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Computer Graphics Image Processing Technology and Its Application in Visual Communication Technology

Yihuai Xie

College of Art and Design, Hunan First Normal University
Changsha, Hunan, 410205, China
xieyihuai@hnfnu.edu.cn

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Abstract. *In recent years, with the rapid development of urbanization and Internet technology, the pace of people's lives has been accelerating. On the one hand, work and entertainment occupy a lot of modern people's time. On the other hand, the network and real world pictures show an explosive growth trend. Therefore, people need to spend less time to browse more images, which inevitably leads to a high load on the operation of the visual system. At this time, the brain processing graphic image module operates at high speed and efficiency and the time and intensity of people browsing images will be reduced. Social culture and personal living habits will also profoundly affect the development of information technology, in order to adapt to the modern high efficiency, fast-paced life. Visual communication (VC)system based on Computer graphics image (CGI)processing technology can play its advantages, so that people sitting in front of the screen can enjoy the image information and landscape pictures from all over the world. Using techniques to meet the needs of people's picture appreciation is not only a huge progress, but also save the time cost of searching. Virtual and real-world picture information is abundant, and the processing technology of CGIs can be used to improve the beauty and appreciation of pictures, so as to achieve unforgettable and eye-catching effects. In order to enhance the efficiency of visual design as well as improve the design effect, this paper proposes an intelligent scheduling algorithm. In the experimental part, several groups of graphics with different styles and formats are tested for intelligent alignment. The results show that the intelligent arrangement algorithm proposed in this paper has high practical value in improving the design efficiency and the design effect.*
Keywords: Graphic image processing, VC, feature capture, intelligent orchestration

1. **Introduction.** CGI processing technology started in the 1990s. Along with the continuous improvement of computer performance, the rapid development of storage technology and the establishment and improvement of on-line technology, a comprehensive graphic image processing technology with the computer host as the core, connecting external devices such as printing, scanning and drawing has gradually formed [1]. The computer can use graphic images and other information to design, modify and do other processing by technical means to meet the individual needs of users. Compared with the old design method, the graphic image processing method based on computer technology has made great progress, which not only meets the more diverse needs of users, but also brings huge social benefits in economic and cultural development [2]. Computer processing technology has freed the hands of graphic image designers. It uses software means to complete design tasks more effectively, greatly improving efficiency, and fundamentally

subverting the breadth and depth of graphic image design. On the one hand, it makes visual design elements stored, shared and reused in a more secure, efficient and convenient way. On the other hand, it can also make the color, line and overall effect of design works more vivid and strengthened [3].

VC technology (VCT) refers to the use of technology to process visual elements such as images to affect the effect of the external world communicating to the human visual system [4]. The term VC became popular at the Tokyo World Design Congress in the 1960s to express the process of transmitting visual works expressed by the hands of designers to the human eye system. The development of the concept of VC has greatly influenced the development of advertising design and commercial promotion, and is a systematic improvement of traditional design methods [5]. By the end of the 20th century, the development of graphic image processing technology led to a greater integration of VCT with computer technology [6]. It has greatly improved the development of VCT and expanded the scope of VC applications without changing the basic concept of VC [7].

One of the most critical parts of CGI processing is graphic language [8, 9]. Through the design and modification of the text display form, the designer can not only let the audience appreciate the multiple dynamic effects of the object, but also improve the viewing value of the whole article by strengthening some or all of the text content [10, 11]. The text design operation step is relatively simple, first to enter the text content, and then to find the function that can modify the text, such as the size, thickness, type, color, etc. of the font. The orchestration of graphic languages is also important. Especially software design, how to intelligently arrange graphic languages has become an important direction in VC design(VCD) [12, 13, 14].

In order to increase the efficiency of visual design as well as to improve the design effect, this paper proposes a graphical language based intelligent arrangement algorithm. The intelligent orchestration of the graphic language mainly consists of three steps, which are the calculation of the size and coordinates of the graphics, the representation of the graphic language, and the design of the orchestration control flow [15, 16]. In all three stages, the use of the old algorithm for calculating the size and orientation of the graph is not satisfactory, and at the same time it highlights the limitations of traditional computational methods. When the graphical language representation is implemented using the meta-model approach, it is difficult to express accurately and it is almost impossible to control the arrangement of the language effectively because it lacks normative and specific criteria. Therefore, it is necessary to introduce an intelligent language orchestration algorithm based on advanced technology, and conduct rigorous experiments, which show that the algorithm achieves a good positive choreography effect and high user recognition.

This article summarizes computer graphics and image processing methods, proposes improved algorithms for this article, provides algorithm support for the research content of this article, and constructs experiments. The reliability of this algorithm is verified by experimental test results.

2. **Methodology.** In this paper, we use a new algorithm combined with experiments to improve it.

The calculation of the size and coordinates of the graphics is first carried out, including the representation of the graphic language, and the design of the orchestrated control flow. Then the programming design, the programming language is Java language, through the computer software to achieve the intelligent arrangement of VCD language.

2.1. **Intelligent arrangement ideas of VCD.** CGI processing technology is used in VC, forming an intelligent orchestration design.

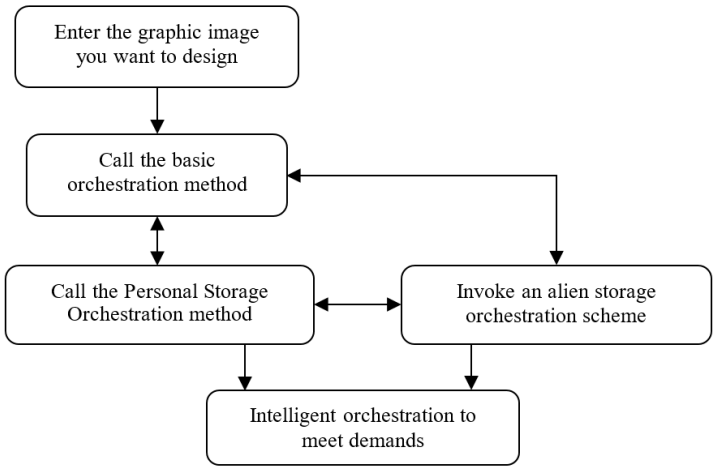

FIGURE 1. Intelligently orchestrate design flowcharts.

Figure 1 showns the main design ideas based on the intelligent orchestration of graphic image language:

(1) Enter the graphic images that need to be designed, and there are the most basic arrangement methods in the processing software to assist the designer in the basic arrangement operation.

(2) Designers can formulate their own reusable orchestration schemes, and store them in personal orchestration repositories, which can be called at any time according to design needs.

(3) Designers can introduce exogenous orchestration schemes and reuse other designers' orchestration schemes according to shared standards.

(4) The software program can calculate the best optimization scheme according to the number of cited orchestration schemes, and intelligently recommend them.

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(5) Repeat (1) to (4) until the design results meet the expected requirements. The processes are Enter the graphic image you want to design-Call the basic or chestration method-Call the personal Storage orchestration method-Invoke an alien storage orchestration scheme-Intelligent orchestration to meet demands.

2.2. **Several design issues of intelligent orchestration management.** (1) How to design the basic arrangement method

To design the basic arrangement method, it is necessary to understand the most commonly used basic design methods in the VCD of graphic language, including the design of the most basic elements such as text, image, shape, and color. As VCD continues to expand into more fields, a vast design field has emerged, including the publishing industry, the printing industry, the exhibition industry, the film and television image editing industry, and the design of specific environments. Based on these wide application scenarios, we design a basic orchestration design method for graphics processing that can be used for examples.

(2) How to call the foreign orchestration scheme

CGI processing technology has developed rapidly in recent years, and specific design schemes and application examples have emerged in an endless stream. Computer graphics processing cases for VCD have been widely discussed and exchanged in web forums and design circles. According to the discussion and formulation of authoritative institutions

and designers in the industry, we will develop a standard for the transfer in and out of more application systems, and use this standard to design and share the arrangement scheme library, and manage according to different application aspects, which can improve the overall level of VCD with high efficiency and high quality.

(3) How to intelligently identify the orchestration method

Using machine learning technology to compile intelligent software programs, the computer will consciously learn and memorize similar, available, and commonly used arrangement methods in the process of VCD by designers, and prompt users to store. The post-storage method can be submitted to the shared platform for trial, and after a certain degree of recognition, it can officially enter the public shared library of the platform to provide more designers with choices.

2.3. **Calculation of drawing size and coordinates.** Now suppose there are n icons in common, their coordinates are $a_i b_i$, i is the natural number, and $1 <= i <= n$. VCD uses graphic buffers to calculate their size using a fixed-value algorithm [17]. The specific calculation process is as follows:

(1) First judge whether the aspect ratio of the size of the graphic in the VCD is consistent with the actual situation. If it does not, there may be a deformation of the design image. Therefore, it is necessary to judge the match in advance before proceeding to the next step.

(2) If the judgment situation and the actual situation are consistent, it can be inferred that the display size of the graphic is also the set width and length.

(3) If the actual situation does not match the width and height of the design, it is necessary to calculate the actual value of the relatively large as the basis and calculate according to the width and height ratio of the graph, and the actual width and height that should be displayed can be obtained.

The width and height of the background are represented by W and H, respectively, and the number of backgrounds is represented by N. To ensure that the number of backgrounds in VCD is minimized, it is necessary to maximize the use of backgrounds and arrange calculations through objective functions.

$$N(\min) = (n-1)H + h \tag{1}$$

In Equation (1), n represents the number of backgrounds, and h is the height of the last background in the VCD [18].

2.4. **Graphical syntax representations.** Language expression mainly contains three parts: morphemes, grammar and semantics. Graphic languages are no exception, with syntax being the most important. In fact, the main part of the graphical arrangement syntax is focused on the grammatical representation. Graphical languages are described according to reasonable grammatical rules.

According to the syntax rules, the logical relationship between one meta icon and another meta icon is described, and the coordinate relationship between the meta icons and other related information is expressed according to a set of rules. Can be expressed as

$$P = (T, BR, DR) \tag{2}$$

In Equation (2), P is the grammatical representation of the arranged language, and T is a finite collection of meta icons. BR represents a collection of non-figurative semantic rules, and its expression is

$$BR = \{f \mid f(m_1, m_2, e); r_1 \ll T, r_2 < T\} \tag{3}$$

The f in Equation (3) is the correspondence between the meta icons, and there are two correspondences, namely Hin and Hout. Hin expresses from m_1 to m_2, Hout expresses from m_2 to m_1, m_1 is the internal meta icon, m_2 is the external meta icon, e is a natural variable, and there are multiple meta icon correspondences.

DR is a figurative collection of semantic rules whose expression is

$$DR = \{(t, size,\ color) \mid t \ll T,\ size \ll Q,\ color \ll G\} \tag{4}$$

Q in Equation (4) represents the combination of meta icon size relationships, G represents the combination of meta icon color relationships, size represents the size of meta icon associated icons, color represents the color of meta icon associated icons, and T represents the meta icon correspondence correlation system.

2.5. **Graphical orchestration intelligent learning architecture.** The adaptive fast peak clustering algorithm [19] is improved and combined with ShareNet to capture the image characteristics learned in the shared online network, form standard parameters and convert, classify and save the attributes, and update the enclosures involved in the classification. The learning model structure diagram is as follows:

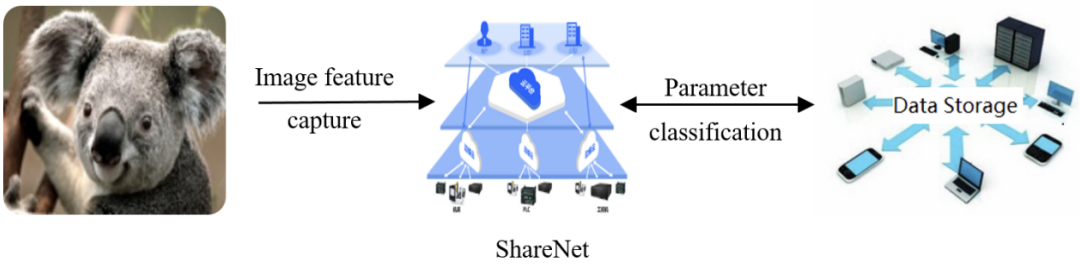

FIGURE 2. Intelligent learning architecture based on ShareNet.

Figure 2 shows that through the establishment of a shared network graphic design for intelligent learning architecture, the graphic characteristics of VCD are captured, classified and saved, and will be updated to the local and shared network for multiple reuse, which greatly improves the efficiency of designers' work, enhances professional technical exchanges, and provides a huge boost for the development of VCD.

3. **Result analysis and discussion.** This part is to verify the research content of this paper through experimental research.

The experimental environment is set to a desktop computer with Intel(R) Core(TM) i5-6500 processor, 4.00 GB RAM, and 64-bit operating system for Windows 7.

3.1. **The experiment for intelligent arrangement of graphic features capture algorithm experiments.** In this section, the experimental goal is to verify the effectiveness of intelligent orchestration algorithms in the practical application of VCD. The design background size set by the experiment is 120*180. The experimental process is to compare the graphical design before and after using the intelligent edge crawling algorithm, and the experimental results are displayed in Figure 3 and Figure 4.

From the display effect and grasping method of Figure 3 and Figure 4, it can be seen that the proposed intelligent orchestration algorithm has a better effect on the capture of graphic features, can better complete the graphic image processing, and can also meet the needs of VCD more efficiently.

In Figure 3, the proposed intelligent orchestration algorithm can meet the needs of grasping a single shape of different shapes, grasping the shape, color, coordinates, size

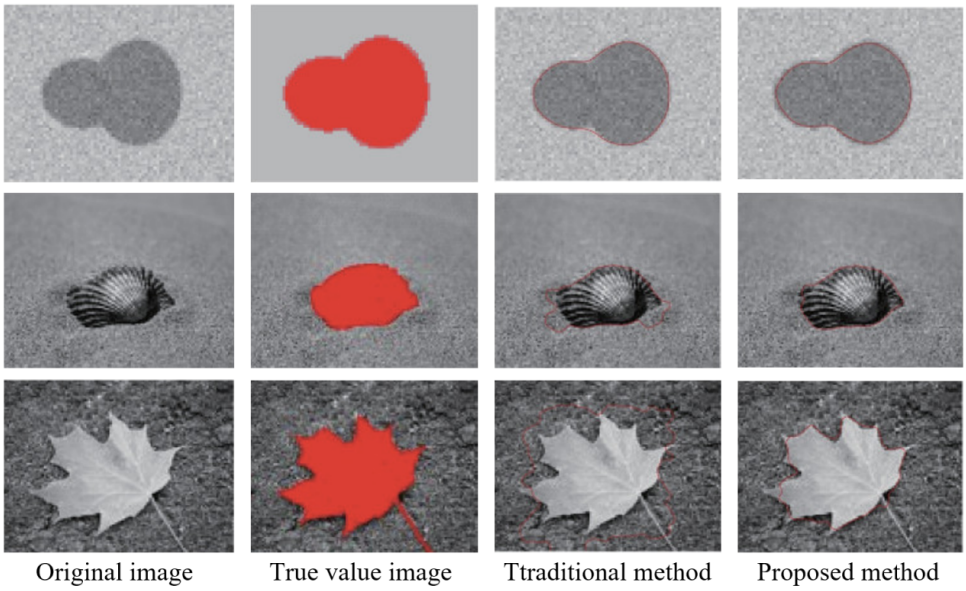

FIGURE 3. Comparison of intelligent arrangement of graphs features capture.

and other information of a single description target in the background, and the graphics after capture, calculation, access and restoration can meet the expected needs of the experiment, and can be intelligently edited and reorganized to meet further design needs.

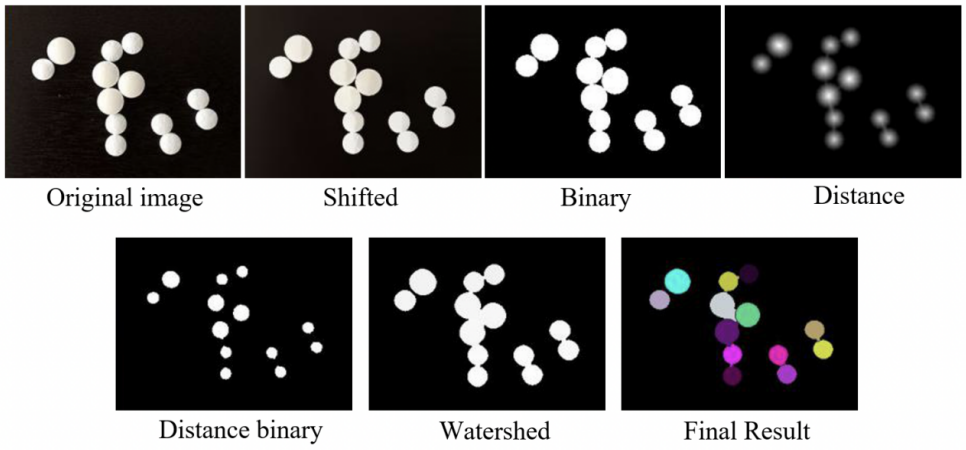

FIGURE 4. The process of obtaining graphic features and rendering.

In Figure 4, there are multiple description targets in a background, and the proposed intelligent orchestration algorithm is used to classify and identify, capture, calculate, access, and restore, and reproduce the graphs containing all the description goals, which can be intelligently edited and reorganized to meet further design needs.

Therefore, the intelligent arrangement algorithm of VCD can accurately calculate the graphic features, access, restore and edit under the standard, which can effectively meet the needs of designers, and has good feasibility and high practical value in graphic image processing.

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3.2. **The experiment for Intelligent orchestration of feature recognition algorithm reliability.** In order to further verify the reliability and stability of the feature recognition algorithm in intelligent orchestration design, and to prove that the intelligent orchestration of VCD has a high practical value in improving design efficiency and improving design effect, intelligent orchestration tests are set for multiple groups of graphics of different styles and formats.

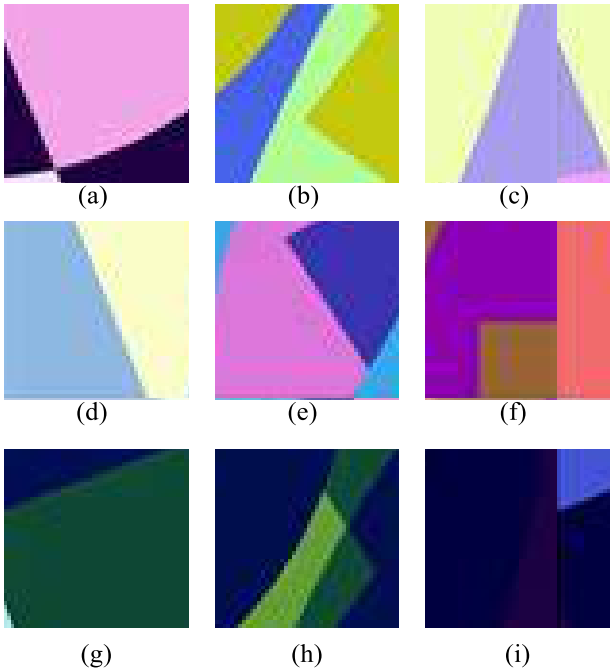

FIGURE 5. The process of capturing multiple color feature.

Figure 5 showns the intelligent orchestration algorithm can quickly identify the different colors of multiple description targets in the same background, and after classifying numbers, calculations, accesses and calls, the graphic colors can be re-edited according to the needs, such as synchronous weakening, strengthening, and inversion. These features are common in some basic VCD needs, and can be further intelligently arranged to learn, resulting in a variety of color editing schemes for users to choose.

Figure 6 showns the intelligent arrangement algorithm can quickly identify the overall outline, line changes, total number of different shapes, and the same number of shapes described in the same background, and after classification numbering, calculation, access and call, the shape of the figure can be re-edited according to the needs, such as synchronous coarsening, refinement, softening, sharpening, etc. The above functions are more common in some basic VCD needs, and can also be further intelligently arranged to learn, and a variety of shape editing schemes can be obtained for users to choose.

Figure 7 showns the intelligent orchestration algorithm can quickly identify the different sizes of multiple description targets in the same background, and after classifying the number, calculation, access and invocation, the graphic size can be re-edited according to the needs, such as synchronous larger and smaller. These features are common in some basic VCD needs, and can also be further intelligently arranged to learn to derive a variety of size editing schemes for users to choose from.

3.3. **Intelligently orchestrated VCD user satisfaction statistics.** In order to further understand the feelings of poster designers, website editors, video editors, visual design students and teachers on the role of intelligent arrangement in VCD, a certain

(a) Original image (b) Processed image

FIGURE 6. The process of capturing multiple shape features.

(a) Original image (b) Processed image

FIGURE 7. The process of capturing multiple description targets.

size of people is set to conduct satisfaction surveys and statistics. The statistical content mainly involves the age, occupation, employment time, use of intelligent programming time, and feeling score of the respondents.

Figure 8 lists the details involved in the statistics, in addition to the basic information of the respondents. There are also options such as user usage scenarios, cognitive intelligent orchestration design paths, introduction of others' willingness to use, and evaluation of the development prospects of intelligent orchestration. This has certain reference value for objectively and comprehensively understanding the application prospect of intelligent orchestration in VCD.

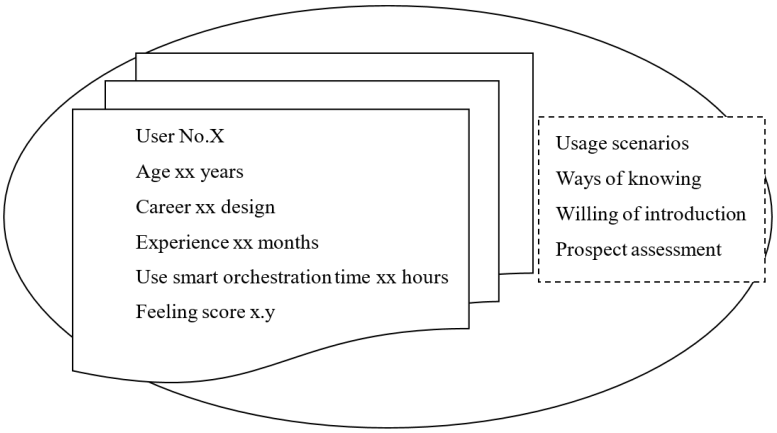

FIGURE 8. The statistical framework for intelligent choreography design.

TABLE 1. Structured user table for designing intelligent orchestration

Occupation	Age range	Number of surveyed	Time of practice (study)	Duration of use
Poster Designer	25–55	80	18–363 months	2–48 hours
Site Editor	22–45	120	18–221 months	2–23 hours
Video Editor	21–43	73	18–195 months	2–18 hours
Student	16–27	161	3–42 months	12–48 hours
Teacher	26–61	32	18–345 months	2–25 hours
Others	23–58	45	18–256 months	2–34 hours

Table 1 details the occupation, age range, number of respondents, time frame for practice or study, and the length of time range for designing using intelligent arrangement. Due to different occupations and ages, there are also large differences in the time of practice or study, the learning time of students is relatively short, the traditional poster designer has a large span of time, the teacher's employment time span is also larger than other groups, and the average time of emerging website editors and video editors is relatively short. There is little difference between different occupations in terms of the age range of the design.

TABLE 2. User satisfaction statistics table for designing intelligent orchestration

Occupation	Satisfactory score range	Average satisfaction score	Proportion of positive reviews (%)
Poster Designer	1.9–8.3	5.6	55
Site Editor	4.9–9.5	8.2	78
Video Editor	5.1–9.4	8.3	81
Student	3.9–8.9	7.3	77
Teacher	2.2–8.7	6.8	69
Others	3.4–9.1	7.1	71

Table 2 lists the evaluation scores of the statistical objects for the role of intelligent arrangement in VCD. The statistical results include the range of satisfactory scores, the average satisfactory score, and the proportion of positive reviews.

Among them, the satisfaction score range is 0 to 10 points, 0 is the most dissatisfied, and 10 is the most satisfied. From the statistical results, it can be seen that the lowest score appears in the traditional VCDer poster design practitioners, and the highest score

appears in the emerging design group of website editors. Students and teachers have scores in the middle.

The average satisfaction score is calculated by dividing the total score by the number of people surveyed, rounded to the next decimal place. From the statistical results, it can be seen that poster designers have the lowest average satisfaction, the only group with an average score of 6 points, and the average satisfaction of video editors is the highest, followed by website editors.

The proportion of positive reviews is basically in line with the ranking of the average satisfaction score. From this, it can be concluded that the group with higher average satisfaction also has a higher proportion of positive reviews.

TABLE 3. Comparison of user satisfaction for multiple algorithms

Occupation	Poster Designer	Site Editor	Video Editor	Student	Teacher	Others
Literature [20]	5.1	7.2	7.1	6.6	6.5	6.3
Literature [21]	5.3	7.3	7.5	6.9	6.7	6.8
Literature [22]	5.1	7.8	7.4	7.1	6.2	6.7
Literature [23]	4.9	7.2	7.7	7	5.9	6.9
Literature [24]	5.2	8.1	8.2	7.7	6.6	6.6
Proposed	5.6	8.2	8.3	7.3	6.8	7.1

Finally, the proposed algorithm in this paper is compared with the literature [20, 21, 22, 23, 24]. The graphical language automatic programming results of each algorithm are given to different users all to view, and the obtained user satisfaction results are shown in Table 3 and Figure 9.

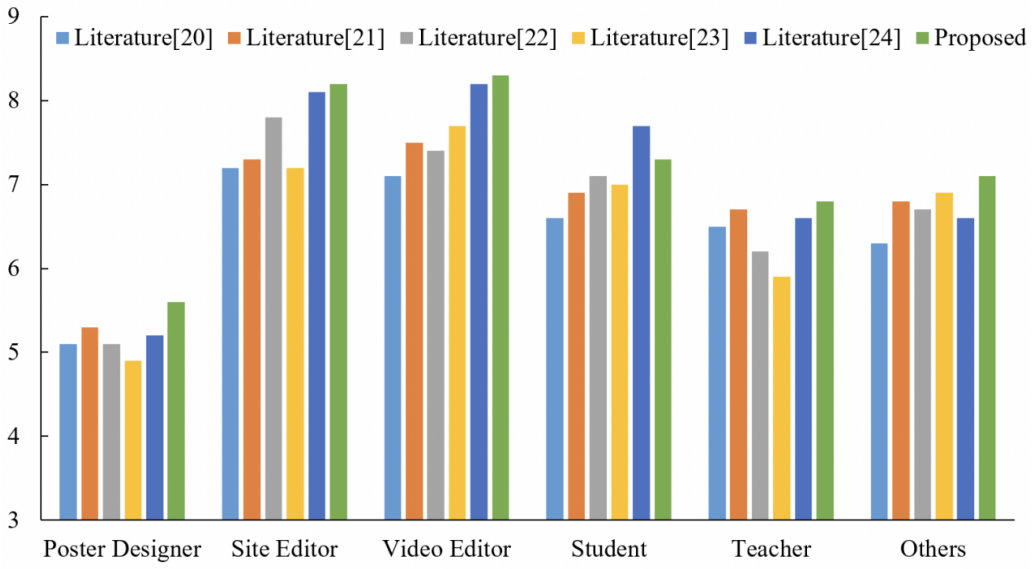

FIGURE 9. Comparison of user satisfaction for multiple algorithms.

By analyzing Table 3 and Figure 9, it can be seen that the algorithm proposed in this paper has the highest satisfaction scores among the satisfaction ratings of different occupational users. This further indicates that the satisfaction of the automatic graphic language scheduling effect obtained by the algorithm in this paper is better, i.e., the stability of the proposed algorithm is verified.

3.4. **The discussion of intelligent orchestration algorithm.** Under the background that computer information technology has penetrated into all aspects of modern society, the traditional drawing VCD has also developed into a virtualized intelligent design based on CGI processing technology. As an important carrier of information dissemination, computers have begun to play an increasingly important role in VCD. Combined with the high efficiency and low cost characteristics of digital technology, the digitization of VCD has become an unstoppable trend, and design works are becoming more and more diverse and innovative. Today, there is hardly a widely used VCD work that is not produced using computer image technology. VCD based on CGI processing technology can have such achievements, largely because it adapts to the trend of the development of modern design technology and meets the increasingly difficult requirements, higher and higher efficiency requirements, and more and more creative requirements in the global market for VCD works. This is not to say that modern VCD works are detached from the material basis and no longer need to consider drawings or actual display effects. In fact, each virtual work is still based on the design premise of physical display effects, but through the use of advanced machine learning technology and efficient sharing platform, the design works can meet the visual effects in a higher level of way.

Intelligent development makes VCD a combination of art and science, to meet the needs of users more complex, higher level. As a product of the Internet era, its future development trend will be to meet people's more personalized needs. Intelligent orchestration algorithm is the product of the rapid development of today's artificial intelligence technology, and it is also a major application of advanced computer technology in visual design. It can be seen from the experimental results that these applications have high use value and are worth further exploration and development.

The above experimental research verifies that the method proposed in this paper is progressiveness and can effectively improve the computer image processing technology, and further enhance the stability of the visual communication system.

4. **Conclusions.** Intelligent development makes VCD a combination of art and science, to meet the needs of users more complex, higher level. As a product of the Internet era, its future development trend will be to meet people's more personalized needs. Intelligent orchestration algo- rithm is the product of the rapid development of today's artificial intelligence technology, and it is also a major application of advanced computer technology in visual design. It can be seen from the experimental results that these applications have high use value and are worth further exploration and development.

In the case of the gradual weakening of the influence of traditional media such as newspapers, magazines, and television, and the continuous development and change of the visual display design needs of emerging media such as the Internet and mobile devices, CGI processing technology is inevitably applied to the VCD process. The media communication market is huge, rapidly developing, complex and changeable, which can be said to be an important aspect representing the development characteristics of the Internet era. In the new media era, the information conveyed by visually conveying works has emerged, various design concepts and thinking have emerged, and at the same time, complex and changeable development directions have emerged. With the advancement and development of information technology, VCD has been applied to all aspects of people's lives, bringing people more novel experiences. Behind these changes are the achievements of several generations of VCDers who have continuously explored new technologies and new ways for higher goals and pursuits, and experienced countless failures.

This paper develops in-telligent scheduling algorithms using computer graphics and image processing techniques. By using this algorithm, designers can accomplish design goals

that used to take days, months, or even years to accom- plish on a computer in a matter of hours or even minutes. More importantly, the intelligent scheduling technology proposed in this paper can produce design results that are difficult to achieve with traditional techniques. It is through continuous learning and maximum shared communication, the intelligent design capability of VCD can be constantly developed and creativity is endless. In the next work, we will system- atically analyze the efficiency of the algorithm in this paper and investigate the methods to improve the performance of the algorithm in this paper.For the algorithm part, the fault tolerance of the algorithm is improved, and the application scope of the algorithm is improved.

The experiment part improves the practicality of the experimental research object, expands the experimental object, and compares it with more documents.

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