square differences is shown in the formula. The commonly used methods for calculating the matching degree of machine vision include square difference matching degree, normalized square difference matching degree, correlation matching degree, normalized correlation matching degree, correlation coefficient matching degree, and normalized correlation coefficient matching degree. The square difference matching degree is calculated by using the sum of squares of the difference between the image and each pixel of the template. In formula (5), the smaller the square

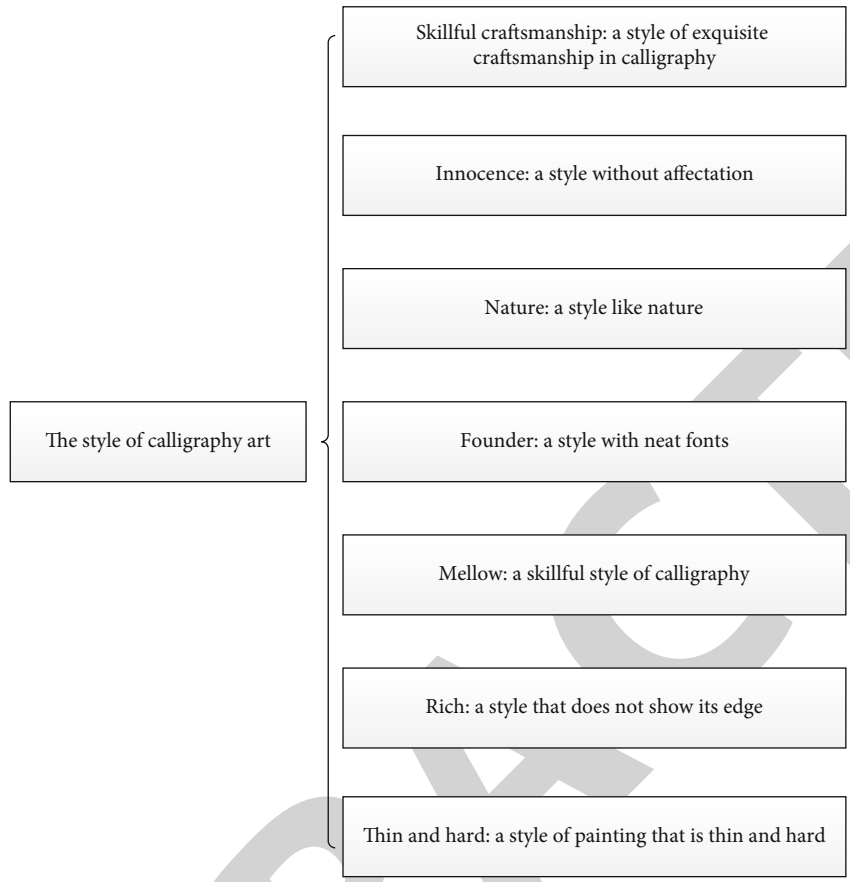

Figure 3: Various related artistic styles of calligraphy post.

difference, the higher the matching degree. Therefore, the accuracy of machine vision positioning is relatively higher.

$$R_{sqdiff} = \sum_{x',y'} \left[T\left(x', y'\right) - I\left(x + x', y + y'\right) \right]^2. \quad (5)$$

In machine vision positioning, I is a projected image, and X and Y are the current distance. The normalized least square method calculates the difference between the equivalent concept and the equivalent square. It also takes advantage of the difference between the machine vision image and the square sum matching of each pixel in the model. Finally, the similarity degree is calculated, and the sum of squares of the original image and gray image is normalized into the machine vision image. The advantage of normalization is that the final matching image has nothing to do with the parameters of the projected image, that is, the machine vision will be blurred when the machine vision model and each pixel of the image are multiplied by the same coefficient. The specific calculation formula is as follows:

$$R_{sqdiff-normed} = \frac{\sum_{x',y'} \left[T\left(x', y'\right) - I\left(x + x', y + y'\right) \right]^2}{\sqrt{\sum_{x',y'} T\left(x', y'\right)^2 \times \sum_{x',y'} I\left(x + x', y + y'\right)^2}}. \quad (6)$$

The higher the similarity and correlation between machine vision image matching and reference pixel, the higher the matching degree in reference model test. 0 represents the worst match result. The specific calculation formula is

$$R_{ccorr} = \sum_{x',y'} T\left(x', y'\right) \times I\left(x + x', y + y'\right). \quad (7)$$

The calculation principle of typical relativistic plane equation is the same as that of equivalence. The similarity is also calculated by the sum of the predicted value of the image and the correlation between different hosts in the model. The result is normalized according to the square sum of gray values of the original image and the image to be measured and calculated by the final equivalent value. The specific calculation formula is

$$R_{corr-normed} = \frac{\sum_{x',y'} T\left(x', y'\right) \times I\left(x + x', y + y'\right)}{\sqrt{\sum_{x',y'} T\left(x', y'\right)^2 \times \sum_{x',y'} I\left(x + x', y + y'\right)^2}}. \quad (8)$$

The specific calculation method of correlation coefficient matching degree of machine vision is the same as correlation matching degree, but the map and model map must be

Table 1: Relative comparison of various visual research methods.

Visual type	Principle	Main technology	Characteristic
Machine vision	Technology combined by optical imaging, artificial intelligence, image processing, and other fields	Feature detection, defect judgment, image detection, etc.	High precision, continuity, high cost efficiency, and flexibility
Computer vision	Through various symbols in data language and computer information mode	Image classification, object detection, target tracking, and so on	Simplified process, fast speed, and automatic processing
Human vision	Light passes through the cornea and through the pupil	Interpret the sensory information according to the knowledge and experience gained in the past	Easy to have illusion and no calculation process

preprocessed before calculating correlation degree. This process reduces the average value of all pixels in the original image and the sample image. The specific calculation formula is

$$R_{ccoeff} = \sum_{x'y'} T'\left(x', y'\right) \times I'\left(x + x', y + y'\right), \tag{9}$$

$$T'\left(x', y'\right) = T\left(x', y'\right) - \frac{\sum_{x',y'} T\left(x', y'\right)}{w \times h}, \tag{10}$$

$$I'\left(x + x', y + y'\right) = I\left(x + x', y + y'\right) - \frac{\sum_{x',y'} I\left(x', y'\right)}{w \times h}. \tag{11}$$

The calculation principle of normalized matching degree of correlation coefficient in machine vision is to calculate the final matching degree of correlation coefficient by comparing the product of square gray value of original image and image to be measured. The obtained results are normalized, and the specific calculation formula is

$$R_{ccoeff-normed} = \frac{\sum_{x',y'} T'\left(x', y'\right) - I'\left(x + x', y + y'\right)}{\sqrt{\sum_{x',y'} T\left(x', y'\right)^2 \sum_{x',y'} I\left(x + x', y + y'\right)^2}}. \tag{12}$$

3.2. Function Algorithm of Machine Vision. Function computation is a very important classification algorithm in the field of machine vision. The existence and necessary and sufficient conditions of structural risk minimization theory lay a foundation for the rapid development of age growth theory. With the development of statistical learning, support vector machine algorithm becomes possible. The basic model of support vector machine is established. By reducing structural risk, the generalization ability of learning is improved, and the empirical risk and confidence interval are reduced. Good statistical rules can be obtained with a small number of statistical samples. For a given machine vision training data set T and hyperplane, the function of machine vision hyperplane with respect to samples is defined as follows: formula (13) is a two-class classification model, and its basic model is defined as the linear classifier with the largest interval in feature space, that is, the learning strategy of support vector machine is the maximum interval, and finally, the related algorithm of machine vision can be transformed into the solution of a convex quadratic programming problem. Therefore, the functional research field of machine vision becomes relatively simple. It is easier to study the training set model and sample template of machine vision.

Table 2: Comparison of scoring time of calligraphy posts by various visuals.

Visual method	Computer vision	Machine vision	Human vision
Feature extraction time, s	0.01302	0.04887	0.05077
Cross-validation time, s	1.82965	0.31708	2.19353
Model comparison time, s	0.00113	0.0002	0.00128
Sorting time, s	0.00099	0.00014	0.00116
Total time spent, s	1.84479	0.36629	2.24674

$$\gamma_i = y_i(w \times x_i + b). \tag{13}$$

Interval function can express the accuracy and influence of prediction. However, it is not enough to choose hyperplane to use intermediate function. This fact reveals that we can add some methods of constraint vector separation on hyperplane, such as normalization, and the interval is deterministic. At present, interval function is introduced into an example of machine vision, and the training method of hyperplane is given. The hyperplane function is calculated as follows:

$$\gamma_i = y_i\left(\frac{w}{|w|} \times x_i + \frac{b}{|w|}\right). \tag{14}$$

In the function calculation of machine vision, compared with most research and analysis, the training set interval of the function is defined as a sample template, and the function calculation formula is

$$\gamma = \min \gamma_i (i = 1, 2, 3, 4 \cdots n). \tag{15}$$

Table 3: Intelligent score of calligraphy post by machine vision.

Level	Level classification	Level requirement	Intelligent scoring
Primary	Level 1	Master the basic writing method of calligraphy post preliminarily, and meet the requirements of correctness and clarity	50-55
	Level 2		55-60
	Level 3		60-65
Intermediate	Level 4	Have a sense of layout, which clearly reflects the characteristics of calligraphy	65-70
	Level 5		70-75
	Level 6		75-80
Advanced	Level 7	Temporary posts achieve unified style and rendering power and use various methods to express calligraphy characteristics	80-85
	Level 8		85-90
	Level 9		90-100

The optimal control plane is determined according to the maximum distance principle. This is a set vector that has a small set that can be used to represent different types of 1 or -1. Linear classifier is to find the machine vision plane. In order to classify all samples correctly and have classification interval, it is required to meet the following requirements:

$$s.t.y_i((w \times x_i) + b) \geq \gamma, i = 1, 2, \cdots, N. \quad (16)$$

The problem of constructing the optimal plane of machine vision is transformed into constraint conditions, and the constraint condition formula expression of the optimal plane of machine vision is

$$\min \psi(w) = \frac{1}{2}\|w\|^2 = \frac{1}{2}\left(w' \times w\right), \quad (17)$$

$$s.t.y((w \cdot x_i) + b) \geq 1, i = 1, \cdots, l. \quad (18)$$

This is a typical convex machine vision optimization problem, also known as constrained optimization problem. The algorithm factor of machine vision can be introduced into this problem, and the optimization relationship of machine vision can be constrained, so that the problem can be transformed into a double problem of machine vision, and the original research can be minimized. The conversion formula is

$$L(w, b, \alpha) = \frac{1}{2}\|w\|^2 - \sum_{i=1}^{i} \alpha(y_i((w \times x_i) + b) - 1). \quad (19)$$

Compared with the algorithm of machine vision, the duality problem is introduced. The so-called machine vision duality is to transform minimax into minimax which is easier to solve, where the expression is

$$\max_{\alpha} \min_{w,b} L(w, b, \alpha). \quad (20)$$

The requirements of machine vision system and the existing structure algorithm cannot meet the detection conditions from the machine vision level, so the original machine vision algorithm is improved. If you encounter linearly indivisible data, it will loop indefinitely until the machine vision correlation coefficient meets the demand. Its functional expression is defined. Formula (21) and formula (22) reflect the research of machine vision into the linear separable functional relation algorithm of support vector machine, which makes the machine vision algorithm more accurate, simpler, and more convenient than direct operation and embodies the high efficiency of machine operation. At the same time, in formula (21) and formula (22), the correlation coefficient of the actual vector machine is calculated by using linear programming bits, and the result is 0, so as to obtain the correlation of the plane model.

$$\min \frac{1}{2}\|w\|^2 + C\sum_{i=1}^{N} \xi_i, \quad (21)$$

$$\nabla_b L(w, b, \xi, a, \mu) = w - \sum_{i=1}^{N} \alpha_i y_i x_i = 0. \quad (22)$$

4. Scoring and Research of Calligraphy Post Based on Machine Vision

4.1. Intelligent Scoring of Calligraphy Post Based on Machine Vision. Machine vision is a widely used research discipline. It works by using cameras instead of faces. Use computers and algorithms to create human brains, instead of using human visual systems to analyze images. The image data is analyzed deeply, the content that the camera needs to be analyzed is expounded, the useful information is obtained from the image analysis, and the final understanding of its application is made, applying machine vision technology to welding, data recognition, fault recognition, positioning equipment, robot vision, and other fields. Therefore, machine vision technology has developed rapidly in different fields. The research of mechanical vision in the fields of intelligent scoring and style research of calligraphy is also widely accepted by people. Therefore, machine vision is superior to computer vision and human vision in the intelligent scoring and style research of calligraphy, because machine vision has high precision and high cost efficiency. The relative comparison between machine vision and other vision is shown in Table 1.

The time spent on feature extraction and cross-validation to find the optimal parameters and the time spent on model comparison and classification recognition are calculated.

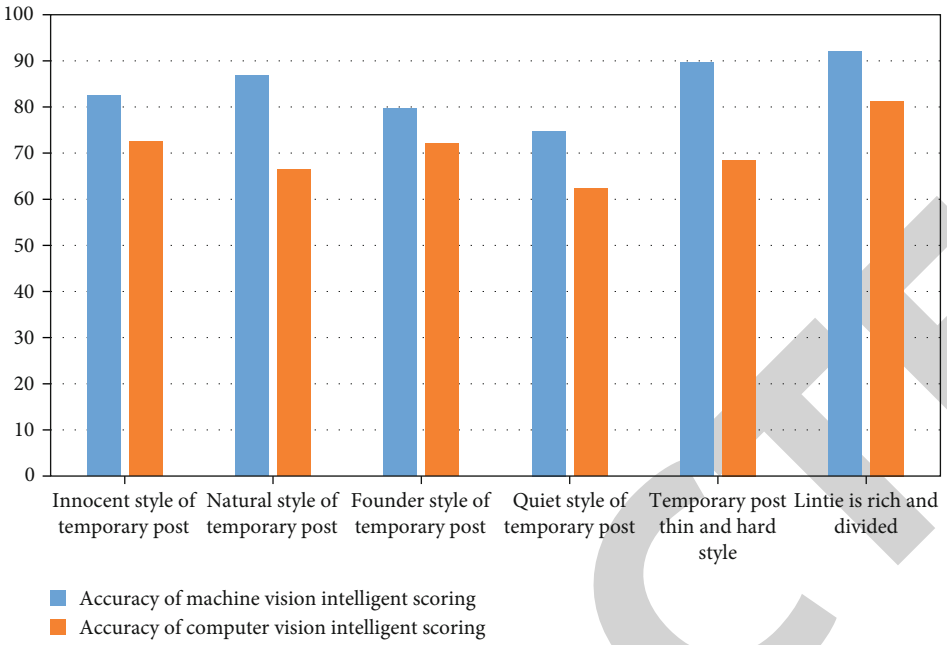

Figure 4: Correct rate of calligraphy style under different intelligent scoring methods.

Specifically, the feature extraction time is calligraphy font feature and the average time of each calligraphy image after feature extraction. Cross-validation time is to calculate a certain number of calligraphy posters. After cross-validation finds the best parameters, the average use time of each calligraphy image was calculated. The time of model comparison is a certain number of calligraphy posters taken from each calligraphy work during model training. Classification and recognition time is the time that each calligraphy image needs a certain number of test samples to classify and recognize calligraphy images. The specific experimental results are shown in Table 2. In machine vision and computer vision, the time of feature extraction in computer vision is longer than that in machine vision, the time of cross-validation is much longer than that in machine vision, and the time of comparison and classification is significantly longer than that in machine vision. Therefore, the research time of computer vision is longer than that of machine vision. This shows that machine vision is superior to computer vision in the extraction of scoring time, and it also shows that machine vision is efficient.

Therefore, we integrate the technology of machine vision into the intelligent scoring of calligraphy posts. Using the relative characteristics of machine vision, such as high precision and flexibility, the intelligent scoring model of calligraphy is established. Through machine vision, nine grades of calligraphy are established, and the first, second, and third grades are divided into primary grades, the fourth, fifth, and sixth grades are divided into intermediate grades, and finally, the seventh, eighth, and ninth grades are divided into advanced grades. Through machine vision, the style of people's calligraphy is rated by machine vision. Make a further study on the calligraphy of modern people. On the basis of machine vision, the style of calligraphy is established for intelligent scoring, as shown in Table 3.

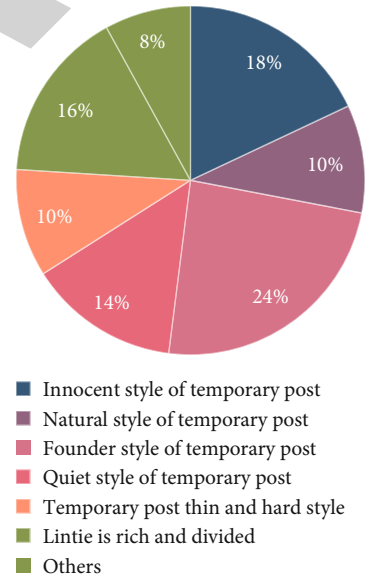

Figure 5: Style types of people's calligraphy posts.

4.2. Research on the Style of Calligraphy Post Based on Machine Vision. Chinese calligraphy can bring people visual satisfaction, but it is also a different artistic expression form and an abstract ideographic art, so some scholars call calligraphy a "meaningful form." From the perspective of modeling, the ever-changing image is formed through the combination of stippling and painting, which shows people's cognition of various forms of aesthetics such as balance and wandering, coordination and conflict, unity and change, cleanliness and communication, and evacuation and proximity. From the perspective of ideology, the author's emotional connotation and personality culture are expressed by

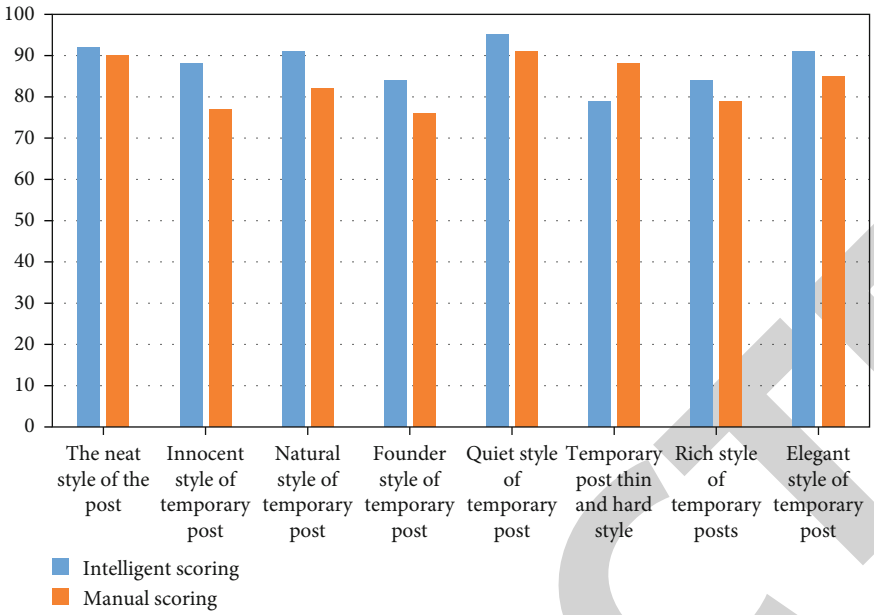

Figure 6: Comparison of the scores of calligraphy style.

the flow of lines. It is pragmatic, and every member of civilized society relies on it to store, transmit, and exchange information. It also has high practicability. Calligraphy is a very common and elegant art in traditional Chinese art, and it is one of the important ways for people to pursue aesthetic ideals and express their will. It is the essence of Chinese artistic spirit. Compared with calligraphers, the style of Lintie is a unique expression of his aesthetic style. Therefore, art regards the formation of style as a symbol of artistic maturity. As calligraphy is an art, it has its own particularity and universality as an art. Therefore, calligraphy has many styles, such as meticulous brushwork, innocence, nature, founder, roundness, and wealth. Here, we draw out several representative calligraphy styles to analyze the correlation of different intelligence scores. The research shows that the accuracy of machine vision is higher than that of computer vision, and it has great advantages in studying the intelligent scoring of calligraphy style. The specific analysis is shown in Figure 4: In Figure 4, machine vision and computer vision are used to score many representative styles of calligraphy, and the accuracy of scoring is compared. Experiments show that in each style of calligraphy, the scoring accuracy of machine vision is greater than that of computer vision. Therefore, in the research, it shows that machine vision has more research value in the style research and intelligent scoring of calligraphy, and the accuracy of intelligent scoring of calligraphy style research by machine vision is relatively higher than that by computer vision.

Calligraphy art aesthetics is a common and popular practical activity. A very important reason why Chinese characters can be sublimated into calligraphy art is that Chinese characters have achieved aesthetic style. Different styles of calligraphy have different ideological characteristics and dynamic art of calligraphy works, and calligraphy has very rich forms of expression. Calligraphy can be divided into group style and individual style. In the individual style, the expression form of calligraphy is vicious, but there is a connection between each one, so people have a variety of calligraphy posts. There are also great differences in people's calligraphy style. Now, this paper investigates people's calligraphy style. A sample of 50 people, including people of all ages and occupations, was selected to ensure the universality of the sample. Detailed investigation of the related styles of calligraphy posts of these 100 people is shown. And use machine vision to intelligently score people's calligraphy posts. Among them, people's calligraphy style is shown in Figure 5, and the intelligent score of people's calligraphy style under machine vision is shown in Figure 6: As can be seen from Figure 5, people's styles of calligraphy are not fixed but vary. It shows that everyone has their own calligraphy style in calligraphy. However, in the scoring system in the calligraphy style in Figure 6, most of the scores of intelligent scores are higher than those of manual scores. There are only one or two styles, and the intelligent score is lower than the manual score, which shows that the intelligent score system is very friendly to people's calligraphy. It has the function of encouraging people to write calligraphy, actively leading people to participate in calligraphy writing, and is conducive to the promotion of people's self-confidence in calligraphy writing.

4.3. Intelligent Scoring of Calligraphy Post Style Research. This study refers to the intelligent scoring of calligraphy beginners' calligraphy posts, so that calligraphy beginners can have a correct understanding of their calligraphy posts. The acquisition of data in the experiment was done, the sample of calligraphy post is the data in the international digital library, and the self-book characters are written by calligraphy beginners according to the post characters. In order to test whether the algorithm of calligraphy post evaluation in this study is basically consistent with the similarity of calligraphy characters judged by people, the experimental

Table 4: Intelligent score of calligraphy post style.

Numbering	Sample	1	2	3	4	5	6	7	8	9	10	Average score
1	Health	64	71	73	77	72	70	66	68	63	71	69.5
2	Books	92	90	82	85	83	86	91	79	85	89	86.2
3	Method	63	68	65	70	66	67	63	62	63	67	65.4
4	I	97	94	99	97	89	92	99	94	89	92	94.2
5	Ground	91	89	85	92	90	89	88	90	92	93	89.9

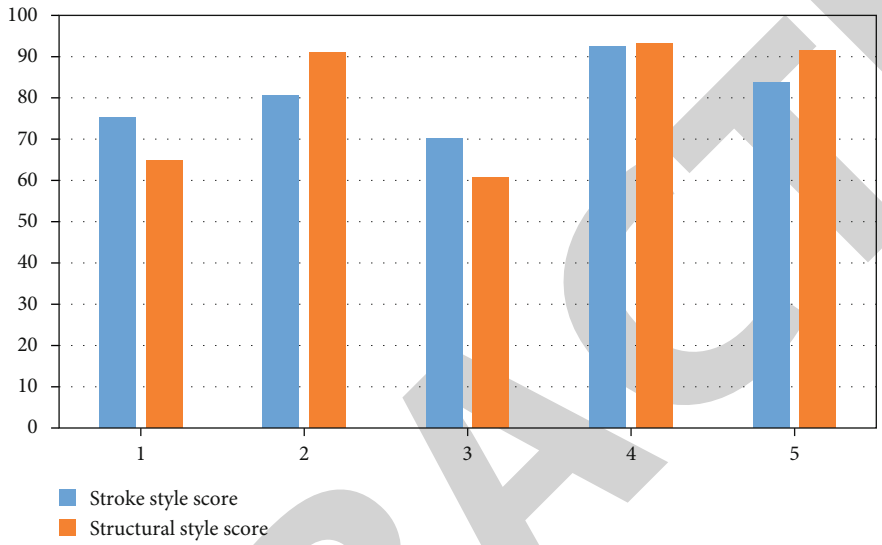

Figure 7: Intelligent score of stroke structure style of calligraphy post.

samples are given to several testers to score their own characters. The testers are students or teachers majoring in calligraphy. Scoring is based on the post characters. Starting from the stroke feature division and structural feature division of calligraphy characters, judge and score whether the self-written characters are "similar" to the post characters, with a full score of 100 points. The evaluation criteria are consistent with the evaluation criteria of this subject. Evaluate whether the self-written characters are "similar" to the post characters from two aspects: stroke division and structure division. Among them, stroke division is mainly evaluated from four characteristics: stroke length, stroke width, stroke starting and closing forms, and stroke trend. Structural division is mainly scored from three aspects: the central position of calligraphy characters, the ratio of height to width of calligraphy characters, and whether self-written characters are correct and straight. A total of 10 testers were investigated this time, and the experimental samples are shown in Table 4.

Comparing the average score of the testers on calligraphy post with the total score of this subject, it is found that the average score of 10 testers on calligraphy post is basically consistent with the total score of this subject according to the evaluation standard of calligraphy post. Experiments show that this study calculates the similarity of calligraphy impressions from multiple characteristic styles of strokes and structures, and the scores of calligraphy impressions are basically in line with human scores. Calligraphy beginners can understand their own learning conditions according to the scores, and this study can be well applied to calligraphy impressions writing guidance. In this study, the similarity of calligraphy posts was evaluated from two aspects, stroke characteristic style and structural characteristic style of calligraphy characters, and summarized and evaluated. The intelligent scoring results are shown in Figure 7.

Under the condition of machine vision, we evaluated the scores of 10 testers by intelligent scoring, in order to study whether the intelligent scoring of machine vision is accurate compared with the scoring of calligraphy style. Firstly, the total scores of 10 testers are calculated by combining the structural scores of calligraphy posts with the stroke style scores of calligraphy posts. The total score is about 70, which has the style characteristics of inclined calligraphy, accurate strokes, loose structure, and general effect. Testers with a total score of 85 have the style that strokes basically follow the requirements of impending posts, the structure is accurate, and the impending posts have good results. The total score of 65 has the style characteristics of accurate strokes and loose structure. The total score is about 92, which has a style with good calligraphy effect, solid strokes, and accurate structure. Testers with a total score of 87 have the style that strokes follow the requirements of the original post, and the structure is accurate, and the post effect is good. Therefore, we will use intelligent scores to estimate the test scores of testers. Compared with the total scores, intelligent scores under machine vision have more accurate prediction data

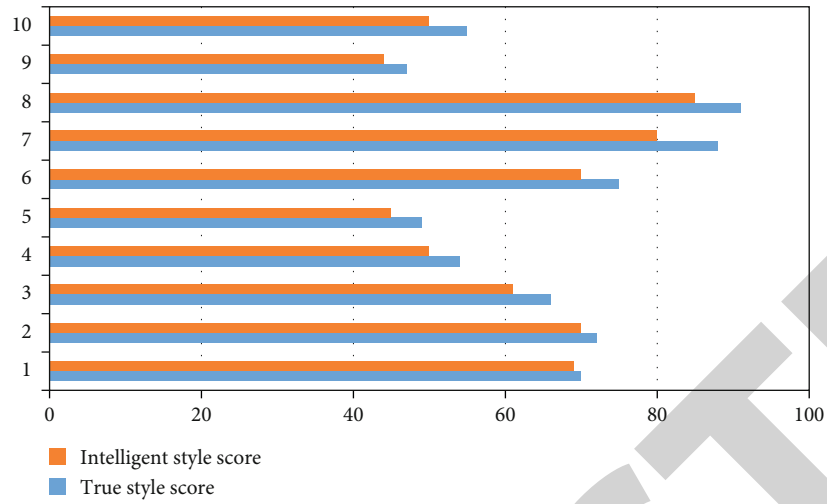

Figure 8: Comparison between real score and intelligent score of calligraphy style.

for the style of calligraphy. Among them, the comparison between the total score of the tester's calligraphy style and the machine vision intelligence score is shown in Figure 8.

It can be seen from Figure 7 that the tester's calligraphy style is associated, and if the stroke style score is not high, the structure style will not be very high. On the contrary, the structural style score with high stroke style score will be relatively higher. It shows that the style of calligraphy is not independent but should complement each other. It can be seen from Figure 8 that there is little difference between the intelligent scores and the actual scores for different styles of calligraphy posts. It shows that the research technology of intelligent scoring can be applied to practical calligraphy research. It is of great reference to the score of calligraphy temporary post research.

5. Concluding Remarks

With the rapid development of machine vision, machine vision technology has been an important part of computer technology since its development. It has existed for more than 20 years. With the development of automation, its functions and application fields have been gradually improved and popularized. In this paper, we use the intelligent scoring of machine vision to score the calligraphy style. At present, with the rapid development of machine vision and intelligence, there are still some shortcomings in calligraphy research. Machine vision has some reference significance for the study of calligraphy style, so it can provide help for calligraphy research in the field of machine vision. It can also help calligraphy learners to have a better understanding of the style of calligraphy post and make calligraphy post have more development in machine vision intelligent scoring. Now is the era of automation. If the calligraphy post evaluation system develops to the intelligent end of machine vision, if it can directly realize the function of evaluating the style of calligraphy post, it will be more convenient for users of calligraphy post and more conducive to studying the style of calligraphy post. In recent years, with the rapid development of intelligent science and technology, machine vision technology, which has the advantages of convenience, accuracy, rapidity, and intelligence, has been widely used in various fields of intelligence. As a modern detection method, it has been paid more and more attention by people. Machine vision technology involves many fields such as computer science, artificial intelligence, signal processing, image processing, machine learning, optics, and automation. Machine vision obtains the image information of the target object through optical equipment and sensors, then converts the image information into digital information, and then displays the data on the electronic screen through computer analysis or guides the machine to complete the task through the control unit. Machine vision focuses on information technology and intelligence, but it is based on the methodology of visual effects of intelligent technology. Its focus is to perceive the position information, size and shape, color information, and existing state of target objects.

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declared that they have no conflicts of interest regarding this work.

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