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Application of AutoCAD in Graphic Art Design based on VBA Language

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Abstract. In the field of art design, graphic art design is a basic design project, and computer-aided design has a wide range of applications in graphic art design. In this study, AutoCAD was used as the secondary development platform, and VBA was used as the development language to develop and build a graphic application design CAD system for graphic art design products. The pattern application design CAD system in this study is intended to allow users to constantly understand the characteristic cultural patterns in the process of hands-on, so that cultural elements are more well-known and applied by the public. At the same time, it explores the new design concept of user-participatory design and provides a new way of expression for the design and application of pattern weaving and embroidery. It provides new ideas for the subsequent application design of special products and patterns.

Keywords: AutoCAD, graphic art design, secondary development, computer-aided design
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1 INTRODUCTION

With the increasing development and maturity of computer graphic technology, computer has been widely used in the field of art design, forming a computer-aided design language. Various professional design software has been used together to form more and more computer graphics systems. The design and implementation methods has moved from traditional manual processes to the digital age [1]. Professional design software is also hundreds of thousands. It is an extension of the human hand, foot, eyes and brain. It is not enough to master only a small amount of software to perfectly express your design thinking. Designers must master at least three or more designs according to their work requirements. Modern human society is diverse requirements [2]. Designers must master a variety of professional software, with its advantages and strength to improve efficiency, to the best short put their creativity to express perfectly in time. Digitization in packaging design has a diverse and far-reaching impact [3].

Park et. al [4] said that the feature of digital new media art design is especially manifested in the excellent control of the standardization of design thinking expression. González-Lluch et. al [5] pointed that designers often use their own memory or imagination to describe the design intent, and the understanding of interactive objects is undoubtedly vague. As shown in Figure 1, digital

design can make the expression of design thinking more intuitive and maximize the preservation of the original intention and unity of the design. Whether it is the performance of the packaging material, the expression of color, the treatment of light and the rendering of the atmosphere, you can get more Intuitive and even real performance. The recognizances of computer media in communication is particularly important for the communication between designers and users [6]. In the field of art design, traditional design performance methods have a considerable distance between expression and communication due to the limitations of tools. Their cultural literacy are very different, and computer digitization is one of the best ways to overcome this obstacle.

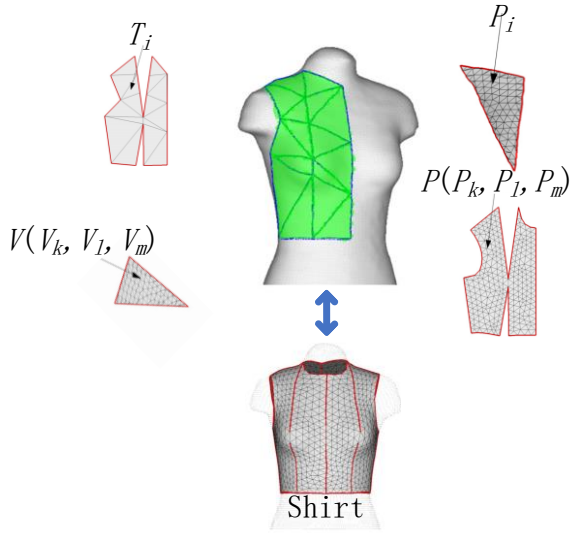

Figure 1: Application of AutoCAD in art design modeling pattern.

In the early days of design, many designers used the simplest drawing and painting tools to record and express their whimsy from the mountain, and applied the design concept by brushing and painting on the paper. When there is a contradiction between the actual work and the original creativity, the enthusiasm for digital expression will far exceed that of pure hand-drawn expression. Computer application and development do bring convenience to work and study. Professional drawing software is used as computer application technology and design [7]. Jiang et. al [8] pointed that the product of the intersection of art disciplines is always in a decisive position in terms of achieving the design one-day goal, or embodying the design content and design process organization. In the course of its application, we should not only pay attention to the technicality and professional pertinence of the application, but also pay attention to the impact of the continuity of computer technology development and the adaptability of professional applications on art design [9].

Packaging is an extension of the product concept. Due to the upgrading of products, consumer demand continues to expand, sales competition intensifies, the development of new materials, new processes, new technologies and the pursuit of beauty by consumers. Centenero et. al [10] said that the information age provides a brand-new communication medium for visual art exchanges. In recent years, the maturity of network communication technology has made that computer technology have the possibility of popularization and broad application prospects in performance and price. In order to adapt to different regions and different consumer groups, there are various forms of packaging, including creativity, colors, specifications, materials and even production methods. The shape and characteristics of the product for the diversity of materials also make the shape and structure of the product packaging ever-changing. The digital application research of packaging design aims to find a reasonable, effective and fast design method and technology,

which can make the packaging design adapt to the development of the times, realize the design daily standard quickly, accurately and economically, and help to better engage in design work [11].

In this paper, packaging analysis in digital technology aided design process were implemented at all stages of the packaging design process on how to use digital technology to better aided design introduced; and presented in a variety of design software. With comprehensive assistance, the digital implementation process of product packaging has been designed.

2 FLAT-SCREEN DIGITAL ART DESIGN STRATEGY

The application of digital technology of packaging design makes subsequent engineering design of the packaging through the computer. AutoCAD can be used in conjunction with Rhino, 3D Studio MAX, Maya, Pro/E, UG, etc. In the computer virtual space, designers can combine graphic design and styling design to make it easier for the three-dimensional solid model to reflect the designer's design intent and make its visual effect achieve the simulation effect.

2.1 Graphic Designs

Overall graphic design is the process of overall layout design in graphics design software for the content involved in the packaging interface. It involves text design, graphic design, color design, graphic layout, etc. This respect is the most commonly used software AutoCAD, which is characterized by easy operation and powerful. When the output file generated graphics and its accuracy is not scaled size. It is worth noting that the default file format of this type of software is the vector graphics format. Files in this format cannot be used by the subsequent 3D software, and certain storage formats must be processed to facilitate subsequent operations. Different software has different processing methods. In the plane graphics processing, and it is a plane design draft of the product packaging completed by the plane graphics in the plant design software. It is a plane graphic. This type of graphic file cannot be directly used for the subsequent generation of 3D visualization.

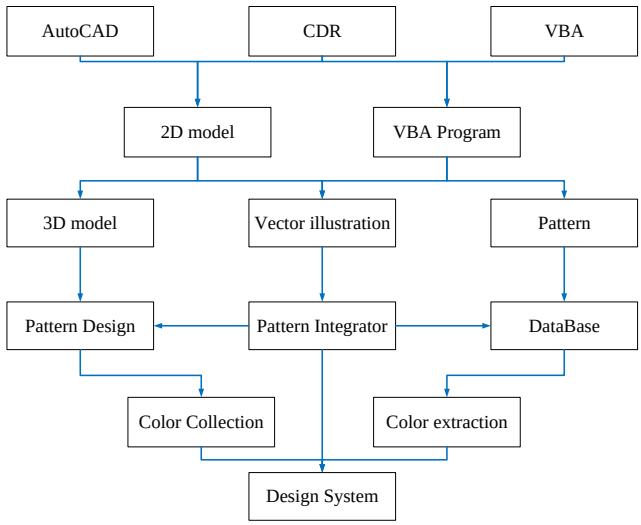

Figure 2: Conceptual system plan of graphic art pattern application design.

AutoCAD is currently the most widely used flat graphics processing software in PCs and Macs. Its function is very powerful. As shown in Figure 2, it can perform arbitrary copying, cutting, deleting, collage, synthesis and various wonderful art processing on images. Now AutoCAD has a high-quality color desktop publishing, pre-printed, multimedia, animation, digital photography and an

important guarantee for coloring. Here we will use it to segment the designed package graphic. The principle of segmentation is the shape and structure of each structural surface in the design of product packaging structure. Each structural surface must be divided into an independent figure, and named according to the characteristics of the structural surface to prevent confusion.

On the other hand, photographs or pictures are often used in graphic design. At present, the acquisition of these materials mainly uses the shooting of digital cameras and the scanning of scanners. After acquired by the computer, they are often not directly used. After the basic completion of the three-dimensional visualization graphics, it is often necessary to process and cut some two-dimensional visualization graphics to obtain beautiful effects. This is only capable of AutoCAD software. AutoCAD is an indispensable application software in the design of product packaging.

2.2 Realization of Art Modeling

Three-dimensional visualization technology is to use three-dimensional graphics software in the computer to create a completely virtual dimensional space on the computer screen. In this virtual space, designers can directly perform various types of three-dimensional design in three dimensions, such as interior design, product design, sculpture design, three-dimensional animation design and so on. The two-dimensional CAD system can only help designers to reduce the workload of manual design and drawing, and the three-dimensional visualization technology can not only reflect the rich creative results of people; it can also grasp the random accidental results generated in the process of shape creation. Especially for designers, it can inspire people's inspiration in design creation. Three-dimensional visualization technology can also be very simple to complete real-time graphical editing and modification. The operation is particularly convenient, and can directly reflect the creative intention of the designer.

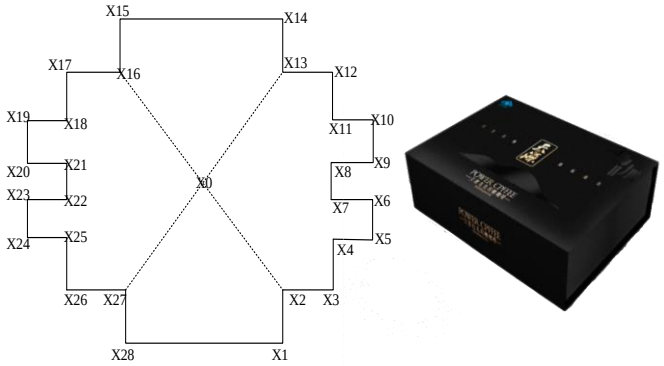

Figure 3: Product pattern parametric design process.

AutoCAD has many advantages. As shown in Figure 3, it has a strong modeling function, divided into basic modeling and advanced modeling, which can provide technical support for the digital generation of product packaging structure design. It has a powerful material editing function. Users can create their own materials according to their needs. This is the rare application of technical support for product packaging visualization. We can make the graphic design graphics divided into corresponding files. After the structural modeling is completed, the produced mapping materials are assigned to the corresponding structural planes according to the structural plane. After rendering, you can get a three-dimensional visualization of the product packaging virtual model. Clayton et. al [12] pointed that some parameters adjustment is necessary, because of AutoCAD has positive and negative points for a software to generate the spatial structure of the surface. Each structural surface has its own three-dimensional coordinate system, and the three-dimensional coordinates of the material must be consistent with the coordinates. If you do not

adjust the corresponding parameters, some structural faces will not see the texture. AutoCAD software has good animation function, which can make the scene of product packaging design into animation, so as to better display packaging design products, and express the designer's design concept in all directions.

2.3 The Combined Use of Graphic Software and Art Entity Modeling Software

The structure and form of packaging are becoming more and more diversified. Designers must have advanced means to quickly, conveniently and accurately design the packaging products needed by the market. The advantages of digital design have means of packaging design, the design creativity space is more flexible and open. The designer collaborates more closely, the materials used in the design are more simplified. The interchange of design materials makes the design change and modification simple and serialized design more convenient. More simple and higher quality performance design efficiency and pass more quickly.

3 DIGITALIZATION OF GRAPHIC ART DESIGN

3.1 Design Digital Realization Processes

Packaging design requires designers to use various methods and means to convey the information of commodities to consumers. It involves many factors such as natural, social, technological, humanistic, physical and psychological. If you want to quickly and accurately achieve the design goals, and increase the added value of the product, you must have strict and thorough Design procedures and methods. Technology is developing, and new design methods are constantly emerging. Methods can no longer meet the current need, and it is necessary to establish a new set of design processes and scientific design methods.

That is the preparation work before design, including design research, market analysis, data collection, design positioning analysis, design concept, sketch design and so on. This stage generally does not require the intervention of digital technology, mainly based on the designer's design experience and design level, and is also the most important link in packaging design.

In order to facilitate the application of professional software for auxiliary design, the materials needed in the design process must be digitized before this. These materials include pictures or photos that may be used on the packaging interface, some technical descriptions of internal products, product function displays, corporate logos, etc. Some existing digital data can be directly imported and used, such as product technical information, corporate logo, etc. The work to be done may be some file format conversion. The scanner is mainly used for the digitization of pictures and photos. The digital camera can directly digitize the material objects. The digitizer is mainly used for the digital input of some technical data and drawings.

Bosche et. al [13], the styling design is the design of the overall external shape of the product packaging, which is the appearance of the product packaging directly displayed to consumers, and it is the key to the success of the design. In the design preparation stage, designers should have a preliminary idea for the appearance of the product packaging. Here, it is only necessary to use the computer to create a modeling sketch. AutoCAD is currently the most popular 3D modeling software on the market, and it is also the most common 3D modeling software. With its powerful modeling tools and Boolean operations, a series of editing tools can easily obtain the packaging design model. In addition, AutoCAD can be observed at an angle of the model object, which is designed to assist designers are very helpful.

Structural design is the structural design of the package shape that has been built. It contains two aspects, the design of the container structure that produces the appearance. As shown in Figure 4, it is to design some technical requirements between the package and the packaged product. Structural design uses the insert command to insert the special file of 3DS MAX into the current document and reuse The tracing method depicts the two-dimensional graphics of each structural surface of the 3DS MAX three-dimensional model. The connection and fitting structure between the various structural surfaces are designed. This design can be completed directly

in AutoCAD. Roh et. al [14] showed that the materials used in the package designing other structures, such as shockproof structure design, according to need loaded products to be designed.

Interface design is to design the packaging surface presented to consumers. It contains many aspects such as text design, color design, graphic design, graphic layout and so on. There are many software systems available in this area, and designers also like to complete this part in the computer. If you need to use photos or existing pictures, you can use graphic files that have been digitized in the digital stage of the design material. At this time, software may also be used, because usually when we use photos or pictures, we do not use them directly, but apply them after certain processing and modification. After the structural design and interface design are completed, whether anyone can achieve the expected goal at this time, no one dares to say, because when the two-dimensional element is converted into the three-dimensional element, the three-dimensional shape after molding is often unexpected due to the expansion and fixed viewpoint changes.

After the design work is basically completed, if the design works do not need to be modified, then the drawings can be exported. The structural design plan can be exported by perfecting the two-dimensional graphics of the structural design in AutoCAD. The main thing to do is the dimensioning and the improvement of some local details. The plane rendering can output the interface design drawing as a whole in AutoCAD, which is often used as a printing manuscript; the 3D rendering is to render the 3D visualization in AutoCAD at the best angle, and then output it to Photoshop.

The development of computers has changed the development path of all walks of life. In the new century, the development of product packaging design is also inseparable from the cutting-edge technology of digital technology. The designers themselves are aware of this, and they are all struggling to find out how to integrate digital technology into packaging design. However, they have no experience when they use digital technology. There is no more systematic design procedure. Therefore, it is very meaningful and necessary to discuss the design process of digital technology-assisted product packaging design. The research and discussion on this point is mainly to find a more reasonable route, so that with the aid of digital technology, packaging design can complete the design task faster and better, thereby saving time and achieving the purpose of improving design efficiency. It avoids some unnecessary duplication of labor in the design process, so as to achieve cost reduction and achieve the design mark quickly and efficiently.

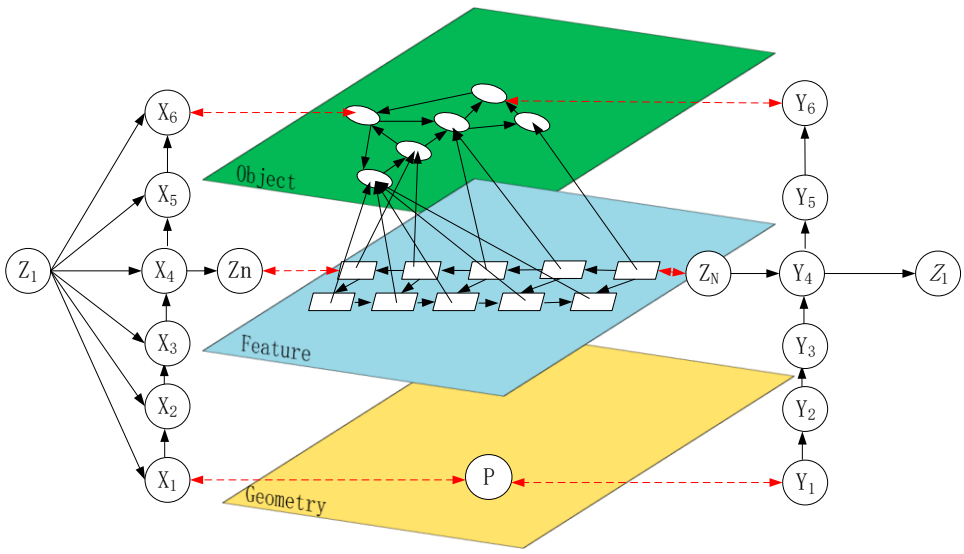

Figure 4: Characteristic model construction process of art pattern design.

3.2 Technical Routes of Graphic Art Color Decoration Design

According to the established basic functional framework, the operation steps of the three functional modules are subdivided, and the work tasks required for each step are listed. The main task of the pattern design module is to generate a two-dimensional pattern decoration. Based on the established weaving and embroidery pattern library, its main technical route is the pattern decoration generation technology; ethnic dolls and packaging design modules are based on the existing library. In order to achieve the combined innovation of weaving and embroidering pattern elements and product knife layout, the main technical routes involved including parametric design and color and pattern decoration generation technology. In order to make the user's use process easier, the main task in the next work is to integrate the preliminary work in the flat vector design software AutoCAD into a complete design system, so that the embroidery pattern can be done on its own basis. Designers need to focus on the following four workflows when building design systems. According to the patterning rules of weaving, VBA programming is carried out in the secondary development platform of AutoCAD, and several patterning rules of weaving and embroidery patterns are realized in the platform. Design the knife layout of ethnic dolls, and integrate the doll layout database of each ethnic group, so that users can choose their favorite ethnic group, ensure the diversity of ethnic dolls, and realize parametric design. Integrate the knives version library of packaging design to realize the parametric design and ensure the practicability and diversity of packaging design. Design and write color extraction and beautification modules can extract colors from their favorite pictures, and then choose their favorite colors for combination innovation.

Pattern patterns are an important part of the art design plane one-half. The components of the pattern mainly include the central main image and the surrounding patterns. Observe the ball-shaped pattern in the figure below. The pattern in the central main picture is a whole, and the surrounding pattern is a unit pattern with varying angles as the curve of the circle flows. The pattern layout is simply repeated. Except for the decorative patterns, observing the skeleton of the group flower found that its structure is a plurality of concentric circular ring structures, and some unit patterns are simply repeated in the area between the concentric circles. According to the above analysis and research, users generate a ball-shaped flower pattern through the design system. They need to construct a skeleton and let the user draw concentric circles at all levels of the ball-shaped flower. They select the element to make the element generate a ball pattern.

The user first draws the ring skeleton of the center pattern, and then selects the required elements in the gallery. As shown in Figure 5, the design system will put the selected elements into the center ring, and scale according to the size of the center ring drawn to generate the center The pattern in the main image. The user draws the ring skeleton, and the user determines the size of the ring required for each layer. In the process of generating a group flower, the following options should be set for the user to choose. The X-axis symmetry and Y-axis symmetry options are the repeated symmetry patterns of the control unit pattern. According to the constitutional rule of the continuous pattern of the two rooms, the two can only choose one symmetry pattern. The options of the outer border and the width of the border and the inner border and the width of the border control whether the pattern needs a border and the width of the border. In the pattern, not every level has a border, and some patterns sorted by unit graphics can also serve as a border. Therefore, the inner and outer border options are flexible options for users to choose according to their needs. The flow of unit patterns along the curve is an important principle in the composition law. When designing the system, it should be set as the default option. The user has special needs, and the unit pattern does not need to flow with the curve, you can also click to cancel this option. The unit number is the number of unit decorative patterns for each ring, and the tightening degree is the distance between each unit pattern.

Plane art design and products are produced in conjunction with the need to paper products by the three into two dimensions. Therefore, it is necessary to design the knife layout, then fold and paste, and finally realize the three-dimensional product. In order to make the final product meet the actual size requirements of users, the technical route used by the two functional modules is mainly parametric design technology. The designer needs to first create a variety of layouts for the

user to choose. The CAD system reads the data, and generates the layout to obtain the final knife layout scheme.

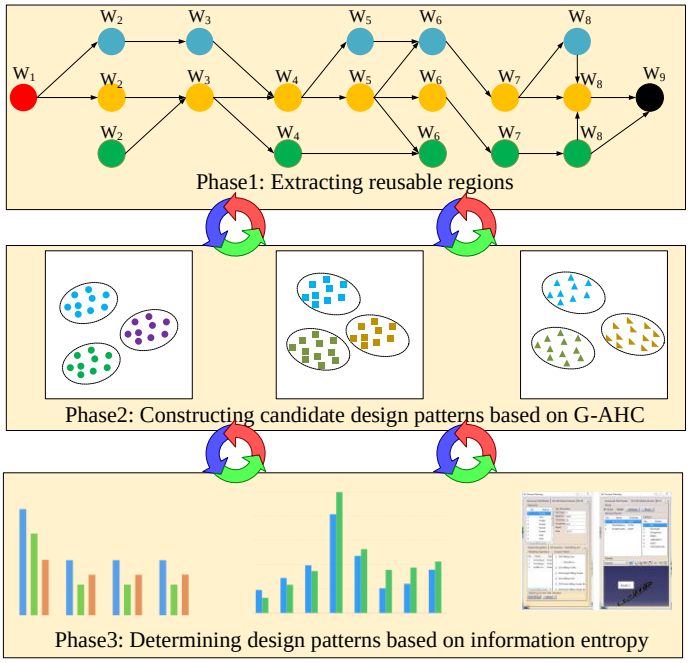

Figure 5: Schematic diagram of the extraction process of color decoration patterns.

The color extraction function is mainly to facilitate the color filling of each block on the layout [14]. Users can choose a picture they like, and import it into AutoCAD. It will extract the main colors on the picture through the design system, and then choose the color they need to fill each block. In this function, the user should set the required number of colors, and can set the color mode to extract the color of the picture, such as the brightness or hue to extract the color. The extracted color system should be arranged according to the proportion of various colors on the selected picture.

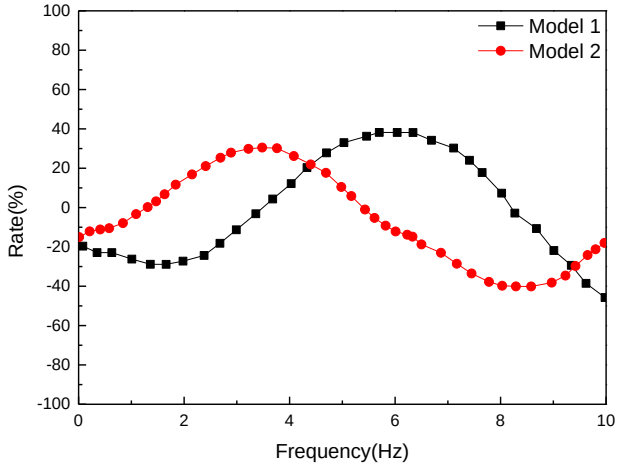

Figure 6: Art color decoration pattern extraction frequency and accuracy evaluation.

As shown in Figure 6, the continuous decoration method of the two parties is similar to the generation pattern of the external pattern decoration. In this function, the user still needs to draw a path that requires the cell pattern to follow the flow, and then select the element to generate the pattern. During use, users should be provided with several options of X- axis symmetry, and tightening degree for users to choose according to their needs. According to the summary of the composition rule of the continuous square pattern, the composition method of the square pattern is divided into four types. In the function, there is no need for the user to draw a decorative path, just select the block to be decorated and set the number of units required in each row to generate a square continuous pattern. The generated square continuous pattern should be automatically and accurately cut into the selected block [15].

This paper for plane art product design application design CAD target users of the system was analyzed to determine the design of the product of the carrier and selected. Next, identify the product design application design CAD functional framework system for CAD overall what the system is systematically planned. The preliminary work required by the CAD system established a gallery of weaving and embroidering patterns of various ethnic groups, and analyzed and summarized the pattern composition rules of the patterns. The technical route required by each functional module of the CAD system is explained, and sufficient preparation is made for the subsequent system construction.

3.3 Development and Application of Graphic Art Color Decoration Design Technology

In this study, through the discussion of various plan elements, the main points in graphic design that can realize dynamic graphic design are excavated. Whether from the graphic design itself or the means to achieve graphic design, the rapid development of new media technology and the continuous update of design concepts There are more possibilities for innovative and dynamic expressions in all time. Plane composition is a form of visual image, mainly in the process of graphic design, how to create image, deal with the relationship between images, how to master the aesthetic formal rules, and organize the graphics in the picture according to the formal rules of beauty. the plane composition, the expression of general beauty can cause dynamic visual effects. A series of repetitive arrangements with slight changes in the continuous band can more intuitively display a series of dynamic effects in the plane. This method is often used in sports print ads.

In most color applications, the use of a single color is relatively limited. Even existing monochrome applications will form a color contrast with the surrounding environment. In graphic design, colors always appear in the form of plurals or gradients. And when it comes to integrating multiple colors, it is the category of color composition research. The composition of the same plane is similar. The study of color composition is to combine and match multiple colors according to different purposes and form a new beautiful color relationship. The composition of colors is based on the contrast of colors, which produce different effects through visual reception and understanding of the brain.

The color extraction method used in this article is K-means color extraction technology. K-means clustering algorithm is an unsupervised learning algorithm, which is used for unlabeled data. As shown in Figure 7, the algorithm uses iterative refinement to produce the final result. The algorithm input is the number of clusters and the data set. The basic method of clustering in color space is to express the color value as a coordinate position point in a three-dimensional or four-dimensional space, and give the number of color types to be obtained. Basic K-means specific method of the clustering algorithm is the one of all pixels in the image processing. Each type of center calculates the distance from the last time and takes the maximum distance. The absolute distance is divided by the maximum distance to convert the distance into a relative index between 0-1. The selection threshold of the judgment threshold is the smallest difference that can be recognized by the human eye. The final clustering result is an extracted color vector and a weight vector. The extracted color vector maintains the color value of each extracted color, and the weight vector maintains the proportion of the number of pixels in each color class. The two options of lightness and hue are used to specify the initial value of the K-means clustering method. The

lightness option uses a series of uniformly changing gray values as the initial value; the hue option takes uniformly spaced colors on the hue circle as the initial value. The color category using the initial value of hue is more general, that is, the actual number of colors obtained is reduced more than the specified number. Which mode to use depends on the actual situation. After the clustering, the proportion of each color stored in the array, then according to have been performed by plotting the color data obtained.

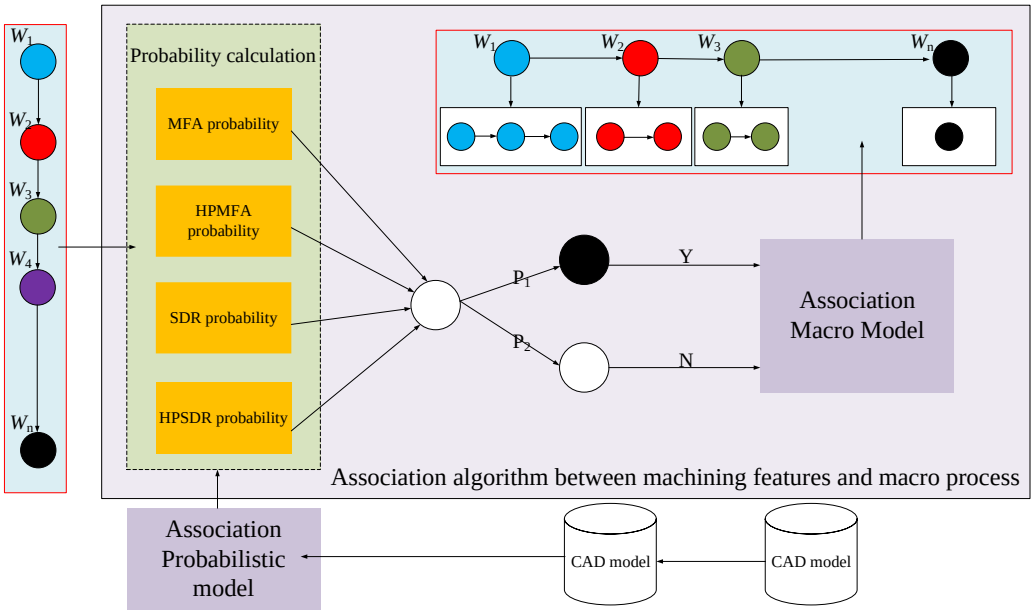

Figure 7: Graphic architecture of graphic art color decoration design technology development.

As shown in Figure 8, copy the scaled unit elements to the line segment position on the path, and arrange them linearly according to the set parameters. After the arrangement is completed, the grouped element patterns are grouped, and unit elements that are scaled at the beginning are deleted. Two continuous patterns are generated. The continuous square patterns are complex and changeable. In this paper, square continuous patterns analyzed are selected for programming. The principle of its generation is to use an element unit to get a new unit.

During the user's operation, the user selects the block to be decorated and the required unit element. After the selection preparation is completed, the user sets the parameters of the number of cells in each row, and the user operation is completed. The internal program should first judge the validity of the selected block. After determining that the unit element is valid, it regroup the unit element to determine the shortest unit element. After the generation of a row of patterns is completed, it will delete the outer frame of each unit, and draw a new frame to surround all the elements of this row and group them to form a new unit. This line gets the pattern full of pages, then cancel the group and delete the outline of each line. Finally, all the elements are reorganized, and the generation of square continuous patterns is ended. According to the size of the selected block, the generated square continuous pattern is scaled, and the pattern is copied from the new page to the page where the block is located, and then the square continuous pattern is accurately cut into the selected block, and the process is completed. The squares are decorated with continuous patterns.

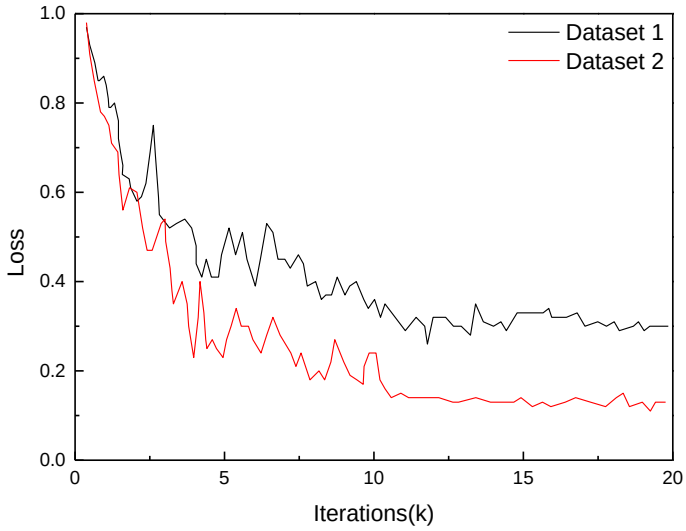

Figure 8: Training set deviation of K-means clustering algorithm.

4 CONCLUSIONS

This study was based on a flat-screen art pattern design theory and computer-aided graphic design. AutoCAD designed the secondary development platform featured. In the previous work, the needs of the user group of the design system were analyzed, and a vector library of patterns was established through research. The composition rules of the patterns were analyzed and summarized. The functional framework of AutoCAD for the pattern application is determined, the system planning for the implementation of the AutoCAD system is carried out, and the technical route required to realize each functional module. The characteristic product features and pattern elements are applied to ethnic products. Combined with parametric design and color decoration design technology, the design of the AutoCAD system is built and implemented.

With the help of professional Au toCAD software, the achievements were tested. Through experiments, it was found that the product pattern designed by AutoCAD. It can be successfully converted into a three-dimensional product through production equipment, and the product has certain decorativeness and practicality. Combined with the summary of the established pattern gallery and pattern composition rules, the method has been used to quickly generate composition patterns in the professional AutoCAD system. This paper uses color extraction technology to realize the method of quickly extracting the color of pictures in the professional AutoCAD system. In this study, to some extent, the plane is computer-aided secondary development technology provides new guidance ideas and technical basis.

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