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Computer-aided Design and Hand-painted Expression Based on Modern Art Design

Hui Cui[1,*]
[1]Art and Design Department, Zibo Vocational Institute, Zibo, Shandong, China, 255000

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Abstract

Computer-aided design based on modern art design and technology in hand-painted expression have effectively solved design efficiency and improved art level through the application of cross-correlation, while modern art design cannot effectively solve it. The successful development of computer-aided design and hand-painted expression based on modern art design not only requires high art quality of designers, but also improves the mastery of computer-aided systems, so that art and computer complement each other.

Keywords: *Art Design, Auxiliary System, Optimized Design;*

1. Introduction

Modern art design is difficult to meet the precise and efficient design requirements of pure paper drawing, so it is gradually replaced by modern art of computer-aided design[1-3]. Computer-aided modern art design combines computer art and design creativity to create exquisite works. Computer-aided art design is more efficient and strives for perfection. With the development of society, the improvement of computer-aided systems is step by step. Computer-aided design of different conventional hardware structure designs provides effective suggestions for the ideal design of the design. Model design tools, contribute to modern art design and hand-painted performance [4-6].

2. Principles of computer aided system design

According to the actual needs of the computer-aided system, the real purpose of the auxiliary system is understood, and the various modules are researched and designed on this basis. The system design principles are as follows.

(1) Principle of rationality

The design of the system should meet the designers' requirements for computer-aided systems, and complete the important tasks of art design on the basis of ensuring advancement and reliability.

(2) Principle of humanization

In art design, the application of auxiliary systems is very extensive. In order to further improve the user's use of the system, the design of the system must follow the principle of humanization, taking into account the designer's habits, and improve the stability of the system.

(3) The principle of scalability: As people have different requirements for the use of computer-assisted systems, the system must be designed with scalability to facilitate system upgrades due to people's higher needs.

(4) Modular design principle: Through the modular design of the system, it is ensured that each module is an independent individual. When a problem occurs in one module, it will not affect the operation of other modules.

3. The realization process of computer-aided modeling

The characteristic of computer-aided modeling lies in the weight control of the key points of the modeling object. It requires the designer to master

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the whole and essence of the modeling object, and control the modeling characteristics of the modeling object from a three-dimensional perspective. In the initial stage of modeling, the key to modeling lies in the overall grasp of the target object, then gradually design the general details of the object, and finally adjust the consistency of the details of the modeling object.

Computer assistance mainly includes two technical factors: design and shaping. In the process of computer-aided modeling, as the expression of three-dimensional space modeling, designers should effectively control the relative relationship between the height and width of each surface, which is essential to grasp the effect of three-dimensional modeling as a whole. This point can be summarized as: consider all the faces and interrelated three-dimensional parts as a whole, which is very different from NURBS spline modeling.

The realization process of computer-aided modeling can be briefly summarized in Figure 1.

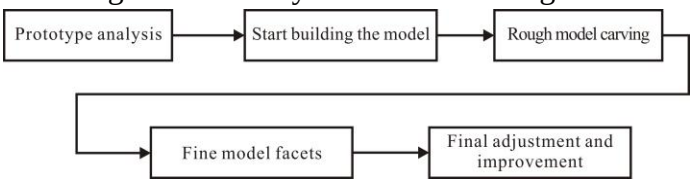

Figure 1. The basic process of computer-aided modeling.

Step 1: Analyze the overall modeling of the modeling object and define the basic characteristics of the modeling object. Take the Fengxiang clay sculpture horse shown in Figure 1 as an example. Its shape is exaggerated, its form is simple, it has a vivid posture and a lovely overall appearance. Analyzing the overall style of the modeling, and always grasping the overall style in the modeling process is the basis to ensure the success of the modeling.

Step 2: Modeling structure analysis. The overall structure of a clay sculpture horse consists of four main parts: head, trunk, limbs and tail. In the entire process of sculpture modeling, the designer should control these four key parts. At each stage, these key components must be simultaneously designed and refined, starting from the rough form and gradually achieving step by step refinement. This is also the biggest difference from NURBS and other modeling methods.

Step 3: Determine the approximate shape and rough model design. On the basis of completing the basic structure analysis of the modeling object, first establish a rough model framework. In the specific modeling implementation, you can choose 3dsmax software with powerful modern art design modeling functions. First select the Box tool to create a simple cuboid object based on the overall size of the clay sculpture horse, and then convert it into a polygon (Poly) object, and Roughly edit its shape through three levels of vertex, edge, and face. Complete the distinguishing construction of the four main parts of the head, torso, limbs and tail.

Step 4: In-depth design of the shape. By editing vertex and edge, you can achieve in-depth description from whole to part, from rough to fine.

In modern art design modeling software such as 3dsmax, by increasing the number of vertexes and faces of the model, more details can be added to the modeling. However, what must be noted in the modeling process is to pay attention to the total number of segments of the model when generating new edges. The basic principle is: the number of points determines the number of segments, the number of segments determines the number of faces, and the number of faces determines the size of the model file. This is one of the biggest differences with curve modeling software.

Curve modeling software generally has a small amount of file data, while polygon files often cause a large amount of file data due to improper face number control, which reduces the efficiency of the machine. Because when adding new edges, new details will be generated, but too many unreasonable edges will increase the complexity of the model, which will reduce the speed of the machine. Simply put, the basic principle of adding new edges is: add edges based on the structural needs of the sculpture

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object, more details require more edges, and conversely, under the premise of meeting the requirements of the modeling details, the number of points and edges Less is better.

In the modeling process, how to specifically add edges to control the data volume of the model file, and achieve the balance of model accuracy and file size, can be solved by the method of evaluation matrix. On this basis, an evaluation matrix for computer-aided modeling edge control can be constructed as shown in Figure 2.

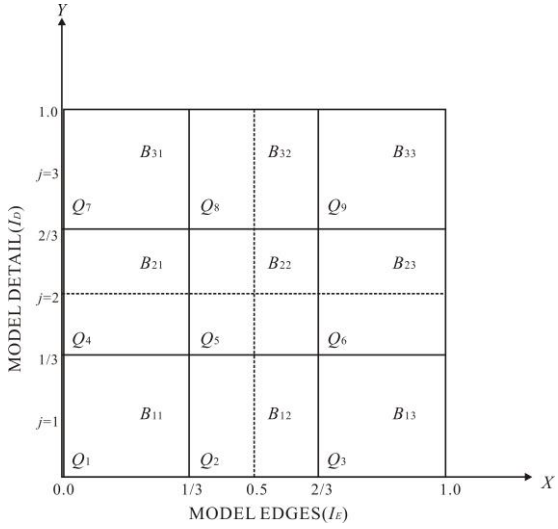

Figure 2. Computer-aided modeling control edge evaluation matrix.

In the two-dimensional matrix shown in Figure 2, the X axis represents the edge (IE) of the model, and its unit distance [0,1] is divided into four scales: 0, 1/3, 2/3, and 1.0. As the value increases, the number of edges in the model increases. The Y axis represents the details (ID) of the model, and correspondingly, [0,1] is divided into four scales: 0, 1/3, 2/3, and 1.0. The value increases, indicating that the details of the corresponding model increase. It can be seen from Figure 3 that the evaluation matrix is divided into nine units of equal size, which are used to represent several different situations that may occur in the modeling process for the control of the number of points that constitute the details of the model. Use the following for different situations The different adjustment strategies proposed to achieve the optimization of the number of points control, so as to achieve the minimum amount of model data under the premise of ensuring the accuracy of the model, and achieve the goal of the best detail control effect.

Analyzing Figure 2, it can be seen that as the modeling accuracy continues to deepen, IE and ID continue to extend along the positive direction of the two axes. Among them, IE represents the number of edges that constitute the model determined by the point (Vertex) (Model Edges); ID represents the details of the model reflected by the corresponding number of edges (Model Detail). The principle of model edge control to solve the optimization of model control can be briefly described as follows:

(1) When i=j, that is, the three areas of B11, B22 and B33 in Figure 3, it means that the edge value just meets the requirements of the detail value, and its accuracy value is basically the same as the number of edges, indicating the current number of wiring Is the most reasonable.

At this time, Q1==Q5==Q9.

(2) When i<j, that is, the three areas B12, B13 and B23 in Figure 2, these areas indicate that the amount of model edge does not match the accuracy requirements, and the model edge layout has been too much, which exceeds the necessary wiring for model accuracy Claim. The result of too many edges is unnecessary waste of resources, reducing the operating speed of the machine, and the number of wiring of the model should be reduced. The adjustment method can be expressed as follows:

$$Q_7 \square (Q_4, Q_8) \quad (1)$$

Among them, $\square$ indicates that the priority of sideline reduction is arranged in descending order, that is, Q7 is far more important than Q4 and Q8.

(3) When i>j, that is, the three regions of B21, B31 and B32 in Figure 3, the edges of the model grid in these regions are too sparse, and the result is that the model lacks due details, because the number of wiring The details required by the model do not match, causing the edge value to be too low. The edge of the model should be increased. The adjustment method can be expressed as follows:

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$$Q_3 \square (Q_2, Q_6) \quad (2)$$

Among them, $\square$ indicates that the priority of considering adding sidelines is arranged in ascending order, and Q3 is more important than Q2 and Q6.

Using the above evaluation method, the wiring control of polygon division can be effectively carried out during the modeling process, and a reasonable three-dimensional model can be constructed while ensuring the detailed description of the model.

Step 5: Adjustment and improvement stage. At this stage, the designer finally grasps the overall structure, gradually completes the description of the model details, and generates the final model. Of course, there is a difference between computer-aided modeling and manual design. Manual design requires bare hands and takes longer, while computer-aided modeling software can use a command (such as Meshs mooth, smooth) to quickly complete smoothing The effect of creating a beautiful model

4. Computer-aided system design requirements

For the design of computer art design and auxiliary system, feasibility analysis should be carried out first, and the design should be designed according to the needs analysis and function analysis of auxiliary system according to the actual application situation. The system is mainly to provide technical support for designers to design perfect works. The specific requirements are as follows.

(1) The design of the auxiliary design system must ensure that the designer can choose the material at will, and the material that has been selected can be changed at any time. There are two main forms of replacement or modification. One is to use the default standard material of the system, and the other is to pass The designer manually modified.

(2) The reality of the system should ensure that the designer can freely set the color and background color of the work according to the needs, and the designer can create the scale and form of the work by himself. And you can preview the completed works in advance through the auxiliary system, and timely modify the places that do not meet the requirements or are not satisfied to ensure the aesthetics of the works.

(3) The system design should provide developers with script sharing services to facilitate different designers to appreciate and learn from their works. Managers should manage the script information within the scope of authority, and provide free access and download services for designers in the development team to improve development efficiency.

The design and application of the system are different. The main operators include designers and managers. The designers are responsible for the material design of the work, model building, lighting layout, work preview, check or download scripts, script sharing, etc., and the management personnel are mainly responsible for User management, data statistical analysis, system configuration management and script management. Different division of labor management.

5. The overall structure design of the computer-aided system based on the WeChat platform

5.1. System functional structure design

The functional structure of the computer-aided system for modern art design mainly includes a system management module, a work modeling module, a material setting module, a lighting layout module, and a script sharing module.

(1) System management module: It mainly designs new works, previews, saves, etc., adds materials to new works, and can manage system configuration. These functions belong to the important content of computer auxiliary functions.

(2) Work modeling module: mainly design the size and curvature of the work, adjust the edge shape to make it more beautiful and meet the design

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requirements. If you are designing a three-dimensional image, you must accurately plan the edge shape of the image. The three-dimensional image can be obtained by rotating. The rotation operation can be automatically completed by the system, while the linear part needs to be manually produced by the designer. This module can be used according to actual needs. Adjust the size and material of the work.

(3) Material setting module: The material of the design product can be added or removed, replaced or modified. The main function is to provide various materials for the work, which can be provided by default by the system or hand-painted by the designer.

(4) Lighting layout module: there is the environment layout module, which mainly selects and sets the background and colors of the design works.

(5) Script sharing module: It is mainly based on database technology to realize the sharing and management functions of scripts. Designers can share design works, and other designers can query and download works through this module to improve development efficiency. effect.

5.2. Hierarchical structure design

In the design of computer-aided systems, the design of script sharing platform is mainly based on J2EE technology, which mainly includes JSP technology, HT-ML technology and Servlet technology. The server will select the corresponding application according to the actual needs of the user [5]. The auxiliary design system is divided into three levels: data maintenance layer, business logic processing layer and display layer. Each layer is independent of each other and has its own responsibilities. Therefore, once a module changes, as long as the interface type remains the same, then The entire computer-aided system can operate normally, which confirms the safe and stable performance of the system.

5.3. Network structure design

The design of the system is mainly to research and deploy according to the basic needs of users, as shown in Figure 3.

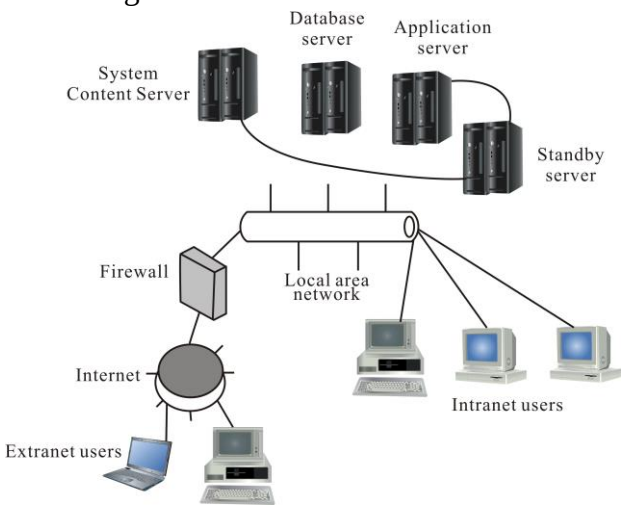

Figure 3. Auxiliary system network deployment diagram.

It can be seen from Figure 3 that there is a one-to-one correspondence between the deployment diagram and the computer-assisted system, so the designer or user can not only access the system through the local area network, but also access the system through the Internet. The difference between the two is that through the local area network, the user You can use all the functions of the system, but users who access from the Internet can only use some of the functions. From this point of view, the design of the auxiliary system has certain safety.

5.4. Database design

In order to ensure that people can query and download script information, the system has been designed with a database to realize the correct management of data information and achieve the maximum value of information use. In software engineering management, the use of the system Analyze to design the database system and create a first-class service for users to query, store, download and manage. When designing the database, it is necessary to improve the stress resistance of the database to prevent excessive data from affecting the system. Once the database is paralyzed, it will seriously affect the operation of the entire system, so the database occupies the core position in the entire system. Database storage information types mainly include user information and script information. The

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user information database mainly stores the user's personal information, identity rights and usage records, while the script information database mainly stores the uploaded works and the related descriptive information. Statistic and record the download information of the script, specifically the number of downloads, download time, etc.

5.5. Function realization

(1) Binding WeChat official account

The system basically realizes the following functions.

WeChat official accounts can be roughly divided into two types: subscription account and service account. The service account has a custom menu function. The first-level menu can be designed through the mobile phone. Therefore, the auxiliary system must be created through the service account. Menu to achieve user interaction. After the account application, apply for the message interface on the page through the system prompt, and then submit the information. In order to obtain the specific services of the course assistance system, WeChat users must implement the WeChat account binding course assistance system and the WeChat public platform. After binding, further realize the realization of the computer assistance system.

(2) Material management

In order to realize the operation of the art assistance system under the WeChat platform, relevant materials must be converted into materials supported by the WeChat platform, including pictures, text, audio, etc., teachers can add the course overview in the form of graphic information to the official account , Students can realize the application of the system on mobile devices.

(3) WeChat query

WeChat query mainly uses mobile phones to query information on the educational administration management system. Students can query results and design works through the WeChat official account platform to give full play to the efficient capabilities of mobile WeChat. Students can also search for data through WeChat search, resulting in independent The data, and feedback to users in the form of documents, the feedback information will eventually achieve diversified forms in the actual content.

6. The practical application of computer-aided system in product design

The application of computer-aided technology in product design can broaden the application field of computers to a certain extent, and have a great impact on traditional design methods and concepts. The application of computer-aided system in product design is mainly reflected in the following points:

(1) Product design is represented by modern art design instead of pen and paper

Through the use of computer-aided systems, traditional drawing tools such as pens, rulers, and gauges can no longer be used. The computer operating platform provides a broad space for product design, and complex tasks can be completed through program operations, with simple and efficient product effects. The application of computer-aided system completely got rid of the hand-drawn mode.

(2) The design of the program is efficient and flexible

Through the art assistance system of modern art design, the creative plan of the product can realize three-dimensional design through three-dimensional modeling, and can be adjusted at will in terms of form, color, texture, etc., during the design process, there is sufficient time and energy In the analysis and evaluation of the works, there will be no loss in copying or downloading the works. People can share the completed works, and the design tasks can also be completed in stages, which effectively improves work efficiency.

(3) Shorten the product development cycle

The application of computer-aided systems in product design can improve the safety and reliability of design results. Due to the improvement of work efficiency, the development cycle of products can be shortened. Products designed through the auxiliary system have a certain three-dimensional effect and

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sense of quality. With the development of digital technology, virtual products become reality. Through the application of virtual reality technology, static design results can be turned into virtual real worlds. People can test the performance of all aspects of products through the simulation of products.

(4) Design simulation and verification

Through the 3D graphics function of the CAD system, designers can simulate the shape of the designed product on the computer screen, optimize the product at the beginning of the design, and achieve the purpose of reducing consumption and improving quality. Before the new product is put into use, the structure, assembly and other characteristics of the product can also be analyzed and tested to improve the first-time product design.

7. Conclusions

The rapid development of computer-aided systems not only means changes in design technology, but also a great breakthrough in design thinking, which further promotes the comprehensive and profound reform of manufacturing from product design to technical management. The application of computer-aided systems can closely combine the accuracy and speed of the computer with the creative thinking and design ability of the designer, so that the product can be intelligent from conceptual design, modeling design, structural design, engineering manufacturing and other programs, thereby creating More economical, practical and beautiful products.

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1. Shandong province art science special project in 2018, the name of the project is "Specialized teaching practice in the application of traditional handicrafts to pattern mixed reform courses", approval number: YJ201811141;

2. Shandong province art education special project in 2019, the name of the project "The teaching practice research of qilu culture integrating cloisonne enamel painting", approval number: YJ201911133.

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