

Design of Ecological Humidifier Based on Computer Modeling Technology

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Abstract—With the rapid development of computer technology and the increasing improvement of three-dimensional modeling technology, computer modeling technology is widely used in various fields and plays a certain auxiliary role in product design, which changes the limitations of traditional design mode and makes the design more in line with the actual application. On this basis, combined with the user's needs for the humidifier in function, space and convenience, a small desktop ecological humidifier is designed. Taking rhinoceros modeling as an example, this paper explains how to quickly build the humidifier model through the modeling method and forming law in the software, and explores and summarizes some skills in the practical operation of three-dimensional modeling.

Key words-computer modeling; humidifier; modeling design

1 Introduction

Air humidity is one of the key indicators affecting people's living comfort. If the air is too dry or too humid, it will have an adverse impact on human health and living and working environment. In the dry autumn and winter season, the desktop humidifier can not only increase the air humidity, but also bring moist air to people. At the same time, the humidifier with novel shape can also play a certain decorative role^[2]. More products with lovely appearance or fashion are available, so that the humidifier can better meet the personalized needs of different consumers, Therefore, humidifier has gradually become the new favorite of office and family. As far as the existing humidifier is concerned, the function is slightly single and the appearance is simple. Humanization and multi-function of the product is a general trend of product development. Compared with other small household electrical appliances, the use and popularization of humidifier in China is relatively weak, the main market is not mature, there is a lot of space to develop, and the industry also maintains good potential and vitality.

According to the characteristics of desktop use, small, portable and multifunctional, this topic designs and studies the function and appearance of the humidifier. At the same time, according to the particularity of the modeling of the humidifier, it studies how to complete the initial modeling design of the humidifier with the help of computer modeling technology, and

discusses a way to complete the modeling quickly and efficiently by using software, which is different from the traditional design method. In the process of computer modeling, different methods are used for operation and specific analysis. In the process of actual operation, the computer stimulates the designer's innovative thinking. This technology also opens up a new space for product design^[1].

2 Current Situation and Advantages of Computer Modeling Technology

Computer modeling is the most basic and widely used computer-aided technology, and it is also a necessary prerequisite for the implementation of other CAD/CAM/CAE technologies. Now computer three-dimensional modeling technology is widely used, such as three-dimensional animation, film and television special effects, electronic games, aerospace industry modeling, automobile modeling and other fields. And its application field will be continuously expanded with the continuous development and maturity of technology^[6]. For example, in the aspect of animation production, the animation production of computer three-dimensional technology is incomparable in technology, effect and other aspects. With the powerful computing power of this computer, people can create realistic visual effects after going through the steps of modeling, material assignment, action adjustment and rendering. They can achieve the same natural and smooth as reality without coloring frame by frame like two-dimensional animation. In animation production, computer modeling technology realizes time-saving, labor-saving and high efficiency, and provides effective artistic and technical support for the creative development of film and television advertising design.

3 Application of Computer Modeling in Product Design

Computer modeling technology plays an auxiliary role in product design. By using CAD, rhino, 3dmax and other software, product designers can easily realize 3D modeling and design^[1]. Computer modeling is powerful because it has powerful NURBS modeling. NURBS is characterized by using curves as surfaces, which can obtain more accurate surfaces. It is very suitable for streamline in products, such as rhino modeling. Because of its powerful surface modeling function and ease of operation, it occupies an advantage in similar computer-aided design software. In the computer three-dimensional modeling technology, the object can be observed in an all-round way. The viewpoint changes with the mouse. It changes the limitation of the viewpoint on the traditional plan. It can observe all angles and details of the object. At the same time, it can also construct and modify the object in the three-dimensional space. In this way, the thinking and evaluation of the problem can start from the three-dimensional space close to the reality, Make the design more in line with the actual application. Designers can also express the design more clearly.

In product design, the characteristics of computer modeling technology are: first, simulation and the introduction of computer modeling technology, which can lead to "sample design" or "virtual design" in advance., the designer can see the appearance effect of the product in advance before the product is produced. Second, accuracy, and can adjust the data of the drawn shape at any time, and record more information to ensure the accuracy of the data.

Third, efficiency, the use of computer modeling technology can save a lot of repetitive work of design modification through point, line and surface adjustment Compared with the traditional model making, it greatly reduces the waste of raw materials and shortens the production time^[7].

4 Overview of Humidifier

4.1 Development status

According to relevant data, the number of people using humidifiers in China is far lower than that in developed countries such as the United States and Japan. The 2021 special research and analysis report on China's humidifier industry released by China Industry Research Network believes that the increase in the development of humidifiers can promote the development of China's air humidifier industry and promote the healthy level of national quality of life^[3]. Due to regional differences and obvious seasonal laws, the demand for humidifiers is stronger in the northern market where the air is dry. With a large number of air conditioners entering the family, the south, which is used to the humid climate, also has a special preference for humidifiers^[8]. Therefore, the market demand for humidifier products is increasing, the types of air humidifier products are more diversified, the modeling elements are more novel, and the materials are more environmentally friendly.

4.2 User requirements and design principles

In the use of humidifier, in addition to the needs of health and comfort, people also pay more attention to the convenience of use, and have high requirements for the intuition and timeliness of product operation process. The design principles are as follows: functional principle. This is not only the most basic starting point of design, but also the needs of all design. Functions should be divided into primary and secondary. Ease of use principle. Abandon cumbersome and complex operations and minimize the learning cost of users. Quality principle. According to the instinctive needs of contemporary young people for taste, humidifiers should pay attention to sensory satisfaction and choose brighter colors and smooth shapes; According to the needs of behavior level and reflection level, humidifier can combine quality with technology, and apply natural form to product modeling to reflect natural and healthy life taste^[4].

5 Design and Research of Ecological Humidifier

In recent years, there have been many new household appliances in the market. Combining humidifier with many household appliances will create new humidification products^[9]. Such as the combination of humidifier and air conditioner and the combination of humidifier and purifier. This combination not only saves space, but also is more convenient to use. It not only improves the value of products, but also enriches the types of market products.

5.1 Function Design and Display

Function is the most basic relationship between product and user. In the process of using a

product, people get the satisfaction of their needs through functions. The functional design of the product embodies the usability principle of product design. After functional design, based on the basic principle of ease of use, we can further explore the principles of product applicability, innovation and beauty. Its functions include the following four points: The cultivation of small flowers is realized while humidifying the air; Add fluorescent lamp irradiation function to promote plant growth; The humidity can be automatically adjusted according to the indoor temperature and can be intelligently controlled through app, such as air humidification degree, fluorescent lamp irradiation degree and irrigation speed to plant roots, as shown in the left figure in Figure 1. When there is no water, the user can be prompted to add water in the form of lights to prevent dry burning, as shown in the right figure in Fig.1.

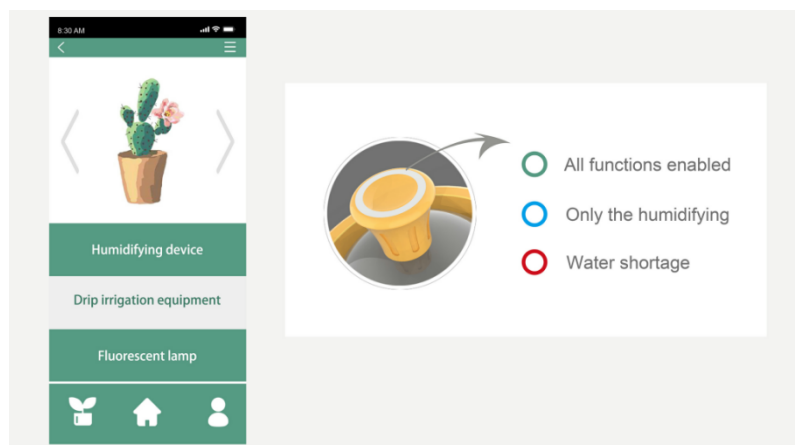


Fig.1 Function display

5.2 Modeling Design

When designing an air humidifier, the overall shape of the product is the primary performance. At present, there are many kinds of humidifiers in the market, which are more and more advanced in function and more diversified in shape. Through design survey, it is found that small and simple products are gradually loved by everyone^[10]. The design process of mass-produced products is not enough to create only according to the needs of the market. The final style of its form still needs to consider many factors such as function, structure, materials, user object analysis and ergonomics. The form of the product follows the function. If the form of the product is separated from the structural function, it will lose its value and significance.

In the design of desktop ecological humidifier, the first consideration in modeling is small and novel, and the cultivation of small flowers should be achieved at the same time. In the process of design, it is first completed by hand drawing, and the sketches of three schemes are selected in the conceptual design stage, as shown in Fig.2. Although scheme a can realize the watering of green plants, it does not have originality in modeling, nor does it give people a beautiful experience, and does not make consumers feel bright in front of them; Scheme B is bulky as a whole, and it is inconvenient to add water; The shape of scheme C is similar to that of the funnel. Insert the product into the flowerpot for use. There is a button on the top to open with

one key. Drip irrigation is realized while humidifying. When adding water, it can be poured directly from the top. Its structure is designed, optimized and model verified. Scheme C in the figure is selected as the final scheme. The final effect drawing of ecological humidifier is shown in Fig.3.

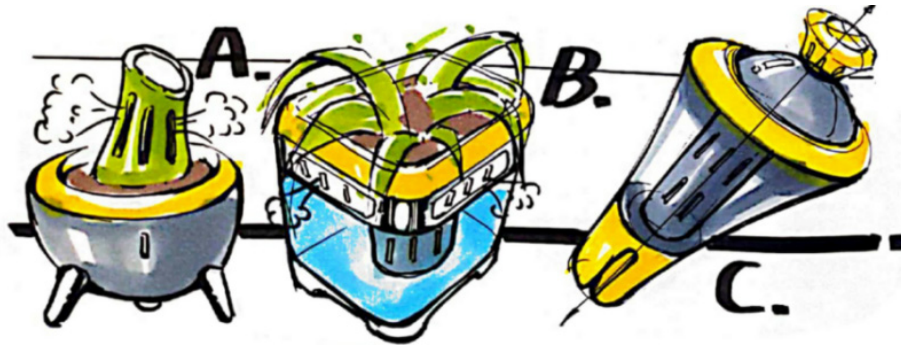


Fig. 2 Sketch scheme

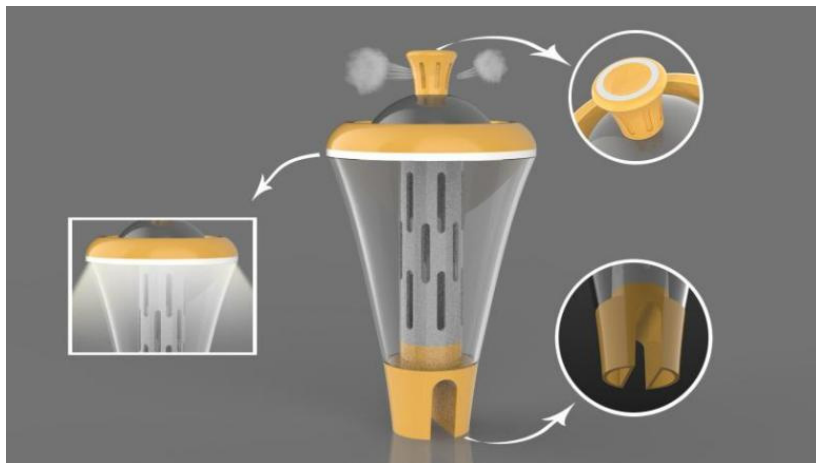


Fig. 3 Final effect drawing

5.3 Application of computer modeling technology in product display

The combination and application of different tools can produce different effects. Why modeling should have good ideas and methods lies in the comprehensive application of tools. Excellent product designers can find the best modeling scheme and establish the product model quickly and efficiently. Everyone has different ideas, and there are differences in modeling methods^[5].

The complexity of the humidifier's modeling determines that it cannot be formed through a surface. When conducting 3D modeling, the whole is generally divided into several different

parts, and then spliced. Special processing is required for surface stitching, such as fillet, chamfer, Boolean operation, etc. Rhino's main steps in the product modeling design:

The first is the drawing of contour lines. In the process of model construction, different contour lines give people different feelings. Therefore, in modeling design, we should pay attention to the treatment of contour lines and create new humidifier modeling by grasping the relationship between line and shape. In order to more intuitively analyze the quality of the generated modeling surface, curvature analysis shall be carried out after contour drawing, curvature analysis can well observe the continuity of the generated surface and facilitate further adjustment. Two rail sweep is one of the commonly used surface modeling methods in the modeling process. Rhino is very powerful in surface modeling. The appearance of products is presented in the form of surfaces. The key is to establish surfaces accurately and quickly. Rhinoceros has more than ten commands to generate or edit surfaces, such as single rail sweeping, double rail sweeping, mesh surface building, lofting and so on.. Boolean operation. In the completed modeling part, the part of an entity shape is removed, and the coincident entities are subtracted by using the Boolean operation difference set command. The objects involved in the operation must have absolutely complete surfaces, no holes, overlapping surfaces or unconsolidated nodes. Trim. Trimming is used to segment lines and curves and remove unwanted modeling surfaces. The cut command can divide the overall shape into any part while preserving the appearance surface, which is convenient for editing the divided part. Ring array. Rhino's array tools are divided into ring array and rectangular array. It can greatly reduce the cumbersome modeling work, improve the modeling speed and obtain accurate modeling. Fillet tool. Fillet after the overall model is created to make the connection between faces smoother. Projection curve. When there is a need to draw a curve on a surface, you can use the projection curve to change a line outside the surface into a line on the surface, which greatly improves the accuracy. Join surfaces. Sometimes there are broken faces after fillet. At this time, the surface needs to be trimmed and connected. Hide. When the built model is complex and inconvenient to observe, you can hide the completed part and unhide it when necessary. Adjustment of wireframe, shading, rendering and other modes. When the modeling reaches a certain stage, different display modes can be selected for observation according to the desired preview effect. Object lock point. By opening the lock point of the object, you can accurately find the accurate position of some points such as the center point, quarter point and endpoint, so as to improve the accuracy of model making. The main steps are shown in Fig.4. and Fig.5.

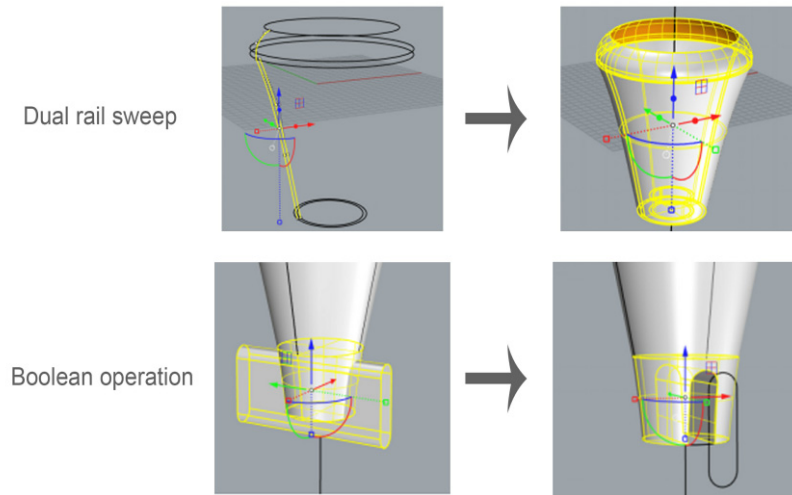


Fig. 4 Modeling steps 1

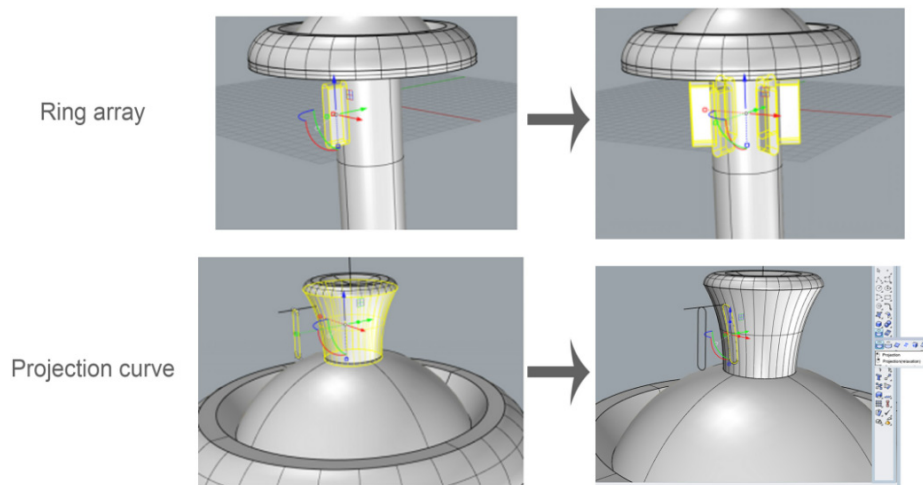


Fig. 5 Modeling steps 2

6 Conclusion

Ecological humidifier plays an important role in increasing indoor air humidity. In the design process, the application of computer modeling technology makes the completion of the model more simple and convenient, and the accuracy is also improved. This has a great impact on the traditional design concepts and methods, which can not be achieved in the composition and Simulation of the model. Through research and analysis, we can find that product modeling design not only needs a solid basis of design experience and comprehensive consideration of

various factors, but also needs to master the operation of rhino software. The application of rhinoceros software in product design can give full play to the best design effect, provide fast, efficient and accurate design ideas and technologies for modern product modeling, and provide more possibilities for the realization of various product modeling designed by product designers.

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