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Modern Design Intelligent Training Assistance Platform based on Lingnan Architectural Image Generation Algorithm

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Abstract:Modern design intelligent training assistance platform based on the Lingnan architectural image generation algorithm is studied in the paper. In order to make the network better train unpaired image samples, this paper introduces a loss function composed of the same mapping loss term and perceptual loss term on the basis of the original loss function. Then, the novel style transfer algorithm is designed. We propose CycleGAN without training on paired datasets, and the network employs two general generators and two discriminators, respectively. Two generators are used to then convert between the two domains, and two discriminators are used to distinguish the true and false images in the two domains. Then, the designed model is implemented with the novel intelligent training assistance platform and consider the factor of the Lingnan issues. Through the experimental simulation, the performance is validated.

Keywords: Image generation; image processing; intelligent training; computer platform; architectural image mining

1. INTRODUCTION

Early non-parametric image style transfer is a method of then analyzing style images, drawing a physical model or a mathematical statistical model according to the style, and then synthesizing the texture of the transferred image to make it more in line with the established model [1, 2, 3].

This method requires the establishment of complex models, which has high theoretical requirements, and each style needs to be modeled separately, which is time-consuming and labor-intensive [4, 5, 6]. Compared with the deep learning methods, non-parametric image style transfer methods show more and more shortcomings. Image style transfer initially appeared as a research problem in the field of image processing. Before the rise of neural network, rendering images with different styles was a very difficult image task, which required both style learning and style rendering [7, 8, 9, 10].

It lacked the image representation of the explicit semantic information and could not separate images from styles. Hence, for the efficient analysis, we consider listed issues.

(1)Combining the content of one image with the style of another image jointly minimizes the feature reconstruction loss, which is also based on a trained convolutional network to extract features. Similar methods have been used for texture synthesis. Their method produces high-quality results but is then computationally expensive because each step of the optimization problem needs to be passed forward and backward through a pretrained network [11, 12, 13].

(2)Randomly select a moderately exposed normal image and load it into the trained model, respectively obtain a low-exposure image and a high-exposure image with HDR detail color, and synthesize the two with the original image into an HDR file; then through tone mapping, get the final image as the general image after HDR style transfer.

(3)The task that CycleGAN wants to accomplish is to transfer the image style in domain A to domain B. Two GANs are used. In order to achieve unpaired training of data, it is not only necessary to calculate the loss functions of two GANs. In the figure 1, the framework is defined [14-19].

Slow neural style transfer based on the image iteration defines two types of loss functions: content loss function and style loss function. Among them, the style loss function is the key to the neural style transfer, and is subdivided into the following two categories according to the different style loss functions: methods based on the statistical parameters and methods based on non-statistical parameters [20, 21]. Deep learning model is difficult to see the internal structure, but for convolutional neural network, it can see the internal feature representation in the form of visualization [22, 23].

Three common visualization methods are convolution kernel output visualization, convolution kernel visualization and heat map visualization. The visualization method can make it easier for the convolution kernel to feel the image and locate the position of the object in the image through the heat map. Accordingly, we will discuss the novel issues in the next sections considering different scenarios.

2. RELATED WORK

As the main form of the information received by human beings, visual information with digital images as the carrier accounts for 85%. The quality of the image may be degraded in the collection, transmission, and processing of digital images, which directly affects the quality of the information contained in the extracted images [24, 25, 26].

Effective image enhancement techniques have always been an important research topic in the field of computer vision. After the HDR image corresponding to the dynamic range of the actual scene is generated, since the equipment used for direct display of HDR image is not yet mature, it is necessary to obtain images that can be displayed by the general LDR equipment through HDR-LDR mapping. The premise of the effective implementation of HDR-LDR mapping is that the generated HDR image must be a real mapping of the scene, which requires the highest possible dynamic range, and the HDR image needs to have a linear relationship with the scene brightness. The generator should cheat the discriminator as much as possible. The two networks confront each other and constantly adjust the parameters. The ultimate purpose is to make the discriminator unable to judge whether the output

result of the generator is true or not. In short, the optimization process of discriminator and generator is a minimax problem, also known as zero sum game. However, the optimization of discriminator and generator can not be carried out at the same time, because the data involved in training is limited. If the discriminator is optimized first, there will be the over fitting phenomenon, resulting in the model can not converge.

3. THE PROPOSED METHODOLOGY

3.1 The Image Style Transfer Algorithm

The current mainstream neural style transfer algorithms can be divided into two categories according to the different image generation methods: (1) slow style transfer based on image iteration; (2) fast style transfer based on model iteration. Among them, the slow style transfer based on image iteration generates stylized images by performing pixel iteration on noisy images, and can be subdivided into methods based on statistical parameters and non-statistical parameters according to different stylization methods.

In the process of visualizing convolution kernel, low-level convolution check is interested in the general color and edge information of the target image, and the extracted features are simple detection points and lines. With the deepening of the level, the content becomes more and more abstract and also complex. The convolution layer perceives the object position in the image more accurately, and the extracted features are usually complex specific objects. Among them, Pix2Pix uses paired data as input, that is, one-to-one corresponding source domain style data and the target domain style data, uses the generator to transform the source domain data, and then uses the discriminator to discriminate between real target domain data and fake data. Pix2PixHD is a high-definition version of Pix2Pix, using a multi-layer pyramid to generate high-definition images defined as the figure 2 [27-29]. We designed a cycle-consistent adversarial network for the image style transfer. This is the first time that GAN has been applied to the field of image style transfer, and achieved very good results. Class problem, and CycleGAN's learning data is unsupervised, small in number, and does not require pairing.

3.2 The Modern Design Intelligent Training Assistance Platform with Image Analyziung Algorithms

A parallel vision frame structure that provides real and artificial image data with parallel images as the viewing angle. Firstly, the artificial image is used to expand and supplement the actual image, and the parallel image "big data" combining virtual and real is obtained. Then, various visual models are then learned and evaluated through computational experiments.

Finally, with the help of the parallel execution of online optimization of the visual model, the intelligent perception and understanding of the complex environment is realized. In the figure 4, the parallel model is defined.

When the SAGAN model is trained, the details can be generated using cues from all feature locations, that unlike traditional convolutional GANs that only generate the high-resolution details from spatially local points in low-resolution feature maps. The discriminator can also check for consistency of highly detailed features in the distal part of the image. The improvement of general information technology is the key to intelligent design. At this stage, although there are many types of software related to architectural design, there is the problem of difficult information interaction. At the same time, some intelligent design software is reverse design, which wastes time and resources, and has no substantial effect on promoting the project. To solve the above problems, we must continue to enrich model plug-in tools based on the forward import of the architectural design, and further standardize digital interaction protocol standards, and achieve high integration and sharing of life cycle information of engineering projects such as design, construction, and operation. In the figure 5, the details of the considered model is demonstrated [30-31].

3.3 The Integration of the Lingnan Architectural Image Generation

The transition space of Lingnan modern architecture is the intermediary area where the inside and outside of the building are combined. It is open and transparent and highly integrated with the environment. These transition spaces have different numbers of effective enclosure interfaces, blurring the indoor and outdoor boundaries through general spatial organization connections such as sight lines and streamlines. The design methods of the transition space are various to provide users with a variety of space experiences. From the space type, it can be divided into the following three categories: "grey space", external extension space, and internal open space.

The overall design method is based on the second-generation design methodology, emphasizing the multi-party participation and overall coordination, and believes that the system is an organic whole composed of several elements with certain new functions. The overall design emphasizes that the design process is a dynamic, open, and progressive process, rather than a static, closed, and final result while paying attention to the ambiguity and diachronicity of the design, and its form and function can be adjusted with time and external conditions. The depth, breadth and integrity of the overall design are greatly expanded, and the dimensions of design objects, design subjects, design goals, design processes and also design mechanisms are also greatly enriched. The layout of traditional buildings in Lingnan has accumulated wisdom and experience in the use of low-tech buildings under the natural climate conditions, so that it can not only realize the building's moisture removal and heat dissipation, but also meet the building's shading and cooling. Its functions are interlinked. Each component complements each other, all of which are exerting their general excellent traditional Lingnan architectural culture.

The combination and restraint of the layout elements, as well as the importance of the cold alley in the layout thinking, formed the unique architectural layout thinking of Lingnan, which has survived to this day. Among them, ecological wisdom and ecological perception still have strong vitality for the adaptability of buildings to natural climate at this stage, which highlights the research value and significance of the Lingnan traditional architectural culture.

4. CONCLUSIONS

Modern design intelligent training assistance platform based on the Lingnan architectural image generation algorithm is the core aspect of the paper. From the comparison of experimental results, it can be found that under the same number of iterations, the method in this paper can achieve style transfer faster and achieve a more realistic style transfer effect. We integrate the DenseNet module in the converter as part of the CycleGAN generator, which reduces parameters, reduces computation, avoids overfitting, and improves image generation quality. In the future, we will apply the designed model into more real scenarios.

5. REFERENCES

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