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Algorithm for Automatic Layout of Graphic Language and Its Application in Graphic Design

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ABSTRACT

When using traditional algorithms to describe graphic languages, the results obtained are not accurate due to the lack of strict standards. In this case, the size and position of the graphic display cannot be accurately determined. Aiming at these problems, we propose a new automatic typesetting algorithm for graphic languages. Use the constant method to calculate the display size of buffered images in graphic design. The ant colony algorithm is used to solve the optimal solution, so that the optimal display position of the graphics in the graphic design can be obtained. Graphics are powerful. For example, excellent graphics such as the presentation of forms, the expression and transmission of information, often make people feel relaxed and empathetic, shorten the distance between each other, and make communication smoother. As a result, graphic languages have become an important part of modern graphic design and are used more and more frequently. This paper attempts to analyze the representation of graphic language, aiming to demonstrate its important role in graphic design.

KEYWORDS

Graphic Design, Graphic Language, Programming Algorithm, Visual Communication

Graphic language plays an important role in modern graphic design, and its reasonable layout and precise presentation are of great significance for information communication. However, traditional algorithms have many limitations in describing and typesetting graphic languages, resulting in unsatisfactory accuracy and effectiveness of the results. Due to the lack of strict standards, it is often difficult to accurately determine the size and position of graphics, which affects the optimal display effect of graphics in graphic design. To address this issue, this article proposes a new automatic graphic language layout algorithm aimed at achieving the best display effect of graphics in graphic design. This algorithm uses the constant method to calculate the display size of buffered images in graphic design and uses ant colony algorithm to solve the optimal solution to determine the ideal display position of graphics in graphic design. By establishing an objective function and combining a set of rules to define graphic elements and logical relationships, as well as describing the positional relationships of graphic elements, automatic layout of graphic language can be achieved.

This article attempts to analyze the manifestations of graphic language and demonstrate its important role in graphic design. At the same time, the focus has been on the application of graphics in graphic design rather than simply referring to patterns or symbols. The automatic layout of graphic language is achieved through parallel and selection processes, and the sorting effect, attention, and

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satisfaction of the algorithm are verified through experimental results, further proving that the graphic language algorithm for computer automatic programming has high practical value. This study promotes the application of graphic language automatic typesetting algorithms in graphic design, providing more efficient and accurate typesetting tools for visual graphic design.

LITERATURE REVIEW

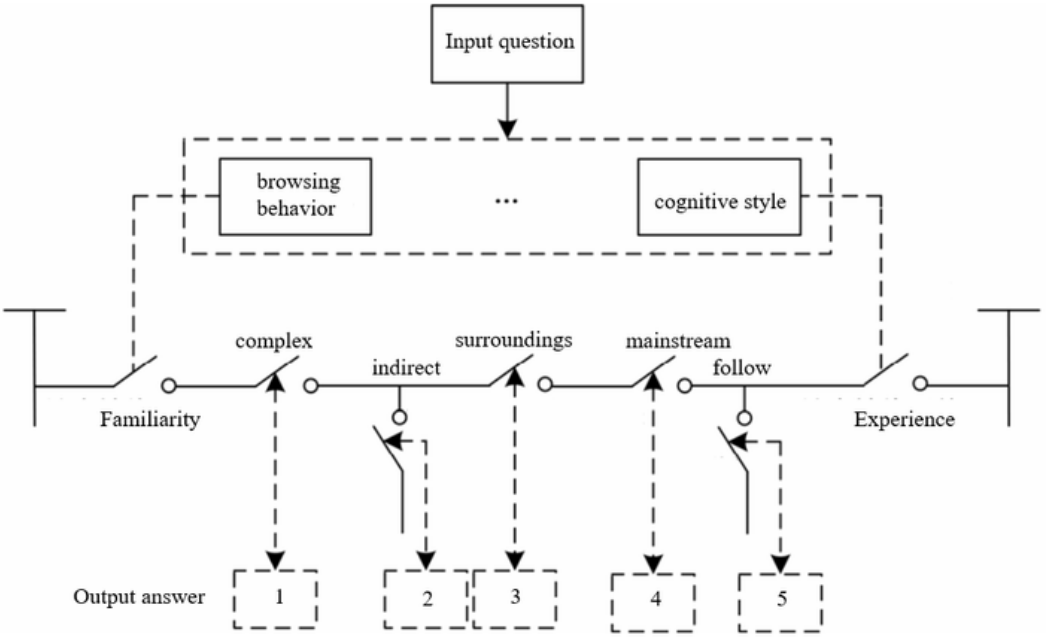
In modern graphic design, graphics are used more and more widely. Whether it is a media advertisement or a corporate logo, graphics have become an integral part of these design links. Graphics are descriptive pictorial images whose purpose is to express to the audience the visual image they want to present or show a specific image, which is different from the visual expression brought by auditory and textual music (Petitpierre et al., 2024). Compared with auditory, graphic language is straightforward and realistic (Momeni Rad et al., 2024). Compared with words, it is more subtle and can give people unlimited space for reverie.

Formally, graphics have their particularities. First, they are a single element or a combination of several elements (Ricci et al., 2024). Second, they are a conscious depiction. Finally, they must be dominated by a specific ideology (Oucheikh & Harrie, 2024). Many people easily confuse graphics with logos and patterns, which are completely different concepts. Graphics cannot simply be defined as some kind of sign or symbol, nor can they be viewed from an aesthetic point of view. In its extensive design, graphics pay more attention to expressing language, humanistic spirit, and symbolic meaning. Text is the carrier of information (de la Parra et al., 2024). The use of words is essential in visual communication design in order to accurately convey various information.

As far as China is concerned, in the actual operation of the relevant design, the fonts used are mostly Chinese characters (He, 2024). This has certain advantages compared with other fonts, and its root lies in the superiority of Chinese characters (Vieira et al., 2024). The development history of Chinese characters can basically be equated with the development history of the Chinese nation (Kochański & Borkowski, 2024). In the graphical language description stage, the lack of strict standards leads to inaccurate model description results. This makes it difficult for the model to effectively support the layout control of the graphic language (Pitts & Fowler, 2024). Therefore, a new automatic typesetting algorithm of graphic language in graphic design is proposed. Experimental results show that the algorithm has better layout effect and higher user satisfaction (Kurylets & Goranin, 2024).

The literature on language on automatic layout algorithms in graphic design has evolved over the years (Mubinabonu & Sohib, 2024). Bharne and Bhaladhare (2024) proposed a method for designing cell libraries using symbolic layout and hierarchical compaction. Suresha et al. (2024) discussed automatic page layout using genetic algorithms for electronic albumin. Asgari and Hurtut (2024) introduced the active layout engine for variable data printing applications. Afolabi et al. (2024) explored structured layout for resizable background art. Recent studies by Soliman et al. (2024), Yudhanta and Hadinata (2024), and Adisusilo (2024) have focused on the application and development of automatic layout algorithms for graphic language in visual communication design. Blake et al. (2024) specifically addressed the automatic layout algorithm of graphic language in visual communication design. Lughbi et al. (2024) proposed a graphical language automatic scheduling algorithm for resource allocation in visual communication design. Jiang (2024) introduced a new algorithm for the automatic layout of graphic language in visual communication design under the new media context, emphasizing real-time decompression and rendering using programmable graphics hardware. These studies highlight the importance of automatic layout algorithms in enhancing the efficiency and effectiveness of the graphic design processes.

Figure 1. Experimental research question framework



RELATED MATERIALS AND METHODS

Graphical

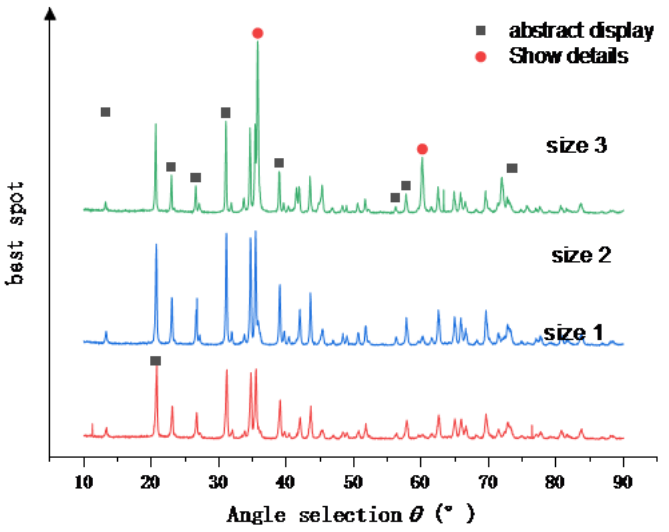
Graphic design is a design activity that uses graphic symbols to convey information and bring visual aesthetics to people. Graphics technology has been closely associated with media since its inception. Figure 1 shows the process of our research problem. Graphic design technology develops with the development of media. However, computer technology has greatly changed the design concept and design method of media due to its innovative design language, thus providing a broader development space for graphic design. Image language is very important in graphic design and is the main form of graphic design. Therefore, it is of great significance to automatically arrange it.

Color plays an important role in expressing the beauty of a graphic. As we all know, different colors will give people different psychological feelings, so related disciplines such as color psychology have also been derived (Priya & Sandesh, 2024). In this article, we only discuss the general perception of color, not the psychological aspect. When people look at colors, they are often visually stimulated, and they generate associations according to their living environment and experience and show different associations according to different colors.

Throughout the development history of human civilization, the connotation and form of graphic language are not static. From petroglyphs to paper printing to digital media art, every technological advancement and media revolution of human civilization has provided a broader space for the development of graphic languages. Since the middle and late 20th century, with the vigorous development of media technology and the development trend of media integration, the manifestations of visual art have been continuously diversified (Arooj et al., 2024). The new media based on digital technology has greatly promoted the production and dissemination of graphic language.

Visual art creation is gradually moving toward scene production mode. Graphic language design under digital media is developing toward a more realistic sense of experience, multisensory and interaction. In addition to the basic information transmission function, it also extends new connotations

Figure 2. Optimal design points for each size



(Miao et al., 2024). The form and characteristics of visual communication, the way and intention of information transmission, and the depth and breadth of media participation have a profound impact on the subject and object of visual communication. In the process of computer graphic design, the choice of color and the application of color language are the most important parts. The application of language is usually influenced by many factors, such as graphic design style, graphic design audience, etc. Therefore, how to use color language more reasonably is a question worth thinking about. Due to the use of computer graphics design, most of the color languages used in computer graphics design have the characteristics of solidification. As shown in Figure 2, it is precisely because the traditional application of color language has this feature, so it is imperative to innovate and adjust color language to adapt to the aesthetics of the new era. In view of the above reasons, we should think deeply about the application of color language and seek more optimized and perfect strategies for its application.

Over the years, great changes have taken place in the aesthetic orientation of computer graphic design. At the present stage, color language is widely used. Color can be said to be a design language, and it can also be said to be a display language. In practical application, color language can also be regarded as one of the design elements in computer graphic design. Language, as a design element, is organically integrated with other design elements, thus forming the basis of computer graphic design. In recent years, the design elements in computer graphic design have been updated, but color language still occupies an important position in the computer graphic design industry. The application of color is the foundation of overall graphic design. The expression of color language will also be presented in the overall design, while the application of other elements in graphic design also needs the support of color language (Jian et al., 2024).

Graphic Design

We will now describe the basic principles of image rendering process optimization. In the process of image drawing, the endpoint conditions are given, and the curve type is judged first. For the open curve, parabolic equations are established by using three points at the first and three points at the last to calculate the slope of the endpoint, as seen in Equation (1).

$$\begin{aligned} a &= c_1 \times x(1) + c_2 \times x(2) + c_3 \times x(3) \\ b &= c_1 \times \mathrm{y}(1) + c_2 \times \mathrm{y}(2) + c_3 \times \mathrm{y}(3) \end{aligned} \tag{1}$$

where x represents the head slope in the image and y represents the end slope.

The slope of the first point and the slope of the endpoint are used to constrain the image drawing process. A suitable image line tension function is selected and expressed by Equation (2).

$$\chi = \frac{a-b}{n-1} \tag{2}$$

where n represents the number of lines in image drawing.

Using the image line tension function in Equation (2) can make the curve between nodes the shortest. It can not only eliminate unnecessary inflection points that may appear but also keep the smoothness of the curve. At the same time, it also realizes the optimization of the three-dimensional image drawing process. However, the traditional drawing process optimization method mainly denoises and reduces the blur of line segments. It ignores the interference of the line segment and the image itself and needs a lot of iterative calculation, which leads to the problems of long optimization time and poor processing effect.

This paper presents an optimization method of the three-dimensional image drawing process based on multisegmented Bezier curve fitting combined with a five-point curve. There are two main ways to collect graphic materials. One is to draw with software, the other is to download with the help of a network. However, the pictures collected by means of the network cannot be directly used in many cases, so some software should be used to optimize them. The purpose is to match the picture with the design. There are many software options for graphics and image processing that are commonly used. One can use a "drawing" tool that comes with the computer itself as well as a standard software for drawing pictures. The style of plane graphics embodies the characteristic content in the form of characteristics. Valuable content is the basis of style. If the content of a work has no characteristics, its style will lose its value. If there is no style in the work, the content will lose its value. As shown in Figure 3, many readers do not understand these multimedia works like designers, and their interests are different from those of designers. Considering the importance of readers' interests and expectations, it seems appropriate to satisfy readers' preferences on the surface, but it is not a good idea if another basic principle is considered. Readers' preferences are dynamic, and with the broadening of their horizons and the increasing of their knowledge and appreciation of taste, they are constantly improving.

$$BH = W(v_1, v_2, v_3 | \psi_1, \psi_2) \tag{3}$$

In formula (3), v represents each parameter of the style dimension.

Graphic design is widely used in advertising design, packaging design, book binding design, web design, and has extensive practical application and is an important topic in industrial design and art design. Visual communication design can improve people's aesthetic ability of visual space and enhance the spatial expression ability and cultural value of patterns and objects. So, it is important to establish the visual distribution structure model of visual space. In Figure 4, we can see that by analyzing the relative relationship between the observer and the external space, the artistic design of plane graphics is carried out. In this way, we can study the method of graphic layout and innovative deconstruction model in graphic design, which is of great practical significance in graphic design and art design.

In the dominant space, the deconstruction mode of plane layout under human sight and vision is established, and the expression effect of visual space is organically unified through the range of human

Figure 3. Figure size setting development process

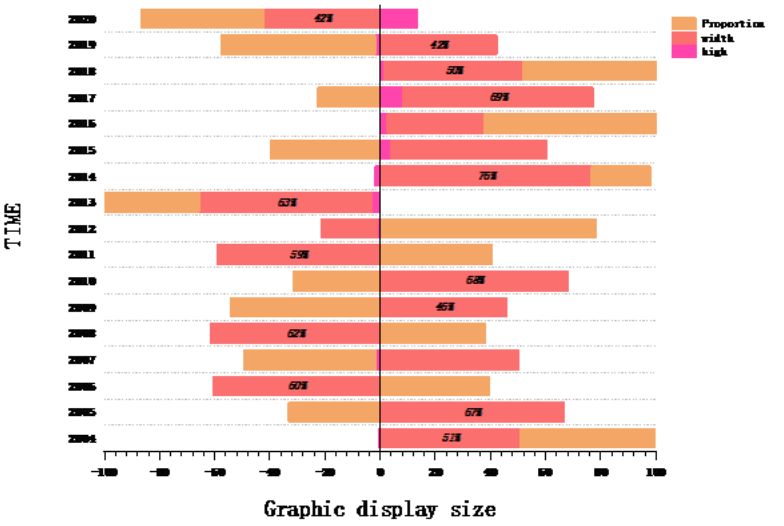
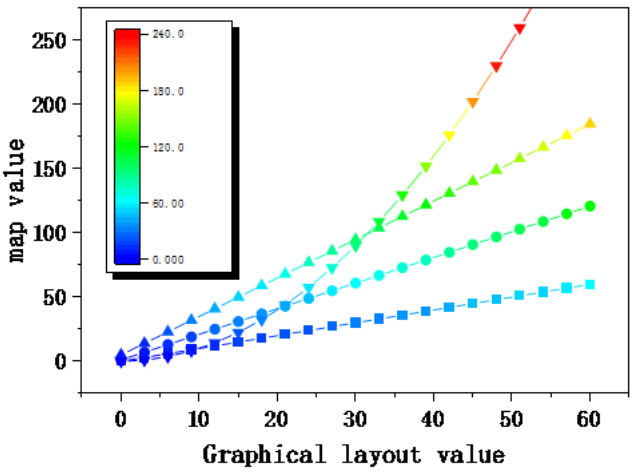


Figure 4. Graphical layout mapping relationship



sight. Construct an innovative deconstruction mode of graphic language arrangement in graphic design and carry out two-dimensional reorganization of graphic design. This can realize the optimal design of language arrangement deconstruction mode in graphic design. The graphic language is applied to the space art design, and the three-dimensional shape model of visual communication is established. Through interactive design, an object is precisely reorganized in the visual deconstruction model to improve the visual space effect in the visual communication design.

Automatic Layout Algorithm of Graphic Language in Graphic Design

Graphical language description plays a key role in automatically arranging graphics in graphic design. Among them, morpheme is the smallest grammatical unit, which can be described by primitive symbols. Grammar is the relationship between elements and symbols, and it can be divided into abstract

grammar and detailed grammar. Abstract grammar can express the logical connection relationship between various elements. Detailed grammar is used to express the appearance type of primitives and the geometric position relationship between primitives, as shown in Equation (4).

$$AH = \frac{\sum_{x=1}^{4} BH}{G} \tag{4}$$

where AH refers to the amount of parallel gaze in the description area.

Compared with other graphic language description methods, rule-based grammar description has the advantages of high rule parsing efficiency and easy understanding of rules. According to the grammar description method of rules, the logical relationship between primitives and primitives is defined by a set of rules. At the same time, a set of rules is used to describe information, such as the positional relationship of the primitives, as shown in Equation (5).

$$BC = \frac{C_x}{\alpha_x} \tag{5}$$

where α is the area adjustment factor.

Abstract State Machines (ASM) is a formal technology for specification and verification, which is suitable for computer-based systems and can be used in practical graphic design. ASM is put forward according to algebraic theory, and the key point is to introduce a state transition system into algebraic theory. In this technology, the basic features of the model can be reflected. In graphic design, the semantic description of graphic language is realized by ASM, which provides the basis for automatic layout of graphic language, as shown in Equation (6).

$$S = \sum_{i=1}^{n} n - i + 1 \tag{6}$$

where S represents the satisfaction degree of the arrangement result.

One can use ASM state transition theory to achieve the purpose of semantic description of graphic language. Updating the abstract state is essentially changing the interpretation of partial functions at partial points. ASM updates the status by using migration rules.

Figure 5 is a three-dimensional display view. In all migration rules, only substantive migration actions are updated, which are atomic rules. In some cases, the migration of the subject is related to multiple updates, forming an update set u. In the process of updating, if there is a function with different point values, it is considered to be disharmonious.

To sum up, one can add the following settings to the automatic layout of graphic language in graphic design:

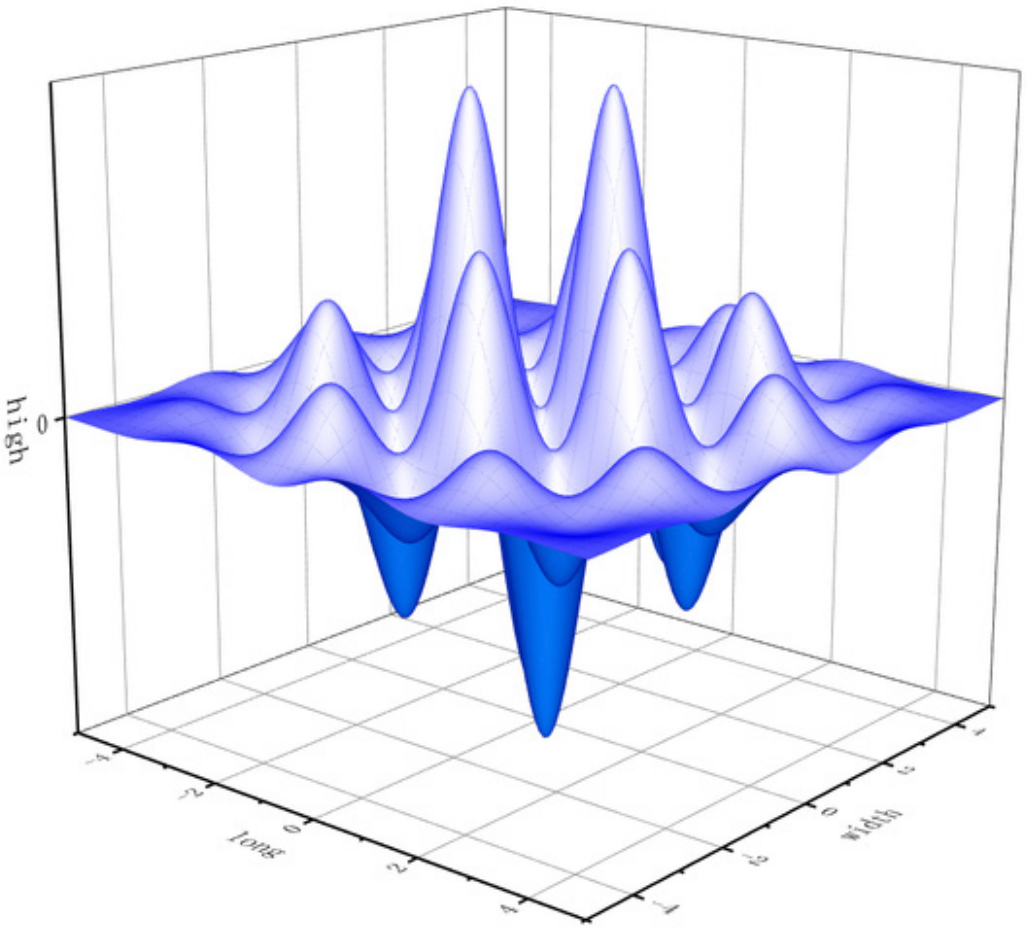
1. Divide the interactive lanes in graphic design, and each graphic language automatic arrangement activity is carried out in a lane, thus highlighting the activity participants. The direction of lane separation is not restricted, either vertically or horizontally, as seen in Equation (7).

$$C(v) = k_1 C_1(v) + k_2 / C_2(v) + k_3 C_3(v) \tag{7}$$

where C represents the point with the smallest function cost metric.

2. Convert the primitive elements into sub-process forms for easy editing.

Figure 5. Stereoscopic display of the programming program



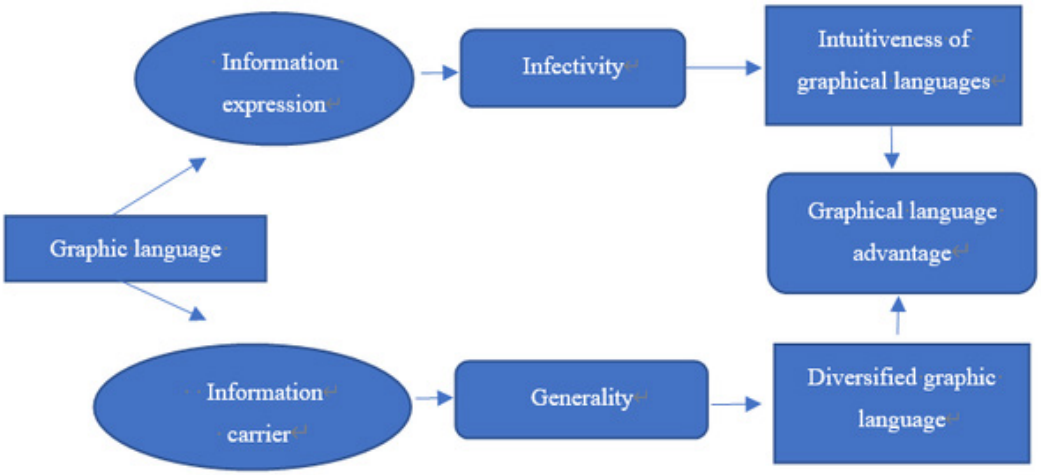
3. Describe the parallel process and selection process of graphic language in graphic design through the parallel and selection marks and realize automatic layout of graphic language through the parallel process and selection process.

Visual Interaction in Graphic Design

Visual interaction in graphic design is the key to realize the optimal design of the deconstruction model of visual communication space layout. From Figure 6, we can see the various characteristics of graphic language. In the visual interaction, improve the spatial expression ability and thinking transmission ability in visual communication design and improve the subjective initiative in the visual design process.

In the process of visual interaction, art designers and appreciators can display the spiritual theme in graphic design through subjective and active visual arrangement. In the graphic language arrangement of graphic design, the spatial expression of visual communication is transformed into the interactive mode of the designer's eye output. In the spatial visual interaction behavior of visual communication, according to the psychological, linguistic, and semiotic elements of visual communication, the behavior deconstruction design of visual communication is carried out. In this

Figure 6. Graphical language advantage



way, we can construct a multidimensional visual interaction deconstruction model of point, line, surface, color, and shape in the process of visual interaction. At the same time, under the constraint of spatial visual distribution, it can improve artistic expression ability and visual aesthetic analysis ability in the process of visual communication.

$$\frac{\partial \sum_{i=1}^{n} B_i^2}{\partial X_2} = -2\sum (A - X_2 - X_3) \tag{8}$$

In Equation (8), X is the single segment Bezier curve.

In the visual interaction of visual communication, it is necessary to design patterns and art according to the spatial form of visual communication. In the visual form, through the layout design of visual space, the perception and aesthetic expression ability of external light stimuli can be improved. Under the aesthetic mode of visual communication, the regular model of spatial distribution in visual communication design is constructed, and the artistic form and semantic expression form of visual communication are analyzed. In graphic design, it is also necessary to pay attention to the influence of cultural constraints and human cognition and solidify the artistic expression ability of visual form into the aesthetic design of works.

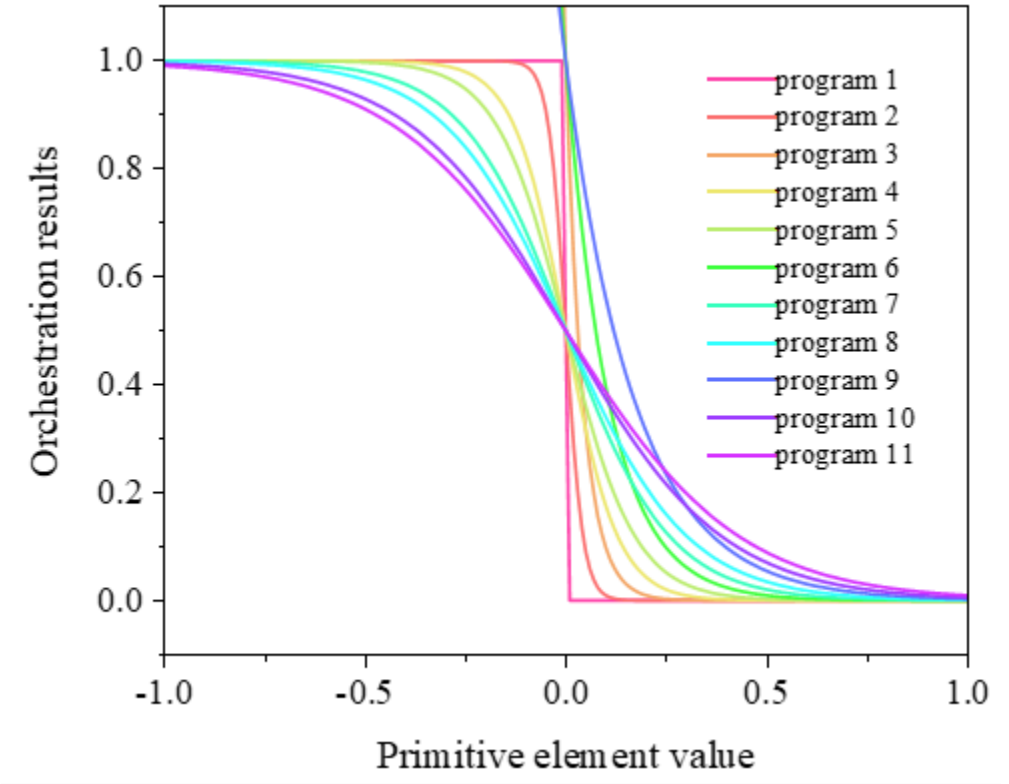
RESULTS AND ANALYSIS

The Expression Characteristics of Graphic Language in Graphic Design

Intuitive

There are various forms of information in graphic language and graphic design, including written language, graphic language, and so on. Compared with written language, graphic language is more intuitive, and it can be used in visual communication design to let viewers get the emotion, and information in visual design works more directly. As shown in Figure 7 shows the results of different programming methods. In addition, the mastery of emotions in words requires skills and experience as well as certain literary skills. So, the audience of graphic language is much wider than that of written language.

Figure 7. Results of different programming



Enrich Diversity

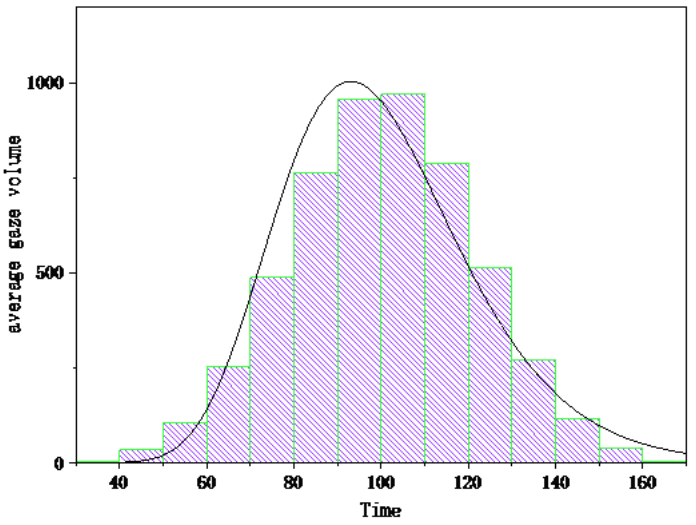
Everyone has a different world outlook and different perspectives on things, including beauty. Therefore, when facing the same figure, different people will have different understandings and associate different things. In this way, the information transmitted by the same figure will be richer to some. Sometimes, it is precisely because of this fuzziness in information transmission that viewers are led to infinite reverie. Graphic design is more attractive because of the diversity and richness of graphic languages. This is the richness of graphic language in visual communication design.

Shocking

Graphic language is the information transmitted by vision, and some means can be used to make graphic language more impactful when transmitting emotions. There is a lot of freedom and room for creative space in graphic design. When creating a visual communication design, the designer will consider the feelings to be conveyed and design the level and structure of the work accordingly. Similarly, graphic language can better serve the theme of visual communication design through the change of hierarchy and structure. For example, in order to highlight a certain part of the work, the designer can enlarge the figure of that part. In this way, the overall proportion of the graphic can be increased, and strong color contrast can be used to better convey the designer's emotion.

$$S_{\max} = \sum_{i=1}^{n} (p_x - p_i) \tag{9}$$

Figure 8. Gaze volume changes over time



In formula(9), p_i is the scheduled delivery date, and p_x is the actual scheduled delivery date.

Extensive Application

Graphic language has almost become an indispensable part of graphic design. For example, logos of various brands, covers of various books, etc. The use of graphics can make consumers understand connotations, brand culture, and the main contents of books more quickly. In addition, it can be seen that graphic language is easier to communicate between different cultures than written language. Graphics contain the cultures of different countries, and there is no national boundary for cultural exchange and integration in graphics language. For this reason, many graphic languages of graphic design at present are the result of communication and integration between China and foreign countries, which also makes our graphic design field more colorful.

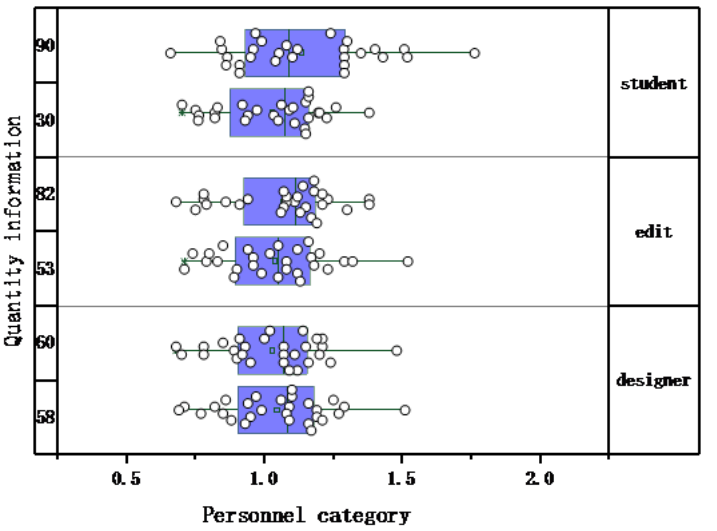
Automatic Layout and Deconstruction Model of Graphic Design

Deconstruction modes of graphic automatic layout in graphic design language are mainly divided into invisible spatial layout deconstruction mode and explicit spatial layout deconstruction mode. As shown in Figure 8, by establishing visual layout deconstruction schemes belonging to graphic vision and color vision, a plane aesthetic distribution model of graphic layout is constructed, which can form a good aesthetic consciousness of visual space within the scope of human vision and perception and enhance the spatial aesthetic expression ability in graphic design.

Visual deconstruction design in graphic language arrangement of graphic design is an important part of innovative deconstruction of graphic language automatic arrangement in the whole of graphic design. In the graphic language arrangement, the spatial structure model of human sight mode is established. Combining the visual cognitive models in the dominant space and the recessive space, the morphological design of graphic language arrangement of graphic design is carried out. Through the spatial order construction and combination design of images, human perception is abstracted into a formal beauty of visual cultural expression. Through interactive design, the graphic language layout structure model of graphic design is transformed into a visual plane structure model.

The two control points of the Bezier curve are calculated by Equation (10), and these two points are used as the basis for fitting the first Bezier curve.

Figure 9. Research object information



$$B(t) = (1-t)X_0 + tX_1 \tag{10}$$

The pattern of graphic language deconstruction in automatic layout of graphic language is the linguistic technology of automatic layout of the whole graphic language. In the plane space design, the image distribution model of visual communication is established according to the graphic linguistics in the visual communication range. Multivision graphics distribution reconstruction scheme is adopted to carry out the spatial disorder reconstruction design of visual communication. In dynamic vision, the two-dimensional plane transformation deconstruction model of visual communication is decomposed into a multidimensional distributed deconstruction reorganization model, and the plane symbolic dynamic graphic distribution scheme of visual communication is constructed.

As shown in Figure 9, through the analysis of graphic expression elements such as position, state, and color of objects, the plane structure layout design is carried out in graphic language. In the process of automatic layout of graphic language, emotional language, lightness, and hue are expressed through dynamic graphics language, which can effectively strengthen the aesthetic characteristics of works.

The research on the plane dimension of automatic layout of graphic language plays an important supporting role in realizing automatic layout and deconstruction design. In two-dimensional graphic design, the aesthetic structural features of automatic layout of graphic language need to be expressed through the plane structure and regular dimensions. The development of graphic language design promotes the optimization of computer design, establishes the dimensional distribution model of plane transformation, improves the expressive ability of plane structure through the study of graphics, and transforms the automatic layout structural model of graphic language into a visual plane structural model.

Optimization of Design Drawing Process

In graphic design, reversible data hiding technology is used to hide information in the carrier. The information receiver can correctly extract the complete secret information and recover the original carrier without distortion. Reversible image data hiding refers to the use of images as hidden carriers, which is widely used in automatic design and programming of plane graphics because of its advantages of small distortion and easy lossless recovery.

Equation (11) expresses that the rigid body displacement of the constraining structure is not considered after being assembled by the element stiffness matrix.

$$U = \left[U_1^T, U_2^T, \ldots, U_J^T\right]^T \tag{11}$$

The intuition of the language itself determines the indispensable role of graphics in graphic design. In modern life, the pace of human life is getting faster and faster, and the design is to meet the needs and convenience of people's lives. It is this complementary relationship that makes graphics more important. Automatic layout of graphics is not achieved overnight but should be a complete process, including creation, deployment, maintenance, and deletion. In order to provide automatic layout service, the automatic layout architecture of graphic language needs to realize a complete programming cycle management function. As the core of the automatic layout architecture, the layout plane is further divided into three modules. They are service function chain arrangement management module, service function chain deployment module, and service function chain QoS collection module.

The basic elements of graphic design include graphics, colors, characters, etc. Among them, graphics, as the most expressive basic elements, play an important role in graphic design.

Equation (12) represents the correction coefficient in the iterative process.

$$\triangle u_a = u_a - u_0 \tag{12}$$

Graphic languages with symbolic and international characteristics are gradually applied to graphic design, which brings fresh vitality to graphic design work. Especially in the increasingly competitive advertising design market, people do not have time to pay much attention to advertising content. One can gain more distinctive visual publicity effects if a graphic is pleasing to the eye. This is also the primary task of the current print advertising design.

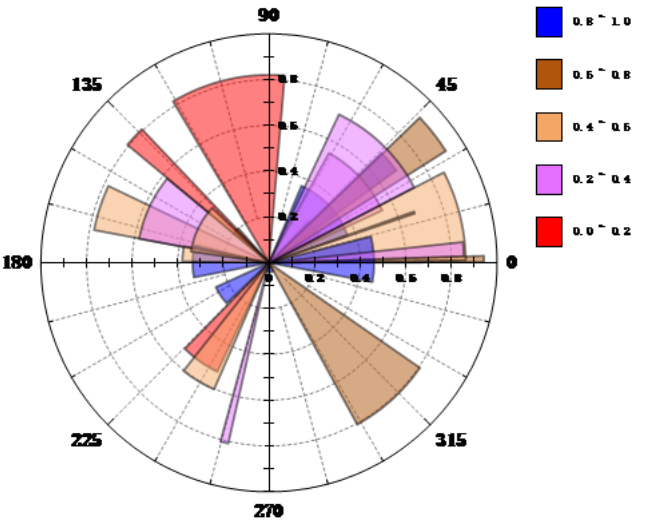
Creative Thinking Mode of Language

The creativity of language is a creative thinking mode. In the process that designers and audiences participate in graphic design together, the inherent and habitual pattern of solving design problems in packaging is broken, and so is the design method of conventional thinking in graphic language of graphic design.

Creative thinking extension of graphic language in vision also refers to divergent thinking. In the innovation process of the fusion of language form and vision, there are multimodal characteristics. Especially in the process of graphic language extraction and recreation, there are many possible thinking directions. It is not a single design thinking mode, which has uncertain goals, divergent thinking trends, and various possible thinking results when facing the interactive experience of the audience. It can also be understood that it is a thinking mode in which one or more ideas are obtained in many ways or divergent structures are generated in many directions. The creative divergent thinking mode of graphic language in graphic image design is mainly manifested in the process of graphic design meaning and interaction. As shown in Figure 10, when designing, we often make divergent thinking and imagination of the common and accustomed forms or images in life according to the audience's life experience, practicality, and immersion. In this way, audience participation can be mobilized, and creative expression can be made through multidirectional observation, multiangle thinking, multidimensional association, multimedia bearing, vertical and horizontal comparison, blending, and so on. Finally, utilizing the advantages of original materials, graphic languages with different artistic essences are produced.

The creative expression of reverse thinking in graphic design is a counter-attack method of reverse thinking, which is contrary to the conventional thinking method and creation of packaging design. Under normal circumstances, we will know creative elements from the opposite side of the

Figure 10. Satisfaction with different arrangements results in graphic design



audience's normal life and determine the variability of graphic language of the original image by using the behavior language that violates the conventional thinking mode and innovative features. Then, the contradictory and unified thinking mode is used to infer and imagine the graphic language in graphic design to achieve some unexpected thinking results.

Analysis of Practical Applications

In contemporary graphic design, the reasonable layout and precise presentation of graphic language are crucial for information transmission. However, traditional algorithms have many limitations in describing and typesetting graphic languages, which not only affect the accuracy and effectiveness of the results but also constrain the optimal display effect of the design. To address this issue, this paper proposes a new automatic layout algorithm for graphic language and explores its application in graphic design through theoretical analysis and experimental verification. However, this algorithm still faces some challenges and requires further research and improvement.

1. Limitations of algorithm effectiveness verification: The paper mentions that the sorting effect, attention, and satisfaction of the algorithm have been verified through experimental results, but there may be a lack of sufficient verification of the algorithm's effectiveness in a wider range of scenarios, leading to certain uncertainties in the applicability and stability of the algorithm in practical applications. Expand the experimental scope, including using more diverse datasets and simulating a wider range of graphic design scenarios, to verify the applicability and stability of the algorithm in different contexts.
2. Limitations of algorithm universality: The newly proposed graphic language automatic layout algorithm may perform well in experiments, but whether it has sufficient universality and applicability for complex and diverse graphic design scenarios still needs further exploration and verification. Further research the universality of the algorithm and consider how to make it adaptable to more complex and diverse graphic design needs, thereby improving its universality in practical applications.
3. Missing comparative algorithms: The paper did not conduct sufficient comparative experiments with other existing graphic language layout algorithms, making it difficult to clearly demonstrate

the advantages and disadvantages of this algorithm compared to existing algorithms. One must conduct a full comparison of the experiments with other existing graphic language layout algorithms and evaluate the advantages and disadvantages of the new algorithm compared to traditional methods and other advanced algorithms in order to more clearly demonstrate its characteristics and advantages.

4. Potential flaws mentioned in the article: There may be some potential flaws or limitations in using ant colony algorithm to solve the optimal solution, such as challenges in algorithm convergence speed, parameter tuning, etc. One must address the potential issues of ant colony algorithm and other methods, optimize the details of the algorithm, improve parameter tuning strategies, enhance the convergence speed and stability of the algorithm, and ensure its effectiveness in practical operation.

Through these countermeasures, the limitations mentioned in the paper can be addressed, and the practicality and promotion value of graphic language automatic layout algorithms in the field of graphic design can be improved. The new graphic language automatic layout algorithm can play an important role in various practical application scenarios, such as:

1. Graphic design tools: Integrating this algorithm into graphic design software helps designers quickly and automatically lay out graphic elements, improving design efficiency and quality.
2. Web design: Applied in web design, it automatically adjusts the layout and arrangement of page elements to make the page more attractive and user-friendly.
3. Data visualization: Used in the field of data visualization, it automatically layout data charts and graphs to help users understand data information more clearly.
4. Mobile application design: Used in mobile application design, it provides automated interface layout solutions that are compatible with devices of different sizes and resolutions.

By applying new graphic language automatic layout algorithms to practical design, design efficiency can be improved, human errors can be reduced, and more creative and professional design works can be produced. With continuous optimization and improvement, this algorithm will demonstrate increasingly broad application prospects in various design fields. The development direction of future automatic layout algorithms for graphic languages may include the following aspects:

1. Intelligence and personalization: Algorithms will become more intelligent and can automatically adjust layout plans based on user needs and design goals, achieving personalized design styles and effects.
2. Multimodal support: The algorithm will support various design patterns and layout methods, including grid, free layout, stacked layout, etc., to meet the needs of different design scenarios.
3. Cross platform applications: Algorithms will gradually achieve cross platform applications, supporting seamless integration and use across different devices and software, achieving efficient collaboration and interoperability in design work.
4. Deep learning integration: By combining deep learning techniques, algorithms can better understand design rules and aesthetic principles, providing more creative and user-friendly layout solutions.

CONCLUSION

In order to solve the problem that traditional algorithms cannot effectively arrange graphic languages, a new automatic layout algorithm of graphic languages in graphic design is proposed. The display size of the buffer image in the visual graphic design is calculated by the fixed value method. By establishing the objective function, the best display position of the graphic in the graphic design is obtained. In the process of describing the graphic language, a set of rules is used to define the logical relationship between graphic elements. At the same time, a set of rules is used to describe the positional relationship and other information of graphic elements to achieve the purpose of grammar description. The semantic description of graphic language is realized by ASM, which provides the basis for automatic layout of graphic language.

Parallel process and selection process are used to realize automatic layout of graphic language, and control flow design of automatic layout of graphic language is realized. According to the experimental results, it can be seen that the proposed algorithm has a good arrangement effect and higher attention and satisfaction. All these are enough to show that the graphic language algorithm of computer automatic programming has a high use value. The development of graphics language is also more diversified. However, it is particularly emphasized that the application of graphics in graphic design we refer to is not pure patterns or symbols in a simple sense. In this creative process, the designer is not a description of reality but a description of the form of things. It is a recreation that needs to process the images and integrate certain design concepts. Intuitive visual graphics, combined with appropriate advertising language, is the most direct way to apply graphic language in graphic design.

DATA AVAILABILITY

The figures and tables used to support the findings of this study are included in the article.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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