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Webpage Design of Watercolor Painting Technique Application Based on Style Transfer Algorithm

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Abstract: As one of the traditional popular art forms, watercolor painting has been loved and sought after by the broad masses of people. The unique charm of watercolor painting is that it uses its own unique expression techniques to attract people and infect the audience. For this reason, this article intends to use the style transfer algorithm to design and research the watercolor painting technique application webpage, with the purpose of making the website more attractive. This paper mainly uses the experimental method and the comparative method to calculate the loss function of the watercolor painting technique under the style transfer algorithm and the webpage image loss function. Experimental data shows that content transfer increases as the number of iterations increases, while style transfer is conversely, and the loss of style transfer reaches 300,000 at 1000 iterations.

1. Introduction

Web pages are mainly used to display various information content. It can form pages with different colors and text. In order to attract the attention of passersby through web pages, it is necessary to study the watercolor painting techniques of the pages. Style transfer refers to comparing different things in different fields to achieve a relative balance. Using this algorithm can make the application web pages more vivid.

There are not a few people who use the watercolor painting technique based on the style transfer algorithm to apply web design research. For example, some scholars use the VGG-19 network for function extraction based on the convolutional neural network to create a new artistic style image with original content and fashionable images[1-2]. In order to solve the problem of image distortion and low accuracy, some people have proposed a picture style transfer algorithm based on neural convolutional network [3-4]. Others said that watercolor technique, as an important form of modern illustration, has a unique artistic charm [5-6]. Therefore, this article will study watercolor painting techniques using the style transfer algorithm and conduct applied research on web design.

This article first studies the related theory of the style transfer algorithm and describes its concept and training process. Secondly, it elaborates and analyzes the application of watercolor painting techniques to web design. Then it analyzes and describes the web design of watercolor painting. Finally, the data results are obtained through experiments.

2. Web Design of Watercolor Painting Technique Application Based on Style Transfer Algorithm

2.1 Style Transfer Algorithm

The style transfer algorithm is to compare the design of a web page with user needs, and then select the page that meets your requirements and habits to better attract viewers. The general idea of style transfer is as follows: We need to prepare two pictures. One is the image of the content we will publish, and the other is the image of the style we need to imitate. We need to generate a picture so that the content of the output picture is similar to the content picture, and the style of the output picture is similar to the style of the style picture [7-8].

To understand the style comparison algorithm, you need to know a name called the Gram matrix. The difference in distance between the Gram matrix of the generated image and the style image is the style difference. Let the generated picture and the target picture, the activation information (content information) of the selected layer near the top remain similar, so that the contents of the generated picture and the target picture remain acquainted [9-10]. Finally, a picture is generated, and then a loss function is obtained:

$$L = CL * w + SL * w \tag{1}$$

Among them, L means loss, CL means content loss, and SL means style loss. Then we use gradient descent to minimize the loss function. The VGG19 model is shown in Figure 1:

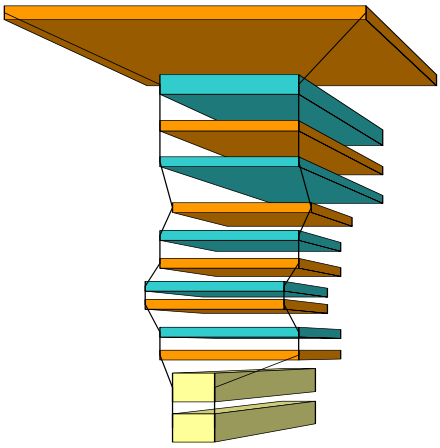

Figure 1: VGG19 Network Structure

Let the generated pictures and style pictures activate the multiple selected layers near the bottom one by one upwards, so that they maintain a similar relationship in the same layer in these several layers, so that the generated pictures and style pictures have the same style [11-12].

(1) The training process is as follows:

Obtain the constant information of the target image and style image. Set the placeholder for the generated picture. Load the pretrained VGG19 model and the weight coefficients obtained on the Imagenet data set. Using the pretraining model, extract the target picture, style picture, generate the activation value of each layer of the picture, and calculate the loss value and gradient according to the definition of the loss function. Use the optimization function to optimize to obtain the optimization result, and the optimization result includes the characteristic data of the generated graph. Perform image restoration processing on the generated image feature data to obtain a displayable image effect. Each round of optimization calculation will have a result, and the tools provided in this article will display the picture effect of each round of optimization in real time [13].

(2) Neural Style Transfer algorithm

The main implementation algorithm of the image style transfer function is the Neural Style Transfer algorithm. The Gram matrix in the Neural Style Transfer algorithm is an important parameter matrix for comparing image styles. In the process of image style migration, it is necessary to continuously adjust the style of the source image so that its style gradually becomes similar to the style of the style image. In this process of adjusting the style, it is necessary to calculate the feature vectors of the source image and the target image, respectively. The formula is expressed as:

$$H_{mn}^{k} = \sum_{l} e_{ml}^{k} e_{nl}^{k} \tag{2}$$

Then calculate the Gram matrices of the two sets of eigenvectors separately to reduce the difference between the two Gram matrices.

In web design, we can apply style transfer algorithms to various types of pages. The style transfer algorithm is a new way of thinking, which can help people make self-selection in a complex and changeable environment and keep it stable to a certain extent. For everyone, they will have their own unique and distinctive personality. When designing a web page, we can incorporate these features into the page. We can design the website with an element that is distinctive, beautiful, and has a certain depth of characteristics, and can be well integrated with other elements. For watercolor painting, there is a very close relationship between color and pattern and can realize its own unique meaning through certain rules.

2.2 Application of Watercolor Painting Technique to Web Design

Watercolor painting is a relatively innovative technology in the design of web pages, but now many websites will choose what they like and can be accepted by others and have high aesthetic value and use value. We can summarize these excellent works as a carrier. Through the analysis of the internal connections and interrelationships between watercolor, pictures and text, video, and other elements, we can determine what style features or common points exist between them. At the same time, consider whether there are differences in content between different types of web pages. In web design, watercolor painting should follow the following principles: (1) Simplicity. It must have a good design style and a variety of characteristics. In order to make the work attractive, it is necessary to consider the overall page layout, color matching, and the relationship between various elements. At the same time, it is also necessary to pay attention to factors such as the connection and coordination between the various sectors, as well as the interrelationship and degree of influence between the various parts to make reasonable arrangements. Before making a web page, you should fully understand the user's needs and analyze them, to determine the appropriate style design. (2) The principle of aesthetics. When designing and making watercolor painting websites, it is necessary to classify pictures of different styles and types, and have a detailed and specific analysis for each classification. At the same time, the page effect can be achieved by making appropriate adjustments to the graphic content. Before the web page is produced, it is necessary to conduct a full investigation of the user's needs to make the design more in line with the customer's requirements. At the same time, it should also consider whether the color matching, matching, and arrangement on the page can attract customers.

The success of web design depends on whether it can attract users to click, and to a certain extent determine whether it can be promoted to the target group. Watercolor painting forms a visual language by creating and producing works based on lines. It is very artistic and expressive. Before making the web page, we have to determine the theme of the watercolor painting, and then add the text and picture information to the database. Doing so can make it more convenient for users to use. In the production process of the webpage, first of all, the website must be reasonably designed to

make the page beautiful and generous. The second is to choose the right color to decorate the picture. Then match it with the font. The final step is to determine the type of style you want to show.

The functional modules of watercolor painting techniques can be classified according to themes on the webpage, such as pictures and text. The most important of these is the picture. We express this information through some special means, so that users can better understand the content and emotions they want to convey. At the same time, the website has more and better visual experience and browsing interest. The main function of the page is to allow users to select and browse on the website. You can click to view the content of the page, or you can add a new page number or delete a page as needed. The most important thing in watercolor painting is that it has a particularity: that is, all pictures have their own unique and irreplaceable language. So we must take this issue into consideration. First of all, make sure that each page is presented in a visual way. The second is the process of showing the user a picture and the content it contains on the entire design interface. In a web page, the website can be divided into several parts according to different content, and each page will have a different color and style. The user clicks to enter different interfaces for browsing.

The interface design of watercolor painting is to combine the text, pictures, and web pages between them, to form a complete and meaningful, which can give people a kind of strong visual impact and fascinating feeling.In the overall layout of the page, you can use some elements that are representative and highly related to the theme and can have some effects.The web interface of watercolor painting is composed of images, text and colors. The purpose is to enable users to easily obtain the emotions conveyed by the watercolor painting, and to visually feel a certain degree of similarity between the text and the pictures in the picture. Therefore, the relationship between the various elements in the interface must be considered when designing the page. For a complete section, the most important thing is to rationally arrange and combine these elements to form an overall style and characteristic web interface form. The second is to make reasonable arrangements for its content, structure, color, and other factors and display them. Watercolor painting is mainly based on lines in the design of web pages, combining different colors, sizes, and textures to enrich the interface. First of all, the overall style of the page is a big frame structure. The second is that the color matching effect and typesetting of the entire screen must comply with certain rules to make reasonable arrangements and permutations to achieve better visual effects to attract users to visit and use watercolor work. Finally, it should be noted that there should be no problems in the visual aspect and cause unnecessary effects.

2.3 Web Design

The expression forms of watercolor painting generally include: rendering method, raza, and folding. In actual creation, watercolor painting usually adopts the method of rendering, because it can directly use materials for cutting. Raza is also a more common technique that is easy to operate and easy to achieve with functional effects. Folding is also a feature that is very commonly used when some special shapes or styling effects are more complicated and not easy to be damaged, and the production cost is high, but it is easy to process and easy to store. There are various techniques of watercolor painting. According to different styles, it can be divided into three types, namely: flat coating + round composite type, point-line-surface combination type, and point-and-piece superposition hybrid fusion method. Many plane processing techniques such as inkjet and brush painting are used in watercolor painting to complete the picture effect. In the production process of watercolor painting, different materials and colors can be used to design. The technique of watercolor painting is mainly embodied in line and color. It is mainly line, color, and toner as the basic point. In the creation, you can choose the most suitable color according to different style

characteristics.

In the process of designing watercolor painting, the most important thing is to design the page, and the style transfer algorithm is a technology that generates new content and realizes new forms when users interact with the web. In the overall layout of a web page, the most important are the interface elements and style tone. Interface elements are planned based on watercolor painting art. By analyzing the characteristics and laws of the user's experience and aesthetic orientation in the process of using watercolor painting software, the overall page structure framework and style tone, color matching and graphic composition methods of the website are determined.

Each page in a web page is independent, and they are connected to each other through an arrangement, which will form a complete structure. The design of the website is dominated by style. The overall framework of the web page designed in this design is mainly divided into two parts. In terms of style, I chose a combination of simplicity and simplicity to create. This can make it easier for users to understand that the content of the work matches the theme, is different from other watercolor paintings, and has the characteristics of originality. Page content mainly includes style, overall layout and color and text. The main function of the page is to classify the information that the user sees, and then realize it through the text link corresponding to the theme element.

3. Experimental Design

3.1 The Purpose of the Experiment

In order to study the feasibility of webpage design and style transfer of watercolor painting, this article uses experiments to compare webpage image transfer. The purpose of this experiment is to prove the effect and feasibility of style transfer through experiments, and to judge the accuracy of the transfer algorithm. Among them, the effect is judged by the change of the webpage image, and the accuracy of the migration algorithm is judged by the data.

3.2 Experimental Method

First, perform observations after approximately 200 iterations to determine the loss of web page images. Then a second test was performed, which was iterated 200 to 400 times to observe the effect of webpage images. After that, the last test was performed, and the target went through more than 400 iterations to get the data results. Then, the dropout method was added to the model prediction for a control study.

3.3 Experimental Test Indicators

Select a random test sample as the input to run the system, observe and compare the trend of loss changes. The style transfer work carried out in the test is to transfer the style of oil painting to landscape photos. A set of tests for the neural graffiti system is to generate a landscape picture from the input web graffiti picture. Compare the difference of webpage pictures, judged by loss function and accuracy. The change of the loss function is mainly carried out from two aspects: content and style.

4. Loss Function Test Results

4.1 Change of Loss with the Number of Iterations

Compared with the style image and content image, the total loss of the target image generated in

the subsequent 200 to 1000 iterations has not changed much. The image effect generated by it is only slightly improved than the result of the previous iteration, but the effect of the target image is still can be continuously optimized. The change data is shown in Table 1:

Table 1: Loss Varies with the Number of Iterations

	Content	Style	Total
200	16000	1500000	6000000
400	17000	800000	3000000
600	17250	500000	2000000
800	17400	350000	1800000
1000	17500	300000	1000000

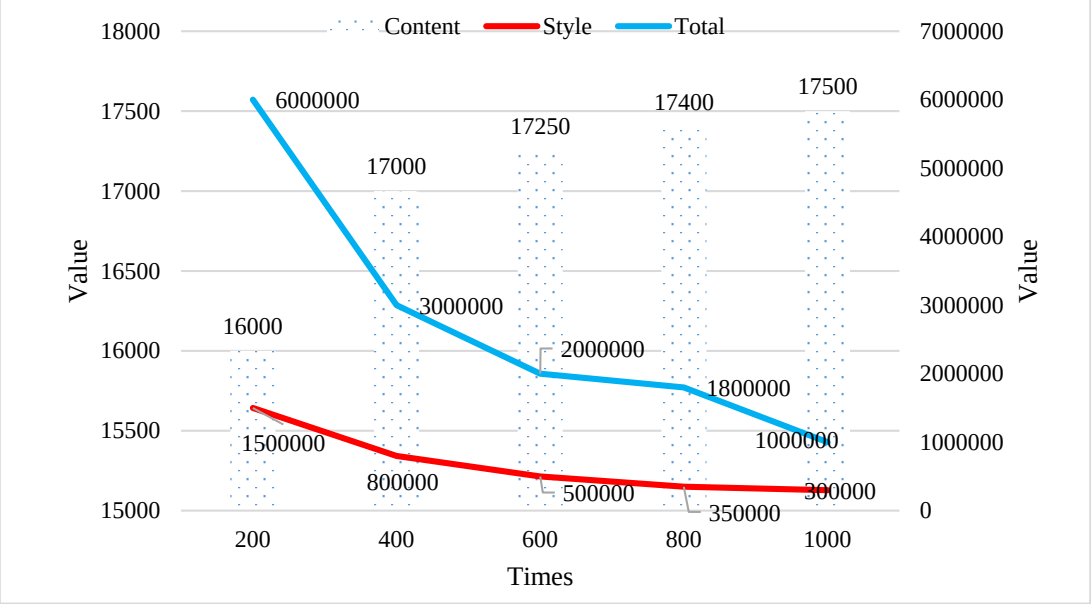

Figure 2: Loss Varies with the Number of Iterations

As shown in Figure 2, when the user uses the image style transfer system, if the user expects to generate a simple transfer result in a short time and does not want to spend more time waiting, the number of iterations of the style transfer system can be set to 200 Second-rate. And if the user wants to obtain a more beautifully migrated image and does not hesitate to wait for a longer time, the number of iterations of the style transfer system can be set to more than 1000.

4.2 Effect of the Dropout Method on the Image Recognition of Fine-Grained Watercolor Painting

Table 2: Effect of the Dropout Method on the Image Recognition of Fine-Grained Watercolor Painting

	With Dropout	Without Dropout
1	65	64
2	85	84
3	92	94
4	90	88
5	89	87

To verify the effect of the dropout method on preventing model overfitting, the comparisons of

the results before and after adding dropout with and without adding dropout operations between the hidden and output layers of the network structure of the MLP were investigated. The details are shown in Table 2.

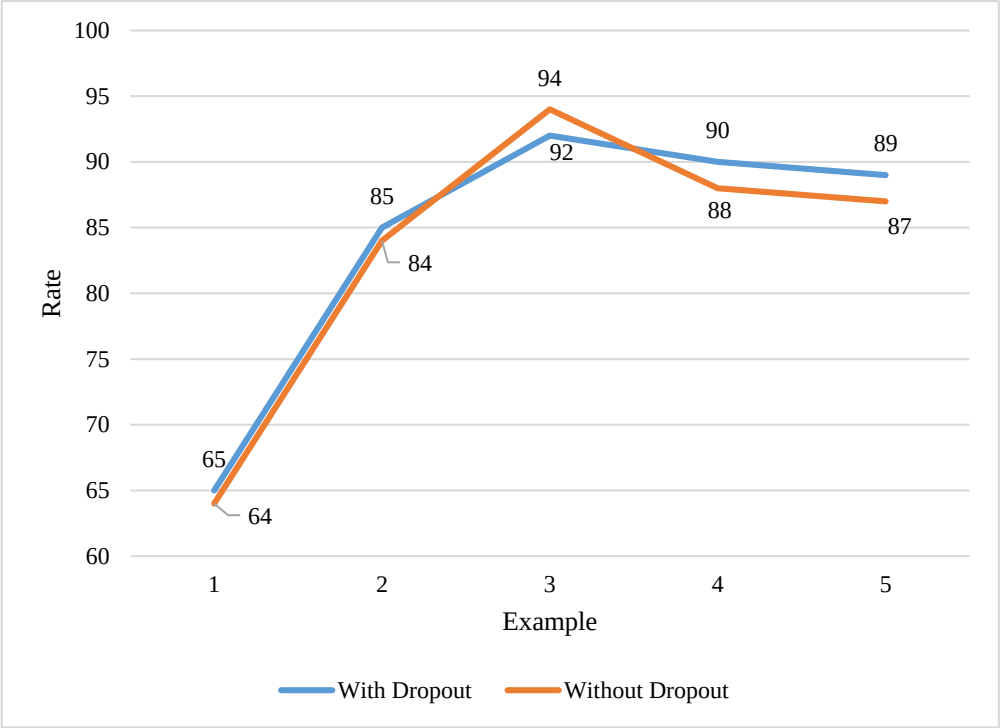

Figure 3: Effect of the Dropout Method on the Image Recognition of Fine-Grained Watercolor Painting

As shown in Figure 3, we can see that after adding the dropout operation, the prediction accuracy rate of the model in the test set is significantly improved, indicating that the dropout method makes the model with strong generalization ability, which can prevent overfitting and improve the predictive ability of the model.

5. Conclusions

With the advent of the Internet age, people are increasingly exposed to modern technology products such as computers, the Internet, and mobile phones. This means that watercolor painting techniques and other techniques will also change with the pace of the times. Image style transfer is to transfer the style of one picture to another, while keeping its content unchanged. Applying the style transfer method has a positive effect on the web design of watercolor painting. It can make painting more efficient to cope with high demand and demanding problems. According to the experiments in this article, this method can quickly perform style conversion and achieve very good results, while saving a lot of time, money, and human resources.

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