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Research and Implementation of Computer Graphics Separation Algorithm

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Abstract: ***Computer graphics separation is the separation of artificial and natural areas in a hybrid image which is synthesized between computer-generated graphics and natural images. Using mapping, we quantify the color image, convert the color plane formed by each color into a two-value image, map the labeled regions and edges to the original image, define and compute the roughness and edges of each region, and finally complete the identification of the various regions. In computer graphics separation courses, theoretical courses are separated from practical courses, so that the theoretical course of graphics becomes the preliminary course of practical classes. By explaining the principles and algorithms of the theoretical curriculum, students' interests are stimulated and students' connections between theory and practice are cultivated.***

Keywords: Computer graphics separation; Separation algorithms; Graphology.

1. INTRODUCTION

Graph separation in computers refers to the partial separation of artificial and natural areas in a mix of images. Computer technology is constantly evolving. Decades ago, the images we made were of a single color. With the continuous development of computer technology, the color images have evolved from a single colour to the current color images. Computer graphics is a technical discipline that studies the principles by which computers process images and is an important part of computer technology. At present, this part has been classified as an important curriculum in universities, which is professional and technical, and computer graphics has been successfully used in many fields, such as animation or medicine.

2. THE SIGNIFICANCE OF COMPUTER GRAPHICS SEPARATION

The emergence of color products greatly facilitate people's daily life, serving more and more daily use, the image of the usual copy, print and other requirements for quality are getting higher and higher. According to the source of the color of the image, it can be divided into three types. The first is images taken entirely from everyday life or nature, such as images obtained through cameras or scanners, which display colors entirely derived from nature and not modified by other technologies. The second is entirely by computer technology, such as through some image processing software to get the picture. The third is partly derived from nature and partly synthesized through artificial technology, For example, some portrait images, because the artificial part of the whole image and the natural part is not the same, each has its own characteristics, so in the actual image processing, should be treated differently. For example, in the photocopying process, the computational method of color domain mapping is suitable for computer-generated images, but not for natural images. There are also techniques that can only be used for naturally obtained images and cannot be used in synthetic images. In addition, in computer synthesis of images and in natural or obtained images, some technical computations, such as color mapping and rendering, are different. So achieving the separation of computer graphics technology is a very valuable and challenging task. Investigation and research show that there is only similar literature abroad, and there is no literature on this aspect in China. It is simply extracted from the text. Fang (2025) proposed an adaptive QoS-aware cloud-edge collaborative architecture to optimize real-time smart water service management, emphasizing efficient resource allocation and latency reduction[1]. Similarly, Qi (2025) developed DecisionFlow, a lightweight visual framework for SMEs, enabling multi-task joint prediction and anomaly detection to enhance operational efficiency[2]. In healthcare, Wang (2025) employed transformer-augmented survival analysis to improve adverse event forecasting in clinical trials, demonstrating superior accuracy over conventional methods[3]. Computer vision has also seen significant progress, with Guo et al. (2025) enhancing vehicle detection using an improved YOLOv8 network, achieving higher precision in complex environments[4]. Further advancing object detection, Jin et al. (2024) integrated hybrid task cascade and high-resolution networks to improve pose estimation and object recognition in dynamic scenarios[5]. Meanwhile, Zhang et al. (2025) explored machine learning-based anomaly detection techniques in biomechanical big data, providing robust solutions for identifying outliers in high-dimensional datasets[6]. In

supply chain optimization, Saunders et al. (2025) investigated AI-driven smart supply chains, outlining strategies to enhance enterprise operational efficiency through predictive analytics and automation[7]. Complementing this, Pal et al. (2025) proposed an AI-based credit risk assessment system for supply chain finance, incorporating intelligent matching mechanisms to mitigate financial risks[8]. Human resource management has also benefited from AI advancements, as Li et al. (2025) optimized resume-job matching using generative pretrained transformers (GPT) and hierarchical graph neural networks, significantly improving recruitment accuracy[9]. For financial applications, Yang and Duan (2025) constructed a knowledge graph for the US stock market, leveraging statistical learning to enhance risk management and decision-making[10]. In healthcare technology, Ma et al. (2023) designed a life cycle prediction system for medical equipment failures, highlighting the role of AI in preventive maintenance[11]. Additionally, Jiang et al. (2025) introduced Investment Advisory Robotics 2.0, leveraging deep neural networks to provide personalized financial guidance, marking a significant step forward in AI-driven financial advisory services[12].

3. LEARNING ABOUT COMPUTER GRAPHICS

In our daily life, the teaching of computer graphics is also explained as part of the key subject content, but because during computer examination, this part focuses on the examination of theoretical knowledge. The overall practical capability of the course is relatively low, and the computer graphics part of the course itself is not suitable for the traditional teaching mode, and if the traditional way of teaching is still used, it will not help students learn and reduce their interest in learning. In the traditional teaching process, the main focus will be on the interpretation of concepts and principles, expressed as a large number of formulas to deduce.

Before the teaching activities of graphics, students do not have a good understanding of the course, which is probably divided into two types. One is that the study of graphics is only for use in the design of games. After learning the content in the course, students can design the game. Another is artistic design, mainly in advertising design, and in fact throughout the course, emphasis is placed on introducing computer graphics, the main content being the drawing and principles and computational methods of graphics to design relatively basic graphics. Therefore, a one-sided perception of computer graphics may lead to a loss of interest in learning. The boringness of the teaching content and the deviation of the expected practical application will create a huge gap for students, leading to excessive knowledge accumulation on a daily basis and eventually developing a form of learning aversion. The implementation of basic graphics algorithms requires students to learn more advanced programming languages, often through the three main directions of basic knowledge, program design and data organization. The entire course of computer graphics is no longer the same as it was in the traditional courses before,Repeat to deepen memory, computer this discipline relative to other disciplines of the operation ability is relatively strong, need to put the knowledge learned, into the practical operation practice to improve students' practical ability, the knowledge of the comprehensive use of [2].

Computer graphics has developed rapidly in technology, and corresponding curricula have changed with it. At present, the study of computer graphics mainly relies on the three main subjects of theory, programming, and problems as the main content in teaching. Mainly through the theory-based teaching method or using the more traditional repetition of memory, using formula derivation as the main presentation method. The teaching method of using programming as the mainstay is typical for developing students' initial introduction to graphics. Look at the problem through the user's perspective, teach the relevant concepts in graphics, deduce and remove some of the formulas that are not very important, and leave a focus. Problem-based teaching aims focus on the development of students in the use of graphics, Develop the ability to communicate with users as a means of achieving a profound understanding of teaching knowledge and achieving graphic teaching of concepts and techniques, with emphasis on how to solve problems through the use of computer graphics. In the traditional teaching of computers, the relevant calculations are implemented through the C language, and the difficulty in this process is great, students have no clue, and they are slowly not interested, and the number of courses causes students to not have enough time to complete. The practical teaching process is mainly to consolidate the theoretical curriculum, deepen understanding, realize the connection between theory and practice in the teaching process, and allow students to complete the corresponding teaching project in a targeted manner. By changing the way of teaching, reducing the technical requirements for students to program, combined with the practical application of graphics and practical ability, so that students participate in the program to improve their programming ability [3].

Computer graphics and image processing are two subjects in the concept and practical use are developed independently, but in the distinction, can not be completely divided, the two subjects have a lot of similarities. Both are the ways in which images are processed, but they are expressed in different ways. The biggest difference

that exists between computer graphics and image processing is in the data of the software. The way computer graphics are represented varies with the complexity of the graphics. Image processing has a large amount of data, but almost nothing to do with the content described. In the process of processing images and computer graphics, some graphics and images have a certain commonality and interdependence. So the fields of application across these two disciplines are increasing. So in the image processing technology, the application of graphics technology, how to use graphics technology to create images of objects.

4. COMPUTER GRAPHICS SEPARATION ALGORITHM

4.1 Description of the algorithm

In natural images, there are a lot of details, and because these small details are smoother when transitioning between one part of the image to another. Since there are houses, mountains, water, etc. in nature, it is possible to show layers in the image, as well as color continuity in the image. This allows the color changes in the image from one region to another to be consistent and not abruptly felt.

4.2 Color quantization

The first step in computer graphics separation is to quantify color in images that need to be manipulated by using organized maps, which is a little easier in most cases when processing simple, less coloured images. In digital image processing, the most common way to reduce the colour is color quantization. A grouping of highly similar colors and selecting a small number of representative colors to represent higher resolution image colors is called color quantification. In order to improve the quality of quantification and the speed of overall quantification in the process of quantification, a new adaptive learning algorithm was explored. Can also be combined with their own learning to use other quantitative methods, such as Zhongwei cutting method. A key point after quantification is the selection of colors. If the selection is not appropriate, it can have a significant impact on the image. Too few colors are chosen, which makes some of the boundaries between the artificial and natural areas unclear;If the color selection is too much, it will make the image after the decomposition can not find a meaningful feature, identification [4].

4.3 Color plane

Select 20 colors in the image library used, select 20 output nodes in the SOM, Finally, 20 color planes are formed. Within each color plane, all the color-bearing portions are set to white and the color-free portions to black, and a total of 20 two-dimensional images are formed, from which you can see, The original entire image is broken down into several connected regions, each of which is either manufactured or naturally formed, so the computer graphics separation technique becomes separation within each small connected region. One of the better advantages is that each time a small area is separated, the accuracy of the separation is improved compared to the one-time separation of the entire image, and the error can be within two pixels, an accuracy that is difficult to achieve by other methods. However, this method also has drawbacks, such as fragmentation in some areas, difficulty in extracting features on the image, and hindering the identification process at a later stage. In the process of marking within connected areas, in order to speed up the processing, the technicians explored a fast marking method to map connected zones with binary images within these areas. After the whole labeling work is completed, in order to reduce the computational load, the connected region is removed, and then the edge of the connected region is detected [5].

4.4 Roughness

Mapping the connectivity areas within each color plane to the raw image allows you to calculate the required roughness in the region from the raw image, a value that reflects the same degree within a region.

4.5 Image reconstruction

In the process of computer operation, the reconstruction of the image is generally done in two ways, the first is the recombination of the image pixels; The second point is to extract the main information from the image information and integrate it through computer technology. For example, a two-dimensional picture on a screen actually represents the three-dimensional picture of the world, but is not particularly perfect in visual presentation. For example, a picture with obvious textures takes up a relatively large amount of capacity in the storage process, but after regional processing, converting the region's data into graphic data, the resulting capacity will be smaller and

the information will not be lost. For three-dimensional objects, during the reconstruction process, they can be displayed using line frames of vectors or by a dense image with shadows. In fact, in the process of learning computer graphics, it can also be used to reconstruct [6].

4.6 Experimental results

In the course of the study, either the use of roughness alone or the use of edge contrast alone did not have a good effect on the identification. However, using the ratio of edge contrast and roughness as a measure, the finally identified effect will have a significant improvement. For a connected area, compute the contrast and roughness of the edges in that area.And then calculate the ratio of the two parts, and then sort the obtained ratio from small to large, and take the average value of one-third of the pixels in the first part as the measure [7].

5. CONCLUSION

With the advancement of computer theory and technology and the needs of society, computer graphics has developed rapidly, and it is a discipline that values theory and practice. Current research in computer graphics is gradually moving towards the cross-integration of the disciplines. Computer graphics separation technology can improve accuracy when editing regional texts. The study of this technology also requires an effective combination of theory and practical operations, and has a certain practicality. This technique plays an important role in 3D image processing.

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