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4D Analysis and Research of Art Painting Intelligent Fusion Based on Calligraphy Character Image Edge Recognition Algorithm

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Abstract:In order to improve the accuracy of image recognition, a new edge detection image recognition algorithm is proposed. This algorithm first uses the Canny operator to identify the edge pixels of the image, and then calculates the gradient of each valid pixel. The normalized histogram is established by the obtained pixel gradient sequence. In the recognition process of the deep learning-based handwritten calligraphy font recognition algorithm, the image processing methods such as projection method are used to locate and segment the Chinese characters in the calligraphy work image, and then use the GoogLeNet Inception- v3 model and ResNet-50 residual network for book style recognition and glyph recognition. Artificial intelligence technology can generate fast and rich teaching auxiliary information for different students or different creative intentions, and intuitively convey teaching goals in art teaching. Improve students' learning efficiency.

Keywords: 4D Analysis, Art Painting Intelligent Fusion, Calligraphy Character, Image Edge Recognition Algorithm

1. INTRODUCTION

Image recognition technology has been widely researched and developed in modern computer science, and has been applied to all aspects of production and life, such as face recognition, fingerprint recognition, motor vehicle monitoring, etc. The traditional grayscale image recognition system [1] is shown in Figure 1. Because the shape of its Chinese characters retains the characteristics of ancient pictographs, it is difficult for people without professional learning to accurately identify each seal script. Therefore, using computers to identify calligraphy fonts can provide calligraphy learners with appreciation guidance, and is conducive to reducing It is difficult for the public to appreciate calligraphy, and to spread the excellent calligraphy culture to the public [2].

The font styles of Chinese calligraphy are diverse. From ancient times to the present, various calligraphy masters have created a variety of calligraphic styles [3]. The same Chinese character written in different calligraphic styles will show different forms and differences, such as regular script, official script, seal script, etc. [4] Handwriting The research on Chinese calligraphy font recognition not only provides a new solution for intelligent character recognition, but also has important theoretical value for promoting traditional Chinese culture and providing great help for calligraphy lovers to learn, appreciate and inherit calligraphy art. and social significance [5].

Art teachers use the Internet resource library and interactive functions to realize the visual expression and emotional communication of art through rich technical means and information carriers, so as to achieve the purpose of interconnecting skills and cultivating "beauty" with "skills" [6], so as to better meet the needs of students in the Internet age. Art study needs. After more than 40 years of development, traditional intelligent technology has been widely used in teaching [7]. Intelligent devices can assist teachers in teaching, assist in classroom management, help teachers liberate more energy from repetitive and mechanized teaching activities, and enable teachers to pay attention to students' spiritual growth and spiritual feelings [8].

It is difficult for people who have not undergone professional learning to accurately identify each seal script. Therefore, using computers to recognize calligraphy fonts can provide calligraphy learners with appreciation guidance, and at the same time, it is beneficial to reduce the difficulty of public appreciation of calligraphy and spread excellent calligraphy culture to the public. Zhang et al. [9] proposed a multi-scale feature extraction method, which constructed a series of optimal feature spaces under different scale parameters, and used a nested subset Mahalanobis distance classifier to realize character recognition. Dataset test, obtained 99.3% and 88.4% accuracy respectively [10].

Considering the strong autonomy of senior students, teachers use the Internet resource library to carry out flipped learning before class [11]. Before the class, guide the students to collect graphic materials from the aspects of cultural value, shape composition, pattern style, pattern characteristics, etc., and then the group leader organizes a discussion to refine the main points and form a PPT report [12]. With the rapid development of modern science and technology, with the technological breakthrough of computer computing power and intelligent algorithms, artificial intelligence technology is widely used in many fields such as manufacturing, finance, transportation, and medical care [13].

Today, the proportion of modern technology in classroom teaching is increasing, which to a certain extent has exacerbated the marginalization of previous teaching methods [14]. The five thousand years of civilization of the Chinese nation and its rich written records have been recognized by the world. In this splendid history, the art of Chinese calligraphy reproduces this transformation process in a unique artistic form and language. With the rapid development of digital technology [15], Chinese calligraphy can be preserved and shared in a digital form, and displayed in front of people in a new form. Artificial intelligence is a science that studies and develops theories, methods, technologies and applications

for simulating, extending and expanding human intelligence. Its central task is to make computers replace some jobs that rely on human intelligence [16].

Artificial intelligence is a science that studies and develops theories, methods, technologies and applications for simulating, extending and expanding human intelligence. Its central task is to make computers replace some jobs that rely on human intelligence [17]. The typical operation of the visual inspection system in life is mainly reflected in the identification and classification of items according to the express barcode. The reasonable use of the visual inspection system in the industrial inspection process can improve the production inspection speed, effectively ensure the production inspection accuracy, reduce manual operations, and reduce labor costs. At the same time, it can avoid human eye errors and improve production and quality [18].

2. THE PROPOSED METHODOLOGY

2.1 The Calligraphy Character Image Edge Recognition Algorithm

First, extract the edge of the object to be tested. By analyzing the matrix of the edge image, the corresponding pixels in the image that are the edge of the object to be measured are retained, which are called effective pixels in this paper. Then, the partial derivative is calculated for the effective pixels in the original image, and the gradient matrix of the effective pixels in the original image is obtained. Firstly, the convolutional neural network model is trained by using the standard font library and the Chinese character book font library in the computer system, so that it can judge the image quality of the image to be recognized. Book style, and then use the MQDF algorithm to identify the feature library under the corresponding font.

The algorithm in this paper preprocesses and recognizes the input image, and finally outputs the recognition result including the calligraphy style and font content. The algorithm description process is shown in Figure 1. First, the image to be recognized is preprocessed to eliminate image noise and frame lines; Target segmentation. In order to adapt to the characteristics of Chinese calligraphy fonts with a large number, complex structure, and various deformations, this paper improves the traditional DenseNet network from three aspects: pooling rules, training strategies, and model clipping. Cascade classifier based on grayscale features Training [2] is the basis of edge detection image recognition algorithm, which provides an effective image recognition research platform. In order to realize the extraction of image edge pixels, the canny operator [4] is used to calculate the statistical average, so that the Gaussian distribution of image pixels tends to be balanced.

Haar-like feature. Due to the age of some calligraphy works, there may be noise in the captured pictures. The method in this paper adopts the method of image morphology, and uses the open operation to corrode the noise in the image, which can achieve the desired effect without affecting the calligraphy font. Denoising effect. Due to the age of some calligraphy works, there may be noise in the captured pictures. The method in this paper adopts the method of image morphology, and uses the open operation to corrode the noise in the image, which can achieve denoising without affecting the calligraphy font. Noise effect. The Nadam algorithm is used to optimize the model training effect, so that the model can adjust the adaptive learning rate, improve the model convergence speed and model performance, and strengthen the feature extraction of different styles of calligraphy fonts.

2.2 The Art Drawing of Image Edge Recognition Algorithm

In art teaching, teachers do not need to pay attention to the training process of artificial intelligence models, but only need to regard the weights and artificial intelligence models obtained from pre-training as an "intelligent toolbox" with only input and output ends. Teachers can use the intelligent style transfer algorithm to discard the pixels that are not greater than the threshold, that is, assign the gray value to 0, and keep the pixels greater than the threshold, that is, assign the gray value to 255, and connect the reserved pixels to detect objects. edge, and retains the direction of the grayscale change rate and the value of the grayscale change gradient value of the edge pixels.

Then the image to be recognized is binarized. Image binarization refers to dividing the pixel value into a set of black and white elements, with black pixels as the foreground and white pixels as the background, in order to achieve the purpose of distinguishing target and background pixels. Breaking through difficult and difficult points is the key link of art class, often because of the size of the work and the spatial distance, the effect is not ideal. The use of modern information technology means, such as micro video, teaching assistant, PAD on the same screen, video booth and other technical means, can focus on magnifying the details of the work. Combined with the calculation process of complement and reflection of mathematical set elements, the original image of the track is preprocessed , so that the output result after edge detection can be compared with the actual image more comprehensively.

By analyzing the linear features of each structure in the track structure, the processing results are separated by mathematical morphology. The standard Ncuts algorithm uses the Keans algorithm to hard partition the image after obtaining the eigenvectors of the matrix, but this method often Destroys regions with smooth gradient consistency.

2.3 The 4D Analysis of Intelligent Integration of Art Painting

Some calligraphy works may have document border lines, which will affect subsequent word segmentation and recognition, so the document border lines need to be removed. The algorithm in this paper uses rectangular structural elements to obtain the horizontal and vertical border lines of the image respectively. Some calligraphy works There may be a document border line, which will affect the subsequent word segmentation and recognition, so the document border line needs to be removed.

The algorithm in this paper uses rectangular structural elements to obtain the horizontal and vertical border lines of the image respectively, and then fuses all the redundant border lines in the image. In the era of artificial intelligence, learning or education itself is not the purpose. The real purpose is to let everyone in the technology. With help, you can get the greatest freedom, reflect the greatest value, and get happiness from it. The art class is assisted by information technology, such as short and concise micro-classes. The design goal of the intelligent stroke generation system is to allow the intelligent body to depict natural scenes in the real world with rich brush strokes. In order to express the artistic details in the painting, artificial intelligence researchers designed different stroke effects and continuous stroke parameter space, and

adjusted the tiny stroke position, color and transparency changes.

The amount of information that can be obtained in the collected orbital images is huge, and under this premise, the hardware conditions for subsequent computer processing are extremely high. Therefore, reasonably selecting and reconstructing image textures and extracting useful information for detection can directly reduce the amount of data required for classification and recognition. If the computational complexity of large-scale data clustering is reduced. A lot of data has heterogeneous features, usually due to different data collection resources or different feature construction methods. For example in visual data, each image can be represented using a different feature descriptor.

3. CONCLUSIONS

The image recognition algorithm based on edge detection maintains the advantages of traditional image recognition and improves the efficiency of image recognition. On the basis of traditional image recognition, new judgment criteria have been added to locate and recognize calligraphy fonts in images by using image processing methods and deep neural network technology. The recognition rates of fonts are 91.57% and 81.70% respectively. The recognition results can provide the public with a reference for interpreting calligraphy works. The education method combining artificial intelligence and art teaching conforms to the development trend of contemporary society and is also a necessary process for the development of art teaching. Rational use of external tools and intelligent equipment to inspire and develop students' wisdom, and continuous in-depth study of art teaching is of great significance for promoting the development of art education.

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